INTERNATIONAL ASSET PRICING UNDER PARTIALLY INTEGRATED MARKETS: MEASUREMENT AND MODELS TESTING

Dissertation

KUSDHIANTO SETIAWAN

Graduate School of Economics, Doctoral Program
HIROSHIMA UNIVERSITY OF ECONOMICS
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To Sita, Satya, Kenzo
& Dening

PREFACE

This dissertation is part of the requirements to earn a Ph.D. from Graduate School of Economics, Hiroshima University of Economics. The dissertation is addressing following research questions:

(1) What is the recent degree of market integration and how should the degree be measured?
(2) What are the driving factors of a country to open up its economy, and what are the effects of becoming more open and more integrated to the world economy?
(3) Is the capital asset pricing model (CAPM) with time-varying beta (market risk measure) useful in international asset pricing? Is the market risk of the international assets priced equally?
(4) Do investors use foreign assets for consumption smoothing?

The definition of market integration used in this dissertation is based on contemporaneous comovement of markets returns. Following the definition, degree of market integration basically can be measured based on cross-correlation of returns or prices of assets from various markets. In Chapters 2 and 3, this definition is applied. The dynamics of the degree of integration was observed over the sample period of 2000 to 2010. The findings show that although the degree of integration is dynamics, there is an apparent trend that the markets are becoming more integrated. In Chapter 2, it found that stock markets were clustered geographically. Meanwhile, Chapter 3 extends the previous study by comparing the measurement based on conditional and unconditional correlation. The results show that both measures support earlier findings, and both measures produce a relatively identic structure of the relationship of the markets. These results imply that markets are becoming more integrated, but the integration is not completed yet; some clusters or market segments were found.

The main investigation of this dissertation is about international portfolio investment (deals with financial assets, mainly those traded in equity market). However, to give an overview of the dynamics of economic openness and its impact to an economy, Chapter 4 discusses the effects of Foreign Direct Investment (FDI) in Indonesia.

The findings in Chapters 2 and 3 have raising issues in international asset pricing model. Previous models for pricing such assets must assume the completeness of the integration. Testing the models by making prior assumption that markets are completely integrated may lead us to the wrong conclusion. The previous tests of international asset pricing models are inconclusive with regard to the fitness of the models as well as to the level of completeness of the integration (whether the asset pricing models are misspecified or that the full market integration is not a feasible assumption for the markets). The misspecification of the model is not only because the inclusion of inappropriate additional risk factors, but also because the proxy of the world market portfolio may be not lying in the efficient frontier and or at tangent of capital market line. The latter is tried to be overcame in Chapter 5 by constructing world market portfolio from the composing assets and do Merton procedure for deriving the efficient frontier and the capital market line. By doing so, the world portfolio that is mean-variance efficient and at the tangency of the capital market line is assured. By applying Seemingly Unrelated Regression (SUR) and considering the multivariate GARCH error structure, International Capital Asset Pricing Model (ICAPM) was tested. The use of SUR with GARCH was intended to test the model in both completely or partially integrated markets. The development of SUR-GARCH model is explained in Chapter 6. In addition, the other model for asset pricing, Consumption-CAPM, was also examined in the context of investment in offshore assets. This topic is discussed in Chapter 7 as an attempt to answer the research question (4).

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In April 2010, I began my studies at HUE with a struggle. With my background in business studies, I had to learn to understand financial economics and more specifically I had to study econometrics. I am very fortunate that Professor Koichi Maekawa was willing to be my dissertation supervisor; he has taught me many things, especially about econometrics. With great patience, he guided, taught me and introduced me to a world-class econometrics expert community. With his help, I was able to attend and to present my research papers in international conferences, including the Hiroshima University of Economics – Hiroshima University – Singapore Management University (HUE–HUE–SMU) Tripartite Conference (Singapore, March 2011 & 2012), SMU-ESSEC Symposium on Empirical Finance & Financial Econometrics (Singapore, 8-9 June 2012), and The 3rd International Conference on High Frequency Data Analysis in Financial Market (jointly organized by HUE and Hitotsubashi University, Hiroshima, 16-18 November 2012). He also provided financial support on many occasions, including assistance so I could attend the Business &Economics Society International Conference in Salzburg, Austria in July, 2012. Through a variety of conferences, I had the opportunity to present my research in front of world-famous professors in econometrics. From these processes, I obtained invaluable comments, critiques, and suggestions that contributed to this dissertation. I wish to thank him for all his invaluable help.

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Hiroshima, December 2012
Kusdhianto Setiawan

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INTRODUCTION

INTRODUCTION

The dynamics of the world economy were developing rapidly during the last decade; we witnessed rapid development in the degree of market openness in almost all economies. Such developments have bolstered international trade for both goods and services. Moreover, many countries opened up their economies to attract investment in both foreign direct investment (FDI) and portfolio investment. As a result, capital is becoming freer in crossing national borders.

As economies are becoming more open and the capital is flowing more freely across borders, we could expect that the transaction cost for acquiring and selling an asset or capital is diminishing. Consequently, an asset must be priced more equally regardless of where the market is. The law of one price becomes central in asset pricing when markets are becoming more and more integrated.

Research Questions

This dissertation tries to answer following research questions:

(1) What is the recent degree of market integration and how should the degree be measured? The main focus in the questions is integration in stock markets, because from much of the literature, stock market performance in a country has a strong relationship to its economic performance. Thus, the stock market is regarded as a proxy for a country’s economy, and analyzing the stock market integration is expectedly able to show the dynamics of the economic integration.

(2) What are the driving factors of a country to open up its economy, and what are the effects of becoming more open and more integrated to the world economy? This will be answered by taking Indonesia as a case study, for it is a prominent emerging market in Southeast Asia and a member of the G20.

(3) Is the capital asset pricing model (CAPM) with time-varying beta (market risk measure) useful in international asset pricing? Is the market risk of the international assets priced equally? In answering these questions, we are assuming that national stock markets are partially integrated such that the country-specific (idiosyncratic) risks are co-varied. Moreover, the

unexpected returns (error terms in CAPM system equation) follow the multivariate GARCH error structure.

(4) Do investors use foreign assets for consumption smoothing? This question tries to answer whether foreign stock market dynamics affect individuals' consumption behavior in a country. If that is the case, then it shows that both markets are integrated. To answer this, consumption-capital asset pricing model (C-CAPM) is applied to test the relationship. Japan and United States were taken as samples of analysis.

Outline of Dissertation

The questions will be discussed in the following chapters:

Chapter 1 UNDERLYING THEORIES AND MEASUREMENT METHODS IN CAPITAL MARKET INTEGRATION

Stylized facts of some indicators that show the world capital markets are becoming more integrated are presented in this chapter. Motivations of a country or an economy to open up its market are explained, in addition to the advantages and disadvantages of being integrated to the world market. Theories and tools for measuring the degree of integration and its effect are also discussed in this chapter.

Chapter 2 ON THE DYNAMICS OF STOCK MARKET INTEGRATION: A MINIMUM SPANNING TREE ANALYSIS

This chapter provides an overview of the dynamics of the stock market integration degree. The main tool used in the analysis is minimum spanning tree (MST), a tool that finds the shortest way to connect all markets in the sample. The pseudo-distance measure is based on unconditional cross-correlation of return of the stock markets. The results from the analysis show that stock markets are becoming more integrated, but the integration is not perfect; some regional clusters were found.

Chapter 3 GLOBAL STOCK MARKET LANDSCAPE: AN APPLICATION OF MINIMUM SPANNING TREE TECHNIQUE

This chapter is an extension of the previous one. It compares the minimum spanning tree graphs produced from unconditional and conditional cross-correlation of the return of the markets. In addition, stability of the structure of the markets is also analyzed. The results show that although the markets are becoming more integrated, markets were clustering based on geographic proximity rather than the market sophistication level (developed versus emerging market). The results support the findings in the previous chapter. Moreover, the structure of relationship is relatively stable. VAR analysis was also performed to detect which market drove the market integration degree (MST length) and found that the US stock market is still the most dominant market, such that its returns and volatilities affect other markets. It also found that the Asian stock market (Singapore) is becoming more prominent in driving other stock market returns than the European stock market. In sum, the results indicate that market integration is not yet perfect such that forming an internationally diversified portfolio may be still useful.

Chapter 4 THE EFFECT OF FOREIGN DIRECT INVESTMENT IN INDONESIA

This chapter shows how market openness affects the economy. Indonesia is taken as a special case for the analysis because it is the largest emerging market in Southeast Asia. It suffered from the acute economic crisis in 1997–1998 that led to political turmoil, yet it eventually was able to survive and grow at a faster pace after that. The analysis shows that market openness significantly affected the economy. It also shows that Indonesia successfully attracted FDI, but the inflows brought a mixed effect to the economy. In general, this chapter shows the advantages and disadvantages of being an open economy and being integrated into the world market.

Chapter 5 REEXAMINATION OF INTERNATIONAL CAPM WITH DYNAMIC BETA: A SUR WITH AND WITHOUT GARCH

Based on Chapters 1, 2 and 3, knowing that the world stock markets were not perfectly integrated has put the benefit of investing in international assets in question. During period from 1997 until mid-2012, there were several crises, recessions, and boom episodes. Such events drove the co-movement of returns as well as volatility. From the analysis, it shows that the asset-pricing model (CAPM) is able to explain the realized (ex-post) returns when we assumed that the error structure in each equation is homoscedastic. However, because of events such as crises, recessions, and boom episodes, the multivariate GARCH error structure does exist in the model. The test of the dynamic beta CAPM for international asset pricing shows that when the error structure is considered, the model does not fit well. Moreover, it also found that the law of one price is violated; the price of the world market risk differs significantly among the markets. The latter indicates that the markets were not perfectly integrated, such that an internationally diversified portfolio could reduce the non-world market risks.

Chapter 6 ESTIMATION OF VECTOR ERROR CORRECTION MODEL WITH GARCH ERRORS

This chapter explains the new method in estimating the expected return of assets using an asset-pricing model that takes into account a multivariate GARCH error structure. The method is suitable for testing conditional CAPM as in the previous chapter.

Chapter 7 HOUSEHOLD CONSUMPTION SMOOTHING THROUGH EQUITY INVESTMENT IN THE UNITED STATES AND JAPAN: AN EMPIRICAL EXAMINATION OF THE CONSUMPTION-CAPITAL ASSET PRICING MODEL (C-CAPM)

As the CAPM does not fit well, the alternative model for international asset pricing used in the next analysis is consumption-CAPM. This model takes into account aggregate investor consumption behavior. The model also explains the relationship between economic condition (proxied by consumption growth) and stock market performance (returns). First, the model was tested for asset pricing in the domestic market, the US, and Japan. The results show that C-CAPM seems to fit well in the Japan in some sub-sample periods. The risk aversion in Japan is also lower than that in the US, and it conforms to the standard consumption theory. Second, the model was tested to investigate whether Japanese households use foreign asset (US assets) to smooth their consumption. The results indicate that there is no evident support for the hypothesis. Once again, it indicates that both markets were not integrated.

The definition of market integration used in this dissertation is based on contemporaneous co-movement of markets returns. Following the definition, degree of market integration basically can be measured based on cross-correlation of returns or prices of assets from various markets. In Chapters 2 and 3, this definition is applied. The dynamics of the degree of integration was observed over the sample period of 2000 to 2010. The findings show that although the degree of integration is dynamics, there is an apparent trend that the markets are becoming more integrated. In Chapter 2, it found that stock markets were clustered geographically. Meanwhile, Chapter 3 extends the previous study by comparing the measurement based on conditional and unconditional correlation. The results show that both measures support earlier findings, and both measures produce a relatively identic structure of the relationship of the markets. These results imply that markets are becoming more integrated, but the integration is not completed yet; some clusters or market segments were found.

In developing asset-pricing models, we strive to find factors that are able to explain or to estimate the expected return of an asset. In international asset pricing, the models can be tested under cross-section, time series, or dynamic system equation settings. In a cross-section setting, markets are said to be fully integrated when the price of a risk factor is found to be identical across the markets. In a time series setting, generally empirical studies decompose the risk factor into two parts: global risk factor and domestic risk factor. When the coefficient of the global risk factor is significant while the domestic risk factor is not, then we said the market is integrated into the world market. Meanwhile, applying the definition for testing the asset-pricing model under the dynamic system equation setting such as under the specification of seemingly unrelated regression (SUR), we would say that markets are fully integrated when: First, we fail to find a cointegrating equation in the model. Cointegration implies that there is long-run relationship among variables. In an error correction model where the dependent variable is expected return of a market (first-order difference of log price), the presence of a cointegrating equation implies that we can combine non-stationary variables (stock market indexes) into a stationary series. If the lagged series of the cointegrating equation is able to explain the expected return of a market, then this means that there are systematic arbitrage opportunities; investors may utilize historical market indexes to estimate the expected return of that market. Second, the price of the risk factor is identical across the equations (markets). The latter is an application of the law of one price with regard to the risk pricing. Chapter 5 deals with not only testing the asset-pricing model, but also testing the degree of integration (to find whether the markets are fully integrated, partially integrated, or not integrated).

However, observing the recent development of trade liberalization for both goods and services in many countries that eventually foster freer capital mobility across borders, we may suspect that at least the markets are partially integrated.

Chapter 1

UNDERLYING THEORIES AND MEASUREMENT METHODS IN CAPITAL MARKET INTEGRATION

UNDERLYING THEORIES AND MEASUREMENT METHODS IN CAPITAL MARKET INTEGRATION

ABSTRACT

This chapter surveys theories related to the measurement of the degree of financial market integration and also summarizes previous important empirical works that defined the status of completeness of the integration processes. Potential issues that emerged from the previous works are exposed, and using more recent data, the author also provides stylized facts about the recent status of the market integration degree and shows the disadvantages of using previous methods in measuring it.

1.1. Stages Towards Market Integration and Completeness of the Integration

1.1.1. Sequencing

The introduction of the euro in European countries is often cited as an example of the countries' ultimate goal of being merged into a single market. Before the introduction of the single currency, European Union (EU) countries passed through several steps in harmonizing trade policies and making freer trade of goods and services, as well as human capital (labor market integration). Meanwhile, ASEAN countries seem to follow the steps taken by the EU in liberalizing their markets. However, there is no indication that the countries will create and use a single currency. Many studies linked the steps necessary to integrate the markets to theory of optimum currency area (OCA). The theory of OCA, first proposed by Mundell (1963), balances the costs and benefits associated with sharing a common currency. It identifies a few factors that matter for this comparison: the relative share of intra-regional trade, the nature of shocks, the flexibility of factor markets, and the economic size of participating countries. There is general consensus that economic liberalization in emerging economies should begin with trade liberalization and be followed by the deregulation of domestic financial markets before lifting restrictions on capital account transactions (Park & Wyplosz, 2010, p. 41).

This sequencing strategy suggests that countries would go through the process of financial market integration before adopting a common currency, as we can see in the

Eurozone. However, not every country took the common currency as the main motivation for becoming more open to the world economy. Although much empirical evidence (e.g., Danthine et al., 2000; Fratzscher, 2002) suggests that intra-regional exchange rate stability can be instrumental to deeper integration of regional capital markets, as it may mitigate currency risks involved in cross-border investment, non-economic factors such as political, geographical, and cultural aspects may be hurdles that inhibit the progress of the integration. For example, the East Asian countries, especially the ASEAN countries, have largely followed the recommended sequencing strategy. They started lowering tariffs and non-tariff barriers long before taking steps to liberalize and open their financial markets. But there is no prediction that liberalization of the trade regime would generate market pressure for the liberalization of financial markets and capital account transactions to follow, or that this in turn creates incentives for monetary integration. Thus, the markets might be regionally integrated, but in a worldwide context, they are not completely integrated.

1.1.2. Partial Integration

If financial liberalization is effective, emerging markets are at least partially integrated with world equity markets. In this case, both local and world risk factors are pertinent in pricing emerging market securities. However, emerging markets might remain segmented after liberalization if the removal of regulatory restrictions does not attract foreign investors in the presence of significant indirect barriers. On the other hand, the measure of market integration must be, in some circumstances, time-varying insofar as emerging markets may evolve from a segmented state to an integrated state through time and vice versa.

A summary of previous studies that mainly adopted time varying risk factors and partially integrated assumptions can be found in Arouri, Jawadi, and Nguyen (2010) is restated as follows:

- The development of asset pricing models that take into account investment barriers such as ownership restriction (Errunza and Losq, 1985; Errunza et al., 1992), withholding tax discrimination (Stulz, 1981; Wheatly, 1988), and information asymmetries (Brennan and Cao, 1996)
- The developments of asset pricing models in which two aggregate sources of systematic risks (local and global) are considered. These risks are in general

represented by the covariance of asset returns with world and local market index returns. Within this category, empirical measures of market integration can be either invariant (Claessens and Rhee, 1994) or time-varying depending on the dynamics of several information variables (Bekaert and Harvey, 1995).

Overall, this research stream concludes in favor of significant impacts of international investment barriers and finds evidence of time varying market integration between the world (including developed markets) and emerging markets.

1.1.3. Complete Integration

In the case of fully integrated markets, the law of one price should be validated in the empirical studies results. In this case, assets of the same risk issued or traded in different markets should command identical expected returns. More precisely, the price of risk as the factor in the asset pricing also must be priced identically across the markets where the asset is traded. As evidence that markets are fully integrated, the empirical study must show that only world risk factors are relevant in explaining the dynamics of expected returns across markets. Harvey (1995) tested an international version of CAPM (ICAPM), and used the MSCI world market index as a proxy of the world market to measure worldwide market systematic risk. The results show a low significance of the global betas for almost all emerging markets.

The statistical rejection of the single-factor ICAPM lead us to think that other factors may be relevant for better capturing the risk-return relation in the markets. Two empirical specifications are then proposed:

- The first one refers to an extension of the ICAPM to a two-factor model in which real exchange rate risk is accounted for. Examples include either the international asset pricing model of Adler and Dumas (1983), where expected returns in a particular currency are generated by the covariances of asset returns and inflation rates in all countries, or the two-factor models of Ferson and Harvey (1994) and Harvey (1995) where an aggregate index of currency returns is introduced to the single-factor ICAPM. The exchange rate factor is, however, found to have marginal explanatory power over the 1976-1992 period in describing the dynamics of emerging market returns.

- The second specification is based on a multi-factor model that comprises five systematic risk factors: worldwide market risk, exchange rate risk, changes in commodity prices, inflation rate, and world business cycle. The results from the models show that inclusion of three additional factors does not help to improve the model's explanatory power, compared to single- and two-factor models.

However, as to the critiques of the CAPM itself (see, for example Fama and French, 2004) the above-presented empirical results are unable to offer us a definitive conclusion as to whether the asset-pricing models are misspecified or that the full market integration is not a feasible assumption for the markets. The misspecification of the model is not only because of the inclusion of inappropriate additional risk factors, but also because the proxy of the world market portfolio may be not lying in the efficient frontier and or at a tangent of the capital market line. The author seeks to overcome the latter in Chapter 5 by constructing a world market portfolio from the composing assets and performing a Merton procedure for deriving the efficient frontier and the capital market line. By doing so, a world portfolio that is mean-variance efficient and at the tangency of the capital market line is assured.

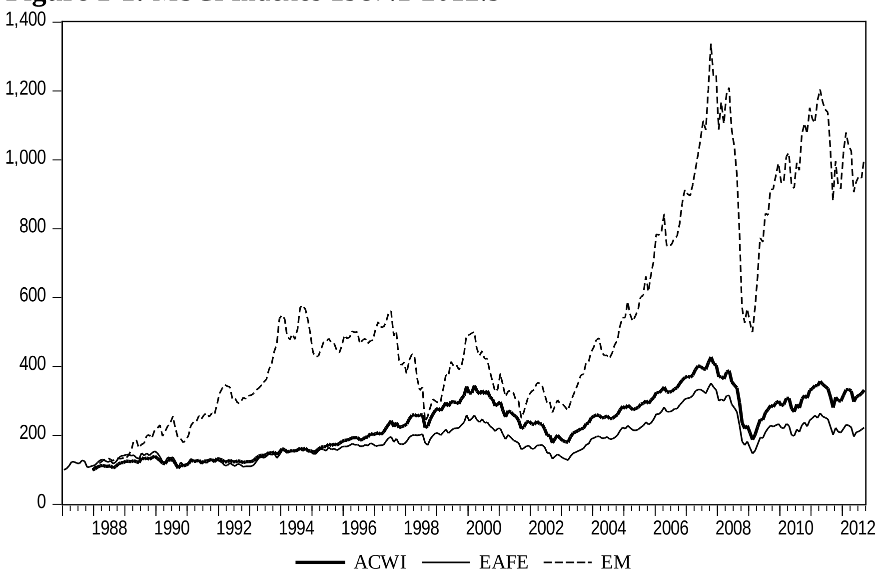
1.2. Benefit and Cost of Market Integration

When a country opens up its economy and lets capital flow in and out freely, one apparent benefit to the participants in trade is that trading costs could be lower because of the removal of trade barriers during the liberalization process. However, many empirical studies show that some factors might inhibit the progress. For example, Portes and Rey (1999), in a study extended by Portes et al. (2001), showed that international diversification of asset portfolios is constrained by information costs that include: number of bank branches in the foreign country, the efficiency and effectiveness of the judicial system, the absence of insider trading, and the degree of sophistication of the host country's financial market.

Apart from the factors that hinder the progress of market integration, past empirical studies show that investing in portfolios from emerging markets offered higher risk-adjusted returns than those of developed markets. The study of Arouri et al. (2010) using data in the period of 1992 to 2009 shows that emerging stock markets outperformed the developed markets. There are several reasons, according to them. First, emerging markets are characterized by a very low correlation with other markets of the world, owing to their numerous restrictions on capital flows from foreign investors. The evidence that correlation between emerging markets and the MSCI world index during that period is less than 35% supports that argument. Second, the rates of returns in emerging stock markets have been found to be higher than in developed ones (the data in the next chapters of this dissertation also show similar findings) thanks to the high potential of economic growth that transforms into corporate earnings and dividends. Finally, higher long-term performance is behind the growing trend towards investing in emerging markets insofar as emerging countries continue to conduct coherent and sound economic reforms.

Using more recent data, the facts presented by Arouri et al. (2010) are confirmed. From Figure 1-1, it is apparent that emerging markets outperformed the developed markets. The correlation of returns between the world index (ACWI) and emerging market index (EM) is 0.956; it is significantly higher than that between ACWI and the developed market index (EAFE), 0.776. Meanwhile, Table 1-1 shows that the emerging markets have higher average monthly returns and standard deviations than those of the developed markets.

Figure 1-1: MSCI Indexes 1987:1-2012:9



Note: ACWI represent the MSCI world market index that includes both the developed market index (EAFE) and the emerging market index (EM). All indexes are value-weighted indexes. Source: MSCI's website (www.msci.com), plotted by author.

Table 1-1: Monthly Returns Statistics of MSCI Indexes 1987:1–2012:9

	ACWI	EAFE	EM
Mean	0.004	0.002	0.008
Std. Dev.	0.046	0.052	0.071

Source: www.msci.com, computed by author.

For investors, the more integrated the markets are, the fewer benefits of forming internationally diversified portfolio. This is because when markets are becoming more integrated; asset prices are highly co-varied, such that reducing diversifiable risk would be less feasible. In addition, it is not only asset price or returns that are co-varied, but also volatility. Thus, the costs associated with the higher degree of market integration are at least in the form of lower opportunity to diversify assets and higher chances of accepting imported volatility and shocks from the other markets. In previous empirical studies, we can find some supporting evidence of contagion or volatility spill-over. For example, King and Wadhwani (1990) test for an increase in stock market correlations between the United States, the United Kingdom, and Japan and find that cross-market correlations increased significantly after the US market crash in 1987. Lee and Kim (1993) extend this analysis to 12 major markets and find further evidence of contagion: average weekly cross-market correlations increased from 0.23 before the 1987 US crash to 0.39 afterward. Calvo and Reinhart (1996) use this approach to test for contagion in stock prices and Brady bonds[1] after the 1994 Mexican peso crisis. They find that cross-market correlations increased for many emerging markets during the crisis. To summarize, each of these tests based on cross-market correlation coefficients reach the same general conclusion: there was a statistically significant increase in cross-market correlation coefficients during the relevant crisis and, therefore, contagion occurred. However, in the later period, co-movement in conditional cross-variances was re-examined by Forbes and Rigobon (2002). They found that there is a high level of market co-movement in all periods of analyzed sample, not only during the crises. The result indicates that the degree of integration should be stable and high. In such a situation, the benefit of forming internationally diversified portfolio would vanish quickly, as market shock in a country is transmitted instantaneously to the other markets.

[1] Brady bonds are dollar-denominated bonds, issued mostly by Latin American countries in the late 1980s. The bonds were named after US Treasury Secretary Nicholas Brady, who proposed a novel debt-reduction agreement for developing countries.

1.3. Measure of Capital Market Integration

The research area of capital market integration is so vast that it hardly found general acceptance as a method to measure the degree of the integration. Various tests have been proposed in the literature, and each has been criticized for providing only inadequate information, ambiguous interpretation, or inappropriate assumptions behind the test or the measure.

The degree of capital market integration is often linked to a measure of capital mobility. Capital mobility is defined as the difference between national savings and investment; hence, capital is said to be mobile only if net foreign assets of a given country change during a certain period of time (Niehans, 1994). The direction of the change of net capital inflows, in turn, is determined by differences in rates of return between countries (Buch, 2004).

Another indicator of capital mobility in a given country is when foreign capital contributes a lot to financing domestic investment, and vice versa. Golub (1990) stated that large gross flows of capital relative to domestic investment would be taken as an indicator that capital is mobile internationally.

However, the indicators that linked capital market integration and capital mobility only provide limited information because researchers usually only analyzed the relationship in pairs of countries, such that we cannot conclude that such indicators indicate that capital markets in those countries are fully integrated, partially integrated, or not integrated at all. The latter is because of the lack of a world or global benchmark regarding the co-movement of the capital. This issue is usually tackled in measures that apply asset-pricing models. Following is a brief review of measures of integration that can be found in Buch (2004).

1.3.1. Interest Parity Test

Comovements of interest rates can be the result of several factors. At one end of the spectrum, interest rates can reach to common external shocks in completely separated financial markets. At the other end of the spectrum, comovements of interest rates can be taken as evidence for financial integration in a currency union in which capital moves freely across the borders and in which exchange rates cannot adjust to equilibrate financial markets (Artis and Zhang, 1998): in frictionless financial markets, identical financial assets must have the same price, irrespective of where they are traded.

Generally, nominal and real interest parity tests must be distinguished. Nominal interest parity can again take two different forms: (a) uncovered interest parity, which postulates that differences in nominal rates of return on financial assets at home and abroad are equal to expected exchange rate changes, while (b) covered interest parity postulates that differences in nominal rates of return are equal to the forward and the spot exchange rate.

Real interest parity furthermore implies uncovered interest parity and *ex ante* relative purchasing power parity to hold (Siebert, 1999). Real interest parity is thus a stronger condition than nominal interest parity alone because it also requires goods markets to be perfectly integrated (Frankel, 1989). By implication, real interest parity may fail even if nominal interest parity holds because of changes in the equilibrium real exchange rate. This also implies that differences in real interest rates do not only reflect risk premia.

Empirical tests typically fail to support real interest parity, while they confirm nominal interest parity, mainly because purchasing power parity fails to explain short-term nominal exchange rate changes (Bayoumi, 1999). In any case, an analysis of nominal interest rate parity suffices for our purpose because we are interested in the rates of return a given investor can realize if he invests either at home or abroad. For this investor, nominal rates of return on the home and the foreign market must be compared to the domestic inflation rate.

Even tests of nominal interest parity conditions pose substantial problems because, in a strict sense, they can be applied only to nominal interest rates for assets denominated in the same currency (Obstfeld, 1995): $i_{\$}^{*} - i_{\$} = 0$, where $i_{\$}(i_{\$}^{*})$ equals the rate of return on domestic (foreign) assets or liabilities denominated in US dollars. Comparing rates of returns on assets in different currencies mixes restrictions on capital mobility with risk premia and expectational errors, all of which might drive a wedge between nominal interest rates without reflecting the immobility of capital.

This can be shown by decomposing the *ex post* uncovered interest parity condition into

$$i_{\$}^{US} - i_{€}^{G} - \dot{e} = \left(i_{\$}^{US} - i_{€}^{E}\right) + \left(i_{\$}^{E} - i_{€}^{E} - \dot{e}\right) + (\dot{e}^{e} - \dot{e}) + (i_{€}^{E} - i_{€}^{G}) \quad (1.1)$$

where $i_{\$}^{US}(i_{€}^{G})$= rates of return on local market in local currency, $i_{\$}^{E}(i_{€}^{E})$= rates of return on the Euro market , $\dot{e}$ = actual change in the exchange rate, and $\dot{e}^{e}$= expected change in the exchange rate.

Hence, the difference between the rate of return on domestic and foreign assets on each home market and the actual rate of change of the exchange rate equals the sum of (i) the on- and offshore interest rate differential for the foreign financial asset, (ii) the country risk premium (measured by the deviation from uncovered interest parity), (iii) an expectational error, and (iv) the on- and offshore interest rate differential for the domestic financial asset.

Obstfeld (1995) therefore proposes to focus on off- and onshore deposit rates for the same currency (the first and the last term on the RHS) in testing for interest parity because the term on the LHS in (1.1) incorporates information on a number of factors unrelated to capital mobility. Lacking information on the relative importance of these factors, one thus cannot conclude whether deviations from interest parity are due to capital account restrictions, asymmetries in information, expectational errors, or a combination of these factors.

The fact that interest parity tests can be applied in a meaningful way to identical financial assets only shows their major flaw: they inform us about the degree of integration of very small segments of financial markets only. As soon as we consider market segments in which information costs matter, such as retail financial markets, interest parity tests should be applied cautiously.

A more fundamental criticism has been raised by Niehans (1994), who argues that tests for arbitrage on financial markets have in principle nothing to say about cross-border movement of capital. This is because prices of financial assets might change simply because they are bid up and down without corresponding changes in quantities. Niehans even concludes, "open economy macro-economics, to be reasonably realistic, should not be based on the arbitrage model of capital flows" (pp. 28).

1.3.2. Saving-Investment Relationship

Feldstein and Horioka (1980) suggested measuring the degree of international capital mobility by looking at the correlation between domestic saving and investment:

$$\left(\frac{I}{Y}\right)_i = \alpha + \beta \left(\frac{S}{Y}\right)_i + \varepsilon_i, \tag{1.2}$$

where *I*= domestic investment, *S*= domestic saving, and *Y*= gross domestic product of country *i*. Under perfect capital mobility, an increase in the saving rate in one country would cause an increase in investment in all countries. Estimates of β close to 1 could be taken as evidence for immobility of capital. This measure of capital mobility can be linked to interest parity conditions by noting that it implies a zero covariance between saving and investment (see Lemmen, 1998, pp. 69).

$$Cov\left(\frac{I_{i,t+k}}{Y_{i,t+k}}, \frac{S_{i,t+k}}{Y_{i,t+k}}\right) = 0. \tag{1.3}$$

At the same time, investment depends negatively on the expected domestic real interest rate *r* and on an error term, μ, which captures all other factors that influence *I*:

$$I_{i,t+k} = -\emptyset E_t\left(r_{i,t+k}\right) + \mu_i. \tag{1.4}$$

If (1.3) holds, the influence of the error term μ and that of the interest rate *r* on domestic saving must cancel each other out. This can be shown by decomposing the covariance between the savings and investment ratio into:

$$\begin{aligned} Cov\left(\frac{I_{i,t+k}}{Y_{i,t+k}}, \frac{S_{i,t+k}}{Y_{i,t+k}}\right) &= Cov\left(\mu_i, \frac{S_{i,t+k}}{Y_{i,t+k}}\right) \\ &-\Phi Cov\left(E_t\left(r^*_{i,t+k}\right), \frac{S_{i,t+k}}{Y_{i,t+k}}\right) \\ &-\Phi Cov\left(E_t\left(r_{i,t+k} - r^*_{i,t+k}\right), \frac{S_{i,t+k}}{Y_{i,t+k}}\right) = 0, \end{aligned} \tag{1.3'}$$

where $r*$ = foreign interest rate. The term in the second line of (1.3’) denotes the covariance between saving and the expected foreign interest rate, and the third term gives the covariance between saving and the expected real interest rate differential. Hence, real interest parity, i.e. $E_t\left(r_{i,t+k} - r^*_{i,t+k}\right) = 0$, may but must not necessarily hold necessarily in order for the Feldstein-Horioka criterion of perfect capital mobility to be met.

As regards the empirical measurement of β in (1.2), Feldstein and Horioka (1980) found a value of almost 1 (0.9). The problem with interpreting this number is that economic theory does not provide an immediate answer to the question of which value for β one would expect in perfectly integrated financial markets. Hence, evidence from the regional financial markets, i.e., those within a given country, is typically used as a benchmark. Studies of capital mobility at a national level tend to find lower correlation between regional saving and investment than at an international level (Bayoumi, 1999; Bayoumi and Rose, 1993; Sinn, 1992), one possible explanation being the redistribution of saving through public transfers. In addition to a redistribution of savings by the government, asymmetries in information between domestic and foreign investors might help to rationalize why the degree of intraregional capital mobility exceed international capital mobility (Gordon and Bovenberg, 1996).

The original findings of Feldstein and Horioka (1980) that the correlation between national saving and investment is fairly high between OECD countries, which can be interpreted as evidence for an incomplete mobility of capital, have been confirmed by a host of subsequent studies (see, for example, Bayoumi, 1990, 1999; Coakley et al., 1995; Montiel 1994; Siebert 1999; or Taylor, 1996, for surveys of the literature on the issue).

While Feldstein and Horioka used cross-section estimates, Gundlach and Sinn (1992) propose to work with the time series data because cross-section studies cloud institutional structures between countries. They suggest exploiting the fact that the difference between savings and investment is the mirror image of the current account balance, i.e., the difference between exports and imports of goods and services ($CA_t = X_t - M_t$), and thus propose to test for the stationarity of the latter:

$$\left(\frac{I}{Y}\right)_t = \alpha + \beta\left(\frac{S}{Y}\right)_t + \varepsilon_t \Leftrightarrow \left(\frac{CA}{Y}\right)_t = -\alpha + (1-\beta)\left(\frac{S}{Y}\right)_t - \varepsilon_t. \tag{1.5}$$

under the assumption that the error term ε_t is statioany. It follows that the degree of integration of the current account provides information about the value of β. If the current account is integrated to degree 1, then β is not equal to 1, and saving and investment move like independent random walks. Following the original interpretation of Feldstein and Horioka (1980), this could be taken as evidence of capital mobility. Conversely, if the current account is stationary, β equals 1, and capital is immobile. Gundlach and Sinn (1992) find that Germany, Japan, and the United States were integrated into the international capital market and find evidence for an increased degree of capital mobility in the post Bretton Woods era. One problem with this approach is that the error term may not be stationary if, for example, a country receives foreign aid. In this case, the current account may not be stationary even though private capital flows are low or even nil. Bagnai and Manzocchi (1996) thus test for the unit root of the current account minus the amount of aid that a country has received. Using the modified current account for 37 developing countries for the years 1961 through 1988, they show that the countries are not fully integrated into the international capital market.

1.3.3. Capital Market Linkages

Studies of capital market integration are also often carried out by directly observing the interrelationship of the markets. From the econometric side, tools such as cointegration analysis and both conditional and unconditional correlation are applied. Chelley-Steely et al. (1998), for instance, test whether the abolition of capital controls in Europe has caused a greater integration of stock markets. The authors take the failure to find statistically significant cointegration relationship between markets as evidence for greater integration: integration implies that systematic arbitrage opportunities are limited. This would contradict the presence of a cointegration relationship since cointegration implies that there is a long-run relationship between two variables, and that this relationship has a clear causal structure. Interpreting the cointegration test in this way, the authors find evidence for an increased degree of integration of German, French, and Swiss stock markets in response to an abolition of exchange controls. Fratzscher (2002) provides us evidence of a greater degree of integration of European stock markets after 1996, after the agreement to stabilize the exchange rates in the run up to the euro.

One reason why the integration of stock markets has proceeded relatively rapidly is that the assets that are being traded on these markets are securitized. Moreover, exchange-traded funds (ETF) have recently gained popularity, such that foreign assets not traded in a local market can be securitized into an ETF index, and hence this index is traded in the local market. The ability to securitize claims, in turn, depends on the ability to make information transferable among the agents. Hence one would a priori expect a relatively quick integration process once formal barriers have been lifted. The situation is different, though, for markets of non-securitized assets, since these, per definition, are much more difficult to trade internationally.

In this dissertation in Chapter 2 and 3, the author extends the use of correlation-based measures by applying the minimum spanning tree (MST) method. The method is able to show the dynamic of the degree of market integration.

1.3.4. Home Bias

When a capital market in a country is integrated into the world capital market, the country may take advantage by, for example, drawing on foreign savings to finance domestic investment. Moreover, investors in both foreign and domestic countries have more opportunities to diversify their portfolio internationally. The more mobile capital, the better these opportunities can be exploited. Portfolio tests of international capital mobility thus typically proceed by comparing an optimal, mean-variance efficient portfolio to actual portfolio choices. Although, in principle, the optimal portfolio may comprise all possible assets, including human capital (Lewis, 1999), most empirical models look at securities portfolios only. This restriction does not bias the analysis towards finding a high degree of home bias, however. Rather, the home bias is even more pronounced if humans are taken into account. The reason is that human capital is typically tilted heavily towards the domestic economy, such that the optimal portfolio would even have a negative share of domestic securities (Baxter and Jermann, 1997).

The standard framework in which international investment decision can be analyzed is the capital asset pricing model (CAPM). The model is based on the assumption that there are no frictions in financial markets, that a risk-free asset exists, and that investors face no restrictions in short-selling this riskless asset. It predicts that the risk of an individual financial asset is measured by its contribution to the overall variance of the expected excess return on the market portfolio over the risk-free rate, and that it will be priced accordingly. More on the derivation of CAPM is given in the next section.

CAPM postulates that optimal composition of the market portfolio does not depend on investors' risk preferences. A test on the degree of capital mobility on the basis of the CAPM checks whether international investment portfolios are allocated according to these predictions. The overwhelming majority of the empirical papers find that they are not. Rather, investors tend to hold the bulk of their financial assets in their home country and/or their home currency (See French and Poterba, 1990, 1991; Tesar and Werner, 1992). The cause of this home (or currency) bias remain largely unresolved, and several explanations ranging from tax incentives, incomplete or asymmetric information, the presence of non-tradables, and law enforcement problems have been advanced (see Lewis, 1999; and Obstfeld and Rogoff, 1996).

Ahearne et al. (2000) propose an intuitive test of the causes of the home bias in international investment portfolios. For cross-section countries, they regress a measure of the degree of the home bias on a number of explanatory variables, including proxies of information costs and of regulations. They find that the share of firms listing on a U.S. stock exchange relative to the total securities issued by a country has a negative impact on the bias, which is interpreted as evidence for the hypothesis that the home bias is low and information costs are small.

1.3.5. Degree of Regional Risk Sharing

Under an integrated market, individuals may smooth their consumption and/or income streams from regional shocks by diversifying their portfolio holdings. Internationally, as was argued above, diversification is often found to be grossly inadequate, as investors tend to have a preference for securities issued in their home country.

Atkeson and Bayoumi (1993) find that fluctuations in regional income from capital are correlated mostly with national income paid to capital rather than regional productivity shocks. This points to a relatively high degree of diversification of capital ownership. For Europe, on the other hand, they find a much lower correlation of income from capital at the national and the European level. Shocks to labor income tend to have a strong regional component in both regions, and there appears to be a tendency to invest “locally” (Hess and Shin. 2000).

1.3.6. Comovement of Business Cycle and Returns

Another indicator of the existence of market integration is the comovement of business cycle and assets returns. Stock and Watson (2005) study the dynamics of business cycle comovement for G7 economies during the period from 1960 to 2002. Using structural VAR analysis, they found that, with the exception of Japan, a significant portion of the widespread reduction in volatility is associated with a reduction in the magnitude of the common international shocks. They concluded that the G7 business cycle has been substantially more volatile and more highly synchronized.

However, the finding of Stock and Watson (2005) does not answer whether G7 economies are a distinguished cluster of economies in the context of world market or the countries have driven other economies in the world to be more synchronized. Hirata et al. (2011) used the dynamic factor model (dynamic stochastic general equilibrium/DSGE model) to analyze the world business cycle dynamics and to find out whether the world economy is segmented (regionalization process) or integrated (globalization process). They analyzed the role of global, regional, and country-specific factors in explaining the business cycle in a large sample of countries and regions over the period 1960 to 2010. They found that, since the mid-1980s, the importance of regional factors has increased markedly in explaining business cycles, especially in regions that witnessed a sharp growth in intra-regional trade and financial flows. By contrast, the relative importance of the global factor has declined over the same period. Their general conclusion is that the recent era of globalization has witnessed the emergence of regional cycles. Once again, this is supporting evidence of the presence of partially integrated markets.

1.4. Asset Pricing Models

This dissertation utilized two asset-pricing models for investigating the degree of integration of stock markets and examining the impact of the degree in pricing the international assets. The first asset-pricing model is the capital asset pricing model (CAPM) with time-varying beta, and the second one is consumption-CAPM. In CAPM, applicability of the model will be tested. In addition, the homogeneity of world market risk premium across the markets will be investigated to indicate whether the law of one price in risk pricing holds. The latter also indicates the degree of integration of the stock markets being analyzed. Meanwhile, in consumption-CAPM, the main research question is whether foreign assets can be used for consumption smoothing of domestic households. In the C-CAPM, Japan is regarded as the home country, and US stock market return is considered as a means of consumption smoothing of the Japanese households. If the two markets are integrated, we may witness that Japanese households may use stocks traded in the US to reduce their future income uncertainty.

1.4.1. Capital Asset Pricing Model (CAPM)

CAPM is one of the most popular in asset pricing method. The model is independently developed by Jack Treynor (1961, 1962), William Sharpe (1964), John Lintner (1965) and Jan Mossin (1966). One importance contribution of work such that CAPM was easily understood is the work of Robert C. Merton (1972) for his work in providing analytical solution to the following portfolio choice problem: Given the expected returns and the matrix of covariances of returns for *n* individual assets, find the set of portfolio weights that minimizes the variance of the portfolio for each feasible portfolio expected return. The latter is known as a method to obtain efficient frontier. Following is the derivation of CAPM that also can be found in Pennacchi (2008).

Efficient Frontier

Let us define $\bar{R} = (\bar{R}_1, \bar{R}_2, \dots, \bar{R}_n)'$ as $n \times 1$ vector of the expected returns of the *n* assets, and define V as the $n \times n$ covariance matrix of the returns on the n assets, which is symmetric and assumed to be positive. V is also assumed to be of full rank, meaning that there are no redundant assets among the *n* assets. A redundant asset is an asset whose return is an exact linear combination of the returns on other assets. Let us also define $\omega = (\omega_1, \omega_2, \dots, \omega_n)'$ as an $n \times 1$ vector of portfolio weights, such that ω_i is the proportion of total portfolio wealth invested in the *i*th asset. The expected return of the portfolio *p* that consists of those *n* assets is given by

$$\bar{R}_p = \omega'\bar{R} \tag{1.6}$$

and the variance of the portfolio return is given by

$$\sigma_p^2 = \omega' V \omega \tag{1.7}$$

The sum of weights of all assets in the portfolio must equal 1, which can be written as $\omega' e = 1$, where e is $n \times 1$ vector of ones.

Efficient frontier is a set of solution from the problem of minimizing the portfolio's variance subject to the constraints of (i) $\omega' e = 1$ and (ii) $\bar{R}_p = \omega'\bar{R}$. The problem can be written as follows:

$$min_\omega \frac{1}{2}\omega' V \omega + \lambda\left[\bar{R}_p - \omega'\bar{R}\right] + \gamma[1 - \omega' e] \tag{1.8}$$

The first-order condition with respect to ω and the two Lagrange multipliers, λ and γ, are

$$V\omega - \lambda\bar{R} - \gamma e = 0 \tag{1.9}$$

$$\bar{R}_p - \omega'\bar{R} = 0 \tag{1.10}$$

$$1 - \omega' e = 0 \tag{1.11}$$

Solving (1.9), the optimal portfolio weights satisfy

$$\omega^* = \lambda V^{-1}\bar{R} + \gamma V^{-1} e \tag{1.12}$$

Pre-multiplying equation (1.12) by $\bar{\mathrm{R}}'$, we have

$$\bar{R}_p = \bar{\mathrm{R}}'\omega^* = \lambda\bar{\mathrm{R}}'\mathrm{V}^{-1}\bar{R} + \gamma\bar{\mathrm{R}}'\mathrm{V}^{-1}e \tag{1.13}$$

Pre-multiplying equation (1.12) by e' we have

$$1 = e'^{\omega^*} = \lambda \mathrm{e}'\mathrm{V}^{-1}\bar{R} + \gamma \mathrm{e}'\mathrm{V}^{-1}e \tag{1.14}$$

Equation (1.13) and (1.14) are two linear equations in two unknowns, λ and γ. The Solution is

$$\lambda = \frac{\delta \bar{R}_p - \alpha}{\varsigma\delta - \alpha^2} \tag{1.15}$$

$$\gamma = \frac{\varsigma - \alpha \bar{R}_p}{\varsigma\delta - \alpha^2} \tag{1.16}$$

where $\alpha \equiv \bar{R}'V^{-1}e = e'V^{-1}\bar{R}$, $\varsigma \equiv \bar{R}'V^{-1}\bar{R}$, and $\delta \equiv e'V^{-1}e$ are scalars. Note that he denominators of λ and γ, given by $\varsigma\delta - \alpha^2$, are guaranteed to be positive when V is of full rank. Substituting λ and γ in equation (1.12), we have

$$\omega^* = \frac{\delta \bar{R}_p - \alpha}{\varsigma\delta - \alpha^2} V^{-1}\bar{R} + \frac{\varsigma - \alpha \bar{R}_p}{\varsigma\delta - \alpha^2} V^{-1}e \tag{1.17}$$

Collecting terms in $\bar{R}_p$ gives

$$\omega^* = a + b\bar{R}_p \tag{1.18}$$

where $a \equiv \frac{\delta \bar{R}_p - \alpha}{\varsigma\delta - \alpha^2} V^{-1}\bar{R}$, and $b \equiv \frac{\delta V^{-1}\bar{R} - \alpha V^{-1}e}{\varsigma\delta - \alpha^2}$.

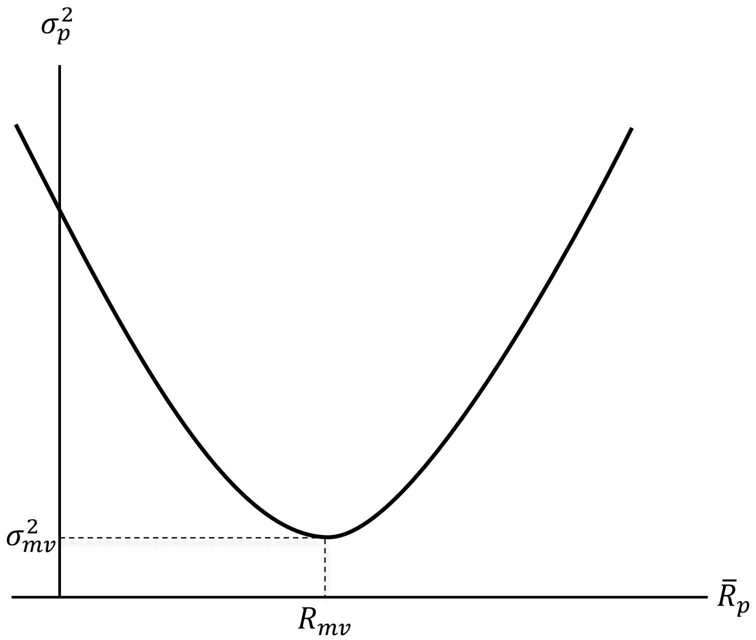
Equation (1.18) is both necessary and a sufficient condition for the frontier portfolio. Given $\bar{R}_p$, a portfolio must have weights satisfying (1.18) to minimize its return variance.

Having found the optimal portfolio weights for a given $\bar{R}_p$, the variance of the frontier portfolio is

$$\begin{aligned} \sigma_p^2 = \omega^* V \omega^* &= (a + b\bar{R}_p)'V(a + b\bar{R}_p) \\ &= \frac{\delta \bar{R}_p^2 - 2\alpha \bar{R}_p + \varsigma}{\varsigma\delta - \alpha^2} \\ &= \frac{1}{\delta} + \frac{\delta(\bar{R}_p - {}^{\alpha}/_{\delta})^2}{\varsigma\delta - \alpha^2} \end{aligned} \tag{1.19}$$

From the third line of (1.19), the unique minimum is at the point $\bar{R}_p = R_{mv} \equiv \frac{\alpha}{\delta}$, which corresponds to a global minimum variance of $\sigma_{mv}^2 = \frac{1}{\delta}$. Substituting $\bar{R}_p = \frac{\alpha}{\delta}$ into equation (1.17) shows that this minimum variance portfolio has weights $\omega_{mv} = \frac{1}{\delta}V^{-1}e$. The frontier portfolios satisfy (1.19) for a given range of $\bar{R}_p$ can be depicted as in Figure 1-2. The efficient frontier is represented only by the region $\bar{R}_p \geq R_{mv}$.

Figure 1-2: Frontier Portfolios



Portfolio Separation

In Tobin's (1958) seminal paper, he stated a theorem that later lay another fundamental in developing CAPM. The theorem is usually called *separation theorem*, stated as follows:

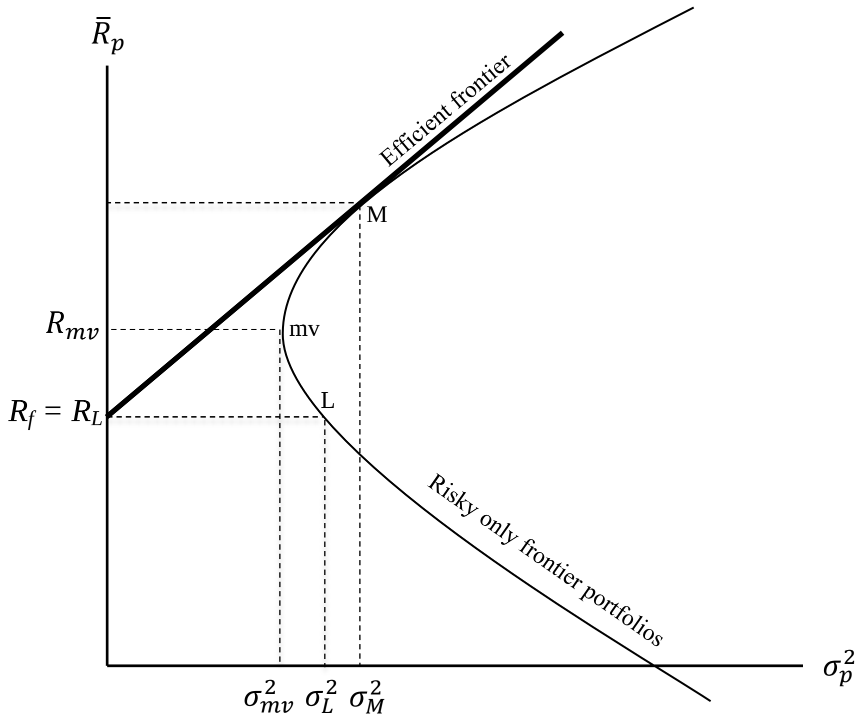
> *Every portfolio on the mean-variance frontier can be replicated by a combination of any two frontier portfolios; and an individual will be indifferent between choosing among the n financial assets, or choosing a combination of just two frontier portfolios.*

The implication of the theorem is that if all investors have the same beliefs regarding the distribution of assets returns, namely, returns are distributed $N(\bar{R}, V)$ and, therefore, the frontier is (1.19), they can form their individually preferred frontier portfolios by trading in as little as two frontier portfolios. A detailed proof and example of the application of the theorem can be seen in Pennacchi (2008, pp. 40–43).

The importance of Tobin's separation theorem to CAPM is that investors may combine zero risk asset and risky frontier portfolios, and because covariance between zero risk asset and risky assets is also zero, the new frontier portfolios from the combination of risk-free asset and risky portfolios are lying in a straight line that connects the two portfolios. In other words, there is a linear relationship between $\bar{R}_p$ and σ_p^2 when portfolio *p* consists of a combination of risk-free asset and risky assets.

Rotating Figure 1-2 in 90 degrees clockwise and then flipping it, we obtain the frontier portfolios of risky assets in $(\bar{R}_p, \sigma_p^2)$ space. When there is risk-free asset with return of R_f, and $R_{mv} > R_f$, the new frontier portfolios that combine both risk-free and risky assets are represented by straight lines that connect both assets with slope that always be positive. Assuming that investors are risk averse, regardless the degree of the risk aversion, we can obtain the new efficient frontier that offers the highest utility value for the investors. The new efficient frontier is thus a line connecting a risk-free asset and a risky portfolio that has the largest tangent, as depicted in Figure 1-3.

Figure 1-3: Frontier Portfolios of Risk-Free and Risky Assets with Zero Covariance



In Figure 1-3, we assume that there exists risky portfolio *M*, which is a mean-variance efficient portfolio, and by combining *M* with R_f we can obtain an efficient frontier with the largest slope or tangent (this slope is later known as the Sharpe ratio), hence the combination of *M* with R_f is always more preferable by risk-averse investors than those of any risky portfolios such as *L* or any combination of R_f with any risky portfolios other than *M*.

Derivation of CAPM

Let us assume that there exists a risk-free asset with a rate of return R_f, and there are risky assets in which the frontier portfolios are lying in the curve line in Figure 1-3, and let ω continue to be the $n \times 1$ vector of portfolio proportions invested in the risky assets. Our objective is now to find portfolio *M* such that its tangent coincides with the new efficient frontier that combines R_f and *M*. Now, however, the constraint $\omega' e = 1$ does not apply, because $1 - \omega' e$ is the portfolio proportion invested in the riskless asset, thus we should impose the restriction that the portfolio weights for all $n + 1$ assets sum to 1 by writing the expected return on the portfolio as

$$\bar{R}_p = R_f + \omega'(\bar{R} - R_f e) \tag{1.20}$$

The variance of the return on the portfolio continues to be given by $\omega' V \omega$. The investor's optimization problem now becomes

$$min_\omega \frac{1}{2} \omega' V \omega + \lambda\{\bar{R}_p - [R_f - R_f e]\} \tag{1.21}$$

In a manner similar to the previous derivation, the first-order conditions lead to the solution

$$\omega^* = \lambda V^{-1}(\bar{R} - R_f e) \tag{1.22}$$

where $\lambda \equiv \frac{\bar{R}_p - R_f}{(\bar{R}_p - R_f)' V^{-1} (\bar{R}_p - R_f)} = \frac{\bar{R}_p - R_f}{\varsigma - 2\alpha R_f + \delta R_f^2}$. This ω^* is the weights of risky assets in portfolio *M* (the weight for R_f in the portfolio is 0). Since V^{-1} is positive definite, λ is nonnegative when $\bar{R}_p > R_f$, the region of the efficient frontier where investors' expected portfolio return is at least as great as the risk-free return. Given (1.22) the amount optimally invested in the riskless asset is determined by $1 - e'\omega^*$. Note that since λ is linear in $\bar{R}_p$, so is ω^*, similar to the previous case of no riskless asset. The variance of the portfolio now takes the form

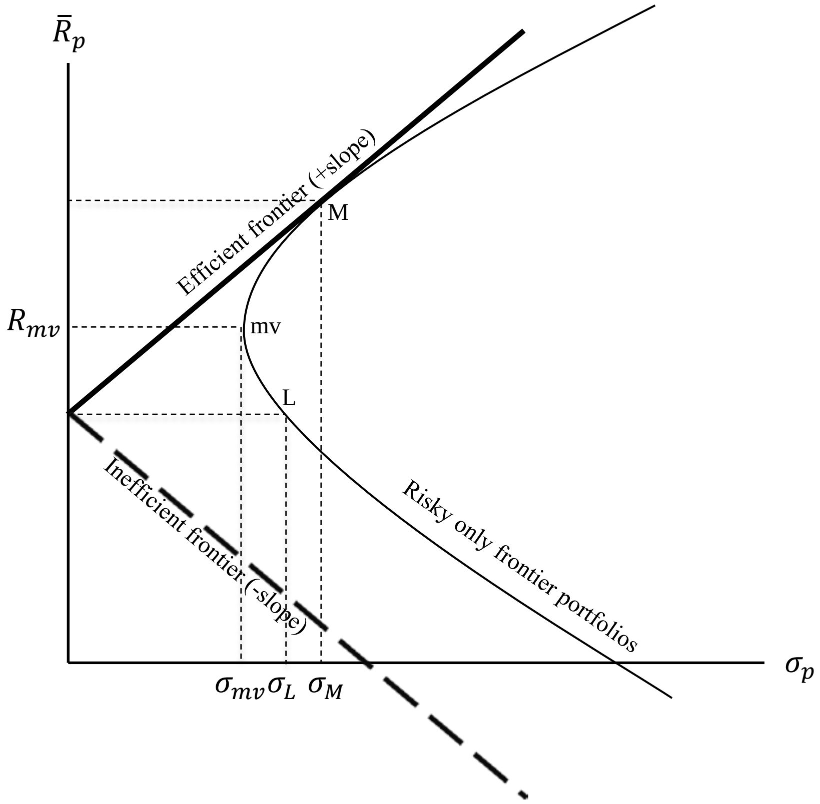
$$\sigma_p^2 = \omega^{*\prime} V \omega^* = \frac{(\bar{R}_p - R_f)^2}{\varsigma - 2\alpha R_f + \delta R_f^2} \tag{1.23}$$

Taking the square root of each side of (23) and rearranging:

$$\bar{R}_p = R_f \pm (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2} \sigma_p. \tag{1.24}$$

Equation (1.24) indicates that the efficient frontier of portfolios that combine R_f and *M* is linear in $\bar{R}_p, \sigma_p$ space and the slope is $\pm(\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}$. However, only the frontier line that has positive slope is regarded as the efficient frontier (the bold solid line in Figure 1-4). The line is also known as *capital market line* (CML).

Figure 1-4: Efficient Frontier with a Riskless Asset



The separation theorem is continuous to hold: two other frontier portfolios can replicate any portfolio on the frontier. In this case, two particular portfolios can replicate any portfolio on the linear efficient frontier: one portfolio that is located on the "risky-asset-only" frontier and another portfolio that holds only the riskless asset. Figure 1-4 is an example of when $R_f < R_{mv}$ such that the positivity of the slope of the efficient frontier is held. On the contrary, when $R_f > R_{mv}$, the efficient frontier of $\bar{R}_p = R_f + (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}\sigma_p$ is always above the risky-asset-only frontier at the point where the line $\bar{R}_p = R_f - (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}\sigma_p$ becomes tangent. In this setting, the efficient frontier of $\bar{R}_p = R_f + (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}\sigma_p$ still can always be achieved, provided that short selling is allowed. The operation of short selling involves two steps: First, sell short portfolio *M* that consists of risky-only assets with the weight of each risky asset defined by ω^* in (1.22) and let denote that $\omega^* = \omega^M$. Second, a proceeds from the short selling is totally invested in risk-free asset. By doing so, the portfolio that consists of short-sold *M* and risk-free asset will always have expected rate of return that greater than R_f, and thus $\bar{R}_p = R_f + (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}\sigma_p$ will continuously hold. Lastly, when $R_f = R_{mv}$, the portfolio frontier is given by the asymptotes of the frontier of risky-only portfolios. In this case, $e'\omega^* = 0$, so that total wealth is invested in the risk-free asset.

The implication of the above mathematical analysis is that if all investors agree that asset returns are distributed as $N(\bar{R}, V)$, then they all consider the linear efficient frontier to be $\bar{R}_p = R_f + (\varsigma - 2\alpha R_f + \delta R_f^2)^{1/2}\sigma_p$ and all will choose to hold risky assets in the same relative proportions given by the tangency portfolio *M*. According to Tobin's separation theorem, portfolio *M* can be constructed from all possible risky assets or portfolios that lie along the risky-only frontier. Investors differ only in the amount of wealth they choose to allocate to this portfolio of risky assets versus the risk-free asset.

Since portfolio *M* theoretically can be constructed from all available risky assets, hence it is often called the market portfolio. Note that the portfolio *M* that we discussed here is not only a mean-variance (risky-only) efficient portfolio, but also a tangency portfolio of the capital market line.

The efficient frontier in Figure 1-4 implies that investors optimally choose to hold combinations of the risk-free asset and the efficient frontier portfolio of risky assets having portfolio weight ω^M. From equation (1.22), $\omega^* = \omega^M$ when $e'\omega^* = 1$ (all wealth is invested in risky assets). Pre-multiplying (1.22) by e', setting the result to 1, and solving for λ, we obtain $\lambda = m \equiv [\alpha - \delta R_f e]^{-1}$, so that

$$\omega^M = mV^{-1}(\bar{R} - R_f e) \tag{1.25}$$

Let us define σ_M as the $n \times 1$ vector of covariances of the tangency portfolio with each of the *n* risky assets. Then using (1.25), we see that

$$\sigma_M = V\omega^M = m(\bar{R} - R_f e) \tag{1.26}$$

Note that the variance of the tangency portfolio is simply $\sigma_m^2 = \omega^{M\prime}V\omega^M$. Pre-multiplying equation (1.26) by $\omega^{M\prime}$, we obtain

$$\sigma_m^2 = \omega^{M\prime}V\omega^M = m\omega^{M\prime}\left(\bar{R} - R_f e\right) = m(\bar{R}_M - R_f e) \tag{1.27}$$

where $\bar{R}_M \equiv \omega^{M'}\bar{R}$ is the expected return on the tangency portfolio. Rearranging (1.26) and substituting in for *m* from (1.27), we have the CAPM

$$\left(\bar{R} - R_f e\right) = \frac{1}{m}\sigma_M = \frac{\sigma_M}{\sigma_m^2}\left(\bar{R}_M - R_f\right) = \beta\left(\bar{R}_M - R_f\right) \tag{1.28}$$

where $\beta = \frac{\sigma_M}{\sigma_m^2}$ is the $n \times 1$ vector whose *i*th element is $\beta_i = \frac{Cov(\hat{R}_m, \hat{R}_i)}{Var(\hat{R}_m)}$. The CAPM in (1.28) states that there is a linear relationship between excess expected return of an asset $(\hat{R}_i - R_f)$ and the market risk β_i.

1.4.2. Issues in Testing CAPM

Equation (1.28) can be interpreted as an equilibrium relationship between the excess expected return on the market portfolio *M*. In other words, in equilibrium, the tangency portfolio chosen by all investors must be the market portfolio of all risky assets. Moreover, the only case for which investors have a long position in *M* is $R_f < R_{mv}$. Hence, for asset markets to clear, that is, for the outstanding stocks of assets to be owned by investors, the situation depicted in Figure 1-4 can be the only equilibrium efficient frontier. This implies that assets' prices or individuals' choice of technologies must adjust (effectively changing $\bar{R}$ and/or *V* to make the portfolio demands for individual assets nonnegative. However, a number of empirical tests on CAPM show that the equilibrium does not exist (see Fama and French, 2004, for extensive literature reviews on CAPM testing).

As a theory, CAPM justifies the practice of investing in a broad market portfolio of stocks and bonds. This insight has led to the growth of "indexed" mutual funds and exchange-traded funds (ETFs) that hold market-weighted portfolios of stocks and bonds (Pennacchi, (2008), pp. 61). The use of market-weighted portfolios of stocks as a proxy of market portfolio *M* has been extensively found in many previous empirical works that examining CAPM. However, as earlier mentioned in the derivation of CAPM, that portfolio *M* is not only a mean-variance (risky-only) efficient portfolio, but also a tangency portfolio of the capital market line. The findings in previous empirical works that reject CAPM may be attributed to the use of "false" market portfolios, which is a market capitalization weighted index (i.e. S&P500 index in the US stock market). Such an index may be a mean-variance efficient portfolio, but we cannot be assured that the index is also the tangency portfolio. The same issue also prevails in applying and testing CAPM for international asset pricing; previous empirical works usually relied on a "world index" such as the MSCI world index as the proxy of the world market portfolio.

The CAPM defined in equation (1.28) requires estimation on β_i. An unbiased estimate of β_i can be obtained by running an Ordinary Least Square (OLS) regression of asset i*'s* excess return on the market portfolio's excess return. The orthogonal, mean-zero residual of the OLS is sometimes referred to as idiosyncratic, unsystematic, or diversifiable risk. This is the particular asset's risk that is eliminated or diversified away when the asset is held in the market portfolio. Since the individual who invests optimally can eliminate this portion of the asset's risk, there is no "price" or "risk premium" attached to it in the sense that asset's equilibrium expected return is not altered by it.

When we want to apply CAPM for international asset pricing, the orthogonality of the residuals must hold if the markets where the international assets come from are completely integrated. Assuming that the markets are completely integrated, CAPM can be tested and/or applied in a cross-section regression framework or equation-by-equation OLS in a dynamic time series setting. As the main theme in this dissertation on dynamic international asset pricing, CAPM with time-varying beta can be tested in the following model:

$$\left(R_{i,t} - R_{f,t}\right) = \hat{a}_i + \hat{b}_i.\hat{\hat{\beta}}_{i,t} + \hat{l}_i.\hat{\hat{\sigma}}_{i,t} + \hat{\varepsilon}_{i,t} \tag{1.29}$$

The model in (1.29) is a modified version of the cross-section test model for CAPM in which we let market risk ($\hat{\hat{\beta}}_{i,t}$) for each asset varies across time and assets. In addition, a measure of home bias is added by variable of the conditional standard deviation of the residuals ($\hat{\hat{\sigma}}_{i,t}$). In order to obtain $\hat{\hat{\beta}}_{i,t}$, we may apply the diagonal BEKK multivariate GARCH model. In the diagonal BEKK model, the system mean equation consists of returns of both risky asset i and the (world) market return as the dependent variables, and constants as the independent variables. From the Diagonal Model we obtain conditional variance-covariance matrix $\widehat{H}_t$ for each time t in which the positive definiteness of the matrix is assured. Having the conditional variance-covariance matrix in hand, we can estimate $\hat{\hat{\beta}}_{i,t} = \frac{\hat{h}_t(i,M)}{\hat{h}_t^2(M)}$, where $\hat{h}_t(i,M)$ and $\hat{h}_t^2(M)$ are conditional covariance between the return of asset *i* and market return *M*, and they are elements of $\widehat{H}_t$. Model (1.29) hence could be estimated by equation-by-equation GARCH model. One of univariate GARCH model that may be used for estimating the parameters in (1.29) is the EGARCH model.

The variance specification for model (1.29) is assumed to follow EGARCH(1,1) as follows:

$$\log(\hat{\sigma}_t^2) = \widehat{w} + \hat{\delta}\log(\hat{\sigma}_{t-1}^2) + \hat{\psi}\left|\frac{\hat{\varepsilon}_{t-1}}{\hat{\sigma}_{t-1}}\right| + \hat{\kappa}\frac{\hat{\varepsilon}_{t-1}}{\hat{\sigma}_{t-1}} \qquad (1.30)$$

The parameters in (1.29) and (1.30) are stored in vector θ and are estimated by a maximum likelihood estimation (MLE) method. Assuming that errors in (22.9) are normally distributed, the contribution to the log-likelihood for observation *t* is:

$$L(\theta) = -\left(\frac{T}{2}\right)\log(2\pi) - \frac{1}{2}[\log(\hat{\sigma}_t^2) - \frac{\hat{\varepsilon}_t^2}{\hat{\sigma}_t^2}] \qquad (1.31)$$

Testing model (1.29) as estimation on equation-by-equation univariate GARCH model implies that $E(\varepsilon_{i,t}, \varepsilon_{j,t}) = 0$ for $i \neq j$. In other words, we are assuming that idiosyncratic risk as represented by ε_i is uncorrelated with that of the other markets, and if CAPM is true, then we should only be concerned with the systematic or market risk represented by the beta.

However, as mentioned earlier in previous sections, many empirical works on testing and measuring the degree of financial market integration often found that financial markets around the world were not completely integrated (partially or mildly integrated). As a consequence, the idiosyncratic risk (in this context, it is also may be called country-specific risk) in each market is often found to be correlated with that of the other markets. Thus, tests of CAPM based on OLS that ignore the covariance of the residuals may become inefficient in estimating the parameters in the test model. This is what will be addressed in this dissertation; mainly it will be discussed in Chapters 5 and 6.

1.4.3. Issues in Testing CAPM with Time Varying Beta for International Assets

To illustrate the potential problems addressed above, let us consider an empirical test of CAPM for international assets pricing in the US using monthly observations from 1997m7 until 2012m7. The risk-free asset is represented by US 3-month T-bills, while the world market portfolio is proxied by MSCI ACWI index. The international assets that we consider in this example consists of 12 stock market indexes from different countries: US—S&P 500 (US), German—DAX (GE), Hong Kong-Hang Seng (HK), Japan—Nikkei 225 (JP), Singapore—Strait Times (SI), United Kingdom FTSE 100 (UK), Argentina—MERVAL (AR), Brazil—BOVESPA (BR), China—SSEC (CH), Indonesia—IHSG (ID), Malaysia—KLSE (MA), and Mexico—IPC (ME). The market indexes are adjusted to US dollar value by multiplying them with local currency per US dollar value exchange rate. The MSCI ACWI index was obtained from MSCI's website (http://www.msci.com), the other market indexes were obtained from Yahoo Finance (http://finance.yahoo.com), and the exchange rates were obtained from OANDA (http://www.oanda.com).

A plot of excess returns of developed markets and emerging markets is shown in Figures 1-5 and 1-6, respectively. In both figures, we can observe that the volatility of the excess returns was higher during crises; such volatility clustering indicates that GARCH error structure might exist. The figures also show that excess returns of the stock markets were co-varied.

As pointed out by Chelley-Steely et al. (1998), the markets are said to be integrated if we fail to find a cointegrating equation among the markets (if a cointegrating equation exists, one may do arbitrage by utilizing published information in the past). Table 1-2 shows Johansen's Cointegration test for pairs of stock markets returns and the world market returns (MSCI ACWI). The Argentine stock market seems to have a long-term relationship with the world stock market; historical prices of the world index might be used for estimating the returns of the Argentinian market. Among the developed stock markets, the Japanese stock market is a market with the lowest degree of integration to the world market, as we can see from the trace statistic and maximum eigenvalue statistic that is just the second highest after the Argentinian stock market (one co-integrating equation is found under the 7% significance level). These findings are evidence that the stock markets were not completely integrated, even for developed stock markets such as the Tokyo Stock Exchange.

Testing CAPM using an equation-by-equation estimation of model (1.29) implies that we ignore two important properties of the data: (i) the existence of GARCH errors structure, and (ii) stock markets were not completely integrated such that idiosyncratic risk (also known as diversifiable risk) cannot be completely removed by forming an internationally diversified portfolio. The result of the CAPM test under this setting can be seen in Table 1-3.

Figure 1-5: Excess Returns of Developed Markets in the U.S. Market

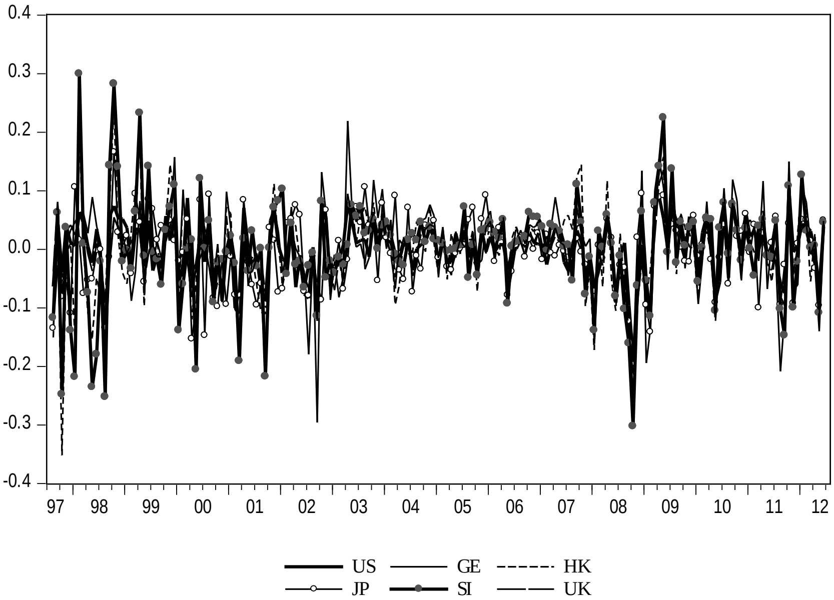


Figure 1-6: Excess Returns of Emerging Markets in the U.S. Market

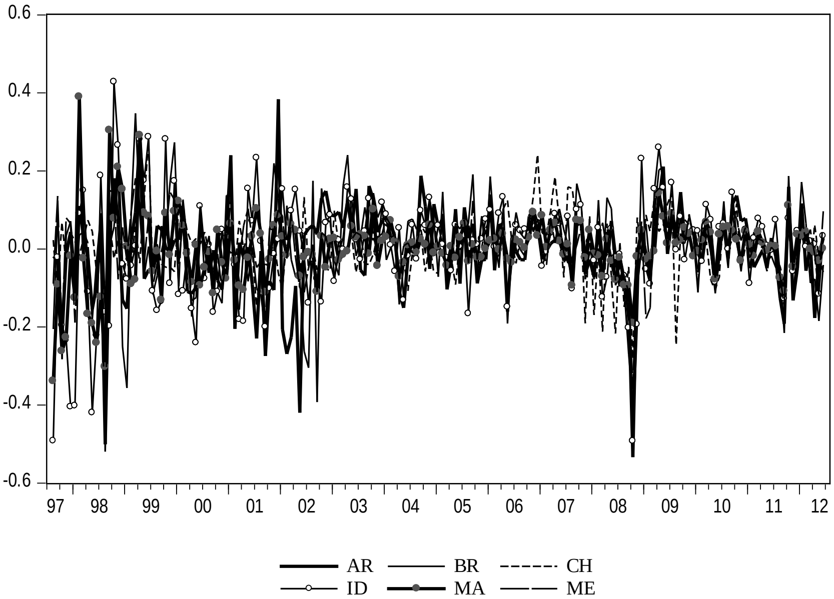


Table 1-2: Cointegration Test between the Domestic Market and World Market

	Eigen value	Trace Stat.	0.05 Trace Crit.val.	Trace p-Value*	Max-Eigen Stat.	0.05 Max.Eig. Crit.val.	Max.Eig. p-value*
US	0.041	9.539	20.262	0.685	7.428	15.892	0.617
GE	0.041	10.821	20.262	0.559	7.567	15.892	0.600
HK	0.043	11.016	20.262	0.541	7.790	15.892	0.573
JP	0.081	19.455	20.262	0.064	15.106	15.892	0.066
SI	0.035	7.822	20.262	0.839	6.439	15.892	0.737
UK	0.030	8.293	20.262	0.800	5.537	15.892	0.838
AR	0.086	21.219	20.262	0.037	16.168	15.892	0.045
BR	0.035	7.126	20.262	0.889	6.296	15.892	0.754
CH	0.043	11.374	20.262	0.506	7.897	15.892	0.560
ID	0.035	7.326	20.262	0.876	6.416	15.892	0.740
MA	0.035	8.117	20.262	0.815	6.378	15.892	0.744
ME	0.037	9.601	20.262	0.679	6.696	15.892	0.706

The series is log(market index) where the market index is US dollar-adjusted .
Test specification: intercept (no trend) in CE, no intercept in VAR, lag order: 1.
**MacKinnon-Haug-Michelis (1999) p-values, Null Hypothesis: no CE.*

Table 1-3: Conditional Beta CAPM Test for International Assets—EGARCH

	$\hat{a}$	S.E.($\hat{a}$)	p-val.($\hat{a}$)	$\hat{b}$	S.E.($\hat{b}$)	p-val.($\hat{b}$)	$\hat{l}$	S.E.($\hat{l}$)	p-val($\hat{l}$)
US	-0.006	0.012	0.600	0.001	0.005	0.741	0.116	0.293	0.693
GE	-0.006	0.027	0.827	0.004	0.003	0.137	0.023	0.370	0.951
HK	0.026	0.016	0.107	-0.005	0.004	0.211	-0.228	0.239	0.339
JP	0.015	0.025	0.556	0.015	0.005	0.001	-0.533	0.454	0.240
SI	0.025	0.013	0.057	-0.004	0.003	0.180	-0.224	0.216	0.299
UK	0.001	0.015	0.954	0.007	0.005	0.120	-0.158	0.343	0.644
AR	0.066	0.034	0.051	0.001	0.004	0.840	-0.662	0.319	0.038
BR	0.041	0.030	0.169	-0.004	0.001	0.006	-0.233	0.281	0.407
CH	-0.169	0.095	0.075	-0.003	0.002	0.223	2.290	1.252	0.067
ID	0.051	0.030	0.089	-0.001	0.002	0.582	-0.441	0.280	0.115
MA	0.022	0.013	0.081	-0.002	0.002	0.418	-0.268	0.217	0.217
ME	0.869	2.367	0.713	-0.001	0.002	0.512	-9.974	27.236	0.714

The results are based on the equation-by-equation EGARCH model, where the mean equation is specified by $(R_{i,t} - R_{f,t}) = \hat{a} + \hat{b}.\hat{\hat{\beta}}_{i,t} + \hat{l}.\hat{\hat{\sigma}}_{i,t} + \hat{\varepsilon}_{i,t}$, $\hat{\varepsilon}_{i,t} \sim EGARCH$, *and* $E(\varepsilon_{i,t}, \varepsilon_{j,t}) = 0$ *for* $i \neq j$.

As we can see in Table 1-3, using the 10% significance level, CAPM is rejected for estimating excess stock market returns of Singapore, Argentina, China, Indonesia, and Malaysia. The premia for market risk (beta) are also different across the assets. It indicates that market risk is priced differently for assets from foreign markets. Moreover, idiosyncratic risk seems to be priced in some markets (Argentina and China), while the common world factor (beta) is not priced significantly. From this test, one may conclude that CAPM does not work for pricing the international assets. However, note that we ignore two important properties of our data that were previously mentioned. Thus, the rejection of CAPM in this test may be caused by the specification error in estimating the model.

Table 1-4: Cross-Correlation of CAPM Residuals

	US	GE	HK	JP	SI	UK	AR	BR	CH	ID	MA	ME
US	1											

GE	0.823	1										
	0.000	-----										
HK	0.662	0.627	1									
	0.000	*0.000*	-----									
JP	0.626	0.545	0.529	1								
	0.000	*0.000*	*0.000*	-----								
SI	0.672	0.586	0.815	0.525	1							
	0.000	*0.000*	*0.000*	*0.000*	-----							
UK	0.834	0.825	0.693	0.600	0.649	1						
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	-----						
AR	0.446	0.456	0.515	0.340	0.555	0.473	1					
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	-----					
BR	0.670	0.645	0.673	0.465	0.612	0.664	0.583	1				
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	-----				
CH	0.283	0.288	0.289	0.173	0.215	0.264	0.255	0.288	1			
	0.000	*0.000*	*0.000*	*0.020*	*0.004*	*0.000*	*0.001*	*0.000*	-----			
ID	0.471	0.439	0.541	0.431	0.709	0.462	0.380	0.448	0.179	1		
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.017*	-----		
MA	0.471	0.410	0.593	0.277	0.691	0.399	0.420	0.414	0.233	0.556	1	
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.002*	*0.000*	-----	
ME	0.685	0.587	0.614	0.477	0.657	0.618	0.612	0.660	0.231	0.416	0.369	1
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.002*	*0.000*	*0.000*	-----

The numbers in italic are p-values.

Testing CAPM using equation-by-equation estimation for each asset ignores the fact that the idiosyncratic risks that represent the market-specific characteristics are still correlated with those of the other market. The risk is not completely removed by the diversification. Table 1-4 shows that cross-correlation of CAPM residuals is found in almost all markets. Knowing this property, tests of CAPM under seemingly unrelated regression (SUR) should be more appropriate to tackle the issue. Table 1-5 shows the results under the SUR framework (the idiosyncratic risk was excluded from model (1.29)).

Table 1-5: Conditional Beta CAPM Test for International Assets—SUR

	$\hat{a}$	S.E.($\hat{a}$)	p-val.($\hat{a}$)	$\hat{b}$	S.E.($\hat{b}$)	p-val.($\hat{b}$)
US	0.000	0.004	0.906	-0.001	0.003	0.746
GE	0.003	0.007	0.663	-0.002	0.003	0.590
HK	-0.004	0.007	0.524	0.002	0.002	0.374
JP	-0.013	0.005	0.016	0.010	0.003	0.002
SI	0.002	0.007	0.820	0.000	0.002	0.773
UK	-0.005	0.004	0.245	0.005	0.003	0.141
AR	-0.004	0.010	0.717	-0.001	0.004	0.799
BR	0.003	0.010	0.737	0.000	0.001	0.753
CH	0.007	0.006	0.291	-0.004	0.002	0.079
ID	0.001	0.010	0.949	0.000	0.002	0.871
MA	-0.002	0.007	0.755	0.001	0.002	0.603
ME	0.005	0.007	0.433	0.000	0.001	0.641
Wald Coefficients Test:	χ^2 Stat.	p-val(H_0^1)		χ^2 Stat.	p-val(H_0^2)	
$H_0^1: \hat{a}_i = 0, \forall i$	18.049	0.114				
$H_0^2: \lvert\hat{b}_1\rvert = \lvert\hat{b}_2\rvert = \cdots = \lvert\hat{b}_{12}\rvert$				13.049	0.290	

Under the SUR framework, CAPM fits well for international asset pricing. Although we found that CAPM seems unfit to be applied to Japanese assets, the joint hypothesis that $\hat{a}_i = 0, \forall i$ cannot be rejected. The result indicates that beta risk is the only factor that matters in estimating the excess returns. Moreover, the estimated market risk premium (in absolute value) is also found to be identical across the assets. It may indicate that the market risk is priced equally regardless of where the assets come from. An asset that has a negative market risk premium indicates that the asset mostly has a negative correlation with the market portfolio during the period of analysis, such that it is most likely that this asset is frequently being sold short.

Now CAPM is in favour under the latter test. However, there is one remaining problem that has not been addressed by SUR: the multivariate GARCH errors structure in the model. Model (1.29) can be estimated as a system equation of SUR, as was done earlier. However, in SUR estimation, the errors are assumed to correlate in cross section, but are homoscedastic or have a constant variance-covariance matrix. As we can see in Figures 1-5 and 1-6, volatility clustering in the excess returns is very likely to be present. Applying diagonal BEKK for testing the CAPM (model (1.29) specifies the mean equation of each asset in SUR system equation), we may tackle the presence of the errors structure.

Table 1-6 shows the CAPM test results under SUR-GARCH model. The estimated parameters were obtained from the diagonal BEKK model estimated by maximum likelihood estimation (MLE). Test of the joint hypothesis that all intercepts are 0 cannot be rejected. However, the significance level for rejecting the homogeneity of market risk premia is increasing. Under the 10% significance level, we reject that the market risk premia are identical across the assets. The latter indicates that market risk is priced differently for assets from different markets.

The test under the SUR-GARCH framework warns us that ignoring the cross-correlation of error terms in the CAPM test model and the multivariate GARCH errors structure may significantly change the verdict of the applicability of CAPM in pricing the international assets.

Table 1-6: Conditional Beta CAPM Test for International Assets By SUR-GARCH (MLE)

	$\hat{a}$	S.E.($\hat{a}$)	p-val.($\hat{a}$)	$\hat{b}$	S.E.($\hat{b}$)	p-val.($\hat{b}$)
US	-0.002	0.004	0.691	-0.001	0.004	0.787
GE	-0.003	0.007	0.638	0.000	0.004	0.947
HK	-0.001	0.006	0.830	0.001	0.003	0.751
JP	-0.017	0.006	0.002	0.013	0.003	0.000
SI	0.001	0.004	0.750	0.000	0.002	0.875
UK	-0.006	0.004	0.180	0.000	0.004	0.934
AR	-0.002	0.009	0.849	-0.003	0.004	0.346
BR	0.006	0.011	0.545	-0.001	0.002	0.446
CH	0.001	0.007	0.886	-0.002	0.003	0.430
ID	0.011	0.008	0.167	-0.002	0.002	0.331
MA	0.002	0.005	0.636	0.000	0.002	0.792
ME	0.003	0.007	0.699	0.000	0.001	0.853
	χ^2 Stat.	p-val(H_0^1)		χ^2 Stat.	p-val(H_0^2)	
$H_0^1: \hat{a}_i = 0, \forall i$	17.717	0.125				
$H_0^2: \lvert\hat{b}_1\rvert = \lvert\hat{b}_2\rvert = \cdots = \lvert\hat{b}_{12}\rvert$				18.430	0.072	

Applying SUR-GARCH enables us to test dynamic beta CAPM under both completely integrated (idiosyncratic risk is uncorrelated with that of other markets) or partially integrated markets (idiosyncratic risk may be correlated with that of other markets). This is the advantage of using the SUR-GARCH framework in testing CAPM. However, as the number of assets we want to analyze is increasing, the number of parameters to be estimated is exploding, such that MLE is becoming infeasible.

In the empirical example of the test above, we use monthly data of 15-year observations (180 observations). In that situation MLE is still feasible and we can see the results as shown in Table 1-6. When high frequency (i.e., weekly or daily) data are used in the analysis, MLE fails to estimate the parameters. This is the disadvantage of using MLE. To tackle this issue, modified feasible generalized least square (mFGLS) that accounts for the multivariate GARCH errors structure is proposed. The application of mFGLS is discussed in Chapter 5 and the superiority of mFGLS over other estimation methods is discussed in Chapter 6.

Given the results above, there is inconsistency with regard to drawing conclusions about the applicability of CAPM in international assets pricing. The inconsistency may be due to the estimation method being used for the test, as described earlier. The other possible reason is because of the world market portfolio. The MSCI ACWI index is a value-weighted index, meaning that the proportion of assets from different markets in the index is always nonnegative. The index is traded as ETF in some markets around the world, including in the US. Note that the MSCI ACWI index or its derivative index (ETF) directly tracks the price of the composing assets in the other markets, regardless of the dynamics of the demand of the index, let us say, in the US. Thus, the weights of the assets in that portfolio (index) were not obtained from an optimization problem as assumed by CAPM. Although the composing assets in that index may include all possible representative assets from almost all stock markets around the world, we cannot be assured that such an index is not only mean-variance efficient, but also the tangency portfolio of the capital market line. With regard to this issue, the rejection of CAPM in a test using such index as a proxy of the world market portfolio may be also due to the inappropriate world market proxy. Chapter 5 also deals with this issue.

1.4.4. Consumption Capital Asset Pricing Model (C-CAPM)

While CAPM was derived by solving the individual/investor objective function and involving micro/individual variables only, the consumption CAPM (C-CAPM) deals with finding the relationship between excess expected return and aggregate or macroeconomic variables in the market—aggregate consumption growth.

Let us assume that there is only one household (or investor) in the economy. The investor is assumed always try to maximize the utility function of his or her consumption decision over time. The utility of the consumption decision is the present value of utility from current consumption and all future consumption. It is assumed that the investor uses the discount rate ρ as his/her subjective time preference, and defines the discount factor β as $1/(1+\rho)$. Note that the notation beta and other notations in this subsection, if they are similar to those used in previous subsections, have different meanings. C-CAPM assumes that the investor has an endowment, e_t, at time *t* that can be used to purchase an asset, let us say stock, with quantity of Q at price p_t, and the remaining endowment is for consumption, C_t. In the next period, investor receives new endowment e_{t+1} and dividend per share d_{t+1}, and the stock price at period $t+1$ is p_{t+1}. The new endowment and total value of assets in the next period can be used for consumption whose value is partly dependent on the consumption decision (or the investment decision; purchasing stock in quantity of Q) made at the earlier period. Thus the lifetime objective function can be defined as

$$\max_Q \sum_{t=0}^{\infty} \beta^t E_t(U(C_t)) \quad (1.32)$$

Stating the objective function in two-period model, (1.32) becomes

$$\max_Q U(C_t) + \beta E_t\,(U(C_{t+1})) \quad (1.33)$$

with budget constraints,

$$C_t + p_t Q = e_t \quad (1.34)$$

$$C_{t+1} = e_t + (p_{t+1} + d_{t+1})Q \quad (1.35)$$

To obtain the solution of the maximization problem above, the constraint equations are substituted to the objective function (1.33) and hence differentiated to get the first order condition.

Restating the objective function (1.33) by substituting (1.34) and (1.35) we have,

$$U(C_t, C_{t+1}) = U(C_t + p_t Q) + \beta E_t(U(e_t + (p_{t+1} + d_{t+1})Q) \quad (1.36)$$

and then the first order condition is obtained by differentiating (1.36) and equalizing it to 0,

$$U'(C_t, C_{t+1}) = -p_t U'(C_t) + \beta E_t U'(C_{t+1})(p_{t+1} + d_{t+1}) = 0 \quad (1.37)$$

Dividing (1.37) by $U'(C_t)$ and adding p_t to the both sides yields

$$p_t = E_t\left(\beta \frac{U'(C_{t+1})}{U'(C_t)}(p_t + d_t)\right) \quad (1.38)$$

Assume that the relevant utility function is restricted to be of the constant relative risk aversion class where γ is the measure of its curvature[2]

$$U(C_t) = \frac{C^{1-\gamma}}{1-\gamma}, 0 < \gamma < \infty \quad (1.39)$$

and dividing (1.38) by p_t to the both sides and defining $(p_t + d_t)/p_t$ as gross rate of return of the asset, R_t, equation (1.38) can be restated as Euler equation:

$$E_t\left(\beta \left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} R_t\right) - 1 = 0 \quad (1.40)$$

[2] When $\gamma = 1$, the utility function is defined to be the logarithmic function, which is the limit of the utility function as γ approaches one (Pennacchi, 2008 pp.16).

For C-CAPM as defined in (1.40) to work, the parameters must satisfy the sign condition as follows:

subjective discount factor: $0 < \beta \leq 1$,

measure of relative risk aversion: $\gamma > 0$.

The basic C-CAPM above can be extended to estimate risk premium (the difference between the real rate of return of the risky asset and real risk-free asset), as can be found in Mehra and Prescott (1985), and is defined as follows

$$E_t\big(r_{i,t+1}\big) - r_{f,t+1} = -\frac{1}{E_t\big(U'(C_{t+1})\big)} cov_t\big(U'(C_{t+1}), 1 + r_{i,t+1}\big) \quad (1.41)$$

where $r_{i,t}$ is real rate of return of risky asset *i* at time *t* ($r_{i,t} = R_{i,t} - 1$) and $r_{f,t}$ is the real risk-free rate at time *t*.

From (1.41), we see that the expected risk premium on a risky asset (expected extra return relative to riskless asset return) is not only dependent on the level of risk (variance) of the risky asset but also dependent on the covariance between the marginal utility of consumption and its rate of return. Thus, one can do consumption smoothing by investing in risky assets that have lower or negative covariance with his consumption growth—e.g., if he buys insurance to maintain his consumption level in the future.

However, using a standard consumption model that defines the utility function of consumption as in (1.39) often requires an extraordinarily high coefficient of risk aversion (to be determined by γ) in order for equation (1.40) to be held; a phenomenon called an equity premium puzzle. Mehra and Prescott documented that by simulating β that vary between 0 and 1, and γ ranges from 0 to 10 the maximum equity premium should be 0.35%, yet they found that the observed equity premium from 1889 to 1978 periods was about 6%. Hansen and Jagannathan (1991) re-estimated the coefficient of relative risk aversion γ using 1891 to 1985 time series data with an annual subjective discount factor that was set to 0.95 and found that γ ranges from 0 to 30 but was still unable to explain the equity premium puzzle.

In Chapter 7, C-CAPM was examined for both the Japanese and US households using respective domestic assets in the stock market. The applicability of C-CAPM is considered by observing the risk aversion and also the subjective discount factor. Hence, investigation into the use of US assets (stocks represented by the US stock market index) for Japanese households was carried out to provide evidence of whether the two markets are integrated or not.

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Chapter 2

ON THE DYNAMIC OF STOCK MARKET INTEGRATION: A MINIMUM SPANNING TREE ANALYSIS

ON THE DYNAMIC OF STOCK MARKET INTEGRATION: A MINIMUM SPANNING TREE ANALYSIS*

ABSTRACT

Stock markets integration is investigated using minimum spanning tree (MST) technique, a technique that finds minimum total distances of edges that connect vertices (markets). The distance measure is a transformed variable of cross-correlation coefficients among the markets returns or indexes. Prior studies have shown that financial openness led to financial market integration and encourage foreign capital inflows in both long-run capital such as foreign direct investment and short-run capital in the stock markets. However, this paper found that stock markets are clustered into regional areas especially when markets returns in both local currency units and US Dollar values were used in estimating correlation coefficients. In addition, markets responded shock in another market differently. Although the degrees of integration are dynamics along the observation periods, yet there is apparent trend that the markets are more integrated. It is also found that stock markets became more integrated when they were economic crises or strong market shock in a leading developed market (subprime crisis in US for instance).

2.1. Background

Financial market integration between two countries takes place when the countries let the flow of capital in and out freely; participants (investors) can buy and sell assets on both markets. As a result, comparable assets traded on both markets are at the same price level and the comovements of returns exist. Therefore, comovement measures such as cross-correlation of markets returns and other econometrics models were applied in measuring degree of integrativeness in some previous studies in this field.

European Union and the use of single currency Euro, the forming of free trade area such as ASEAN Free Trade Area (AFTA) that recently elaborated to ASEAN+China Free Trade Area (AC-FTA), and North American Free Trade Agreement (NAFTA) are examples of efforts made to ascertain integrated markets that expectedly fostering intertrades and capital flow. However, as an impact of more integrated financial market, a market shock in a market (country) may affect the others, and they were not

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necessarily crises, even a bad news or negative signal indicated by a worsening economic variable in a market may be a trigger for negative comovement of stocks prices or returns in different markets. The effect of high degree of integrativeness among capital markets has changed the way investors should price the risk in estimating stock's expected return on a particular market, this is because there is covariance between country-specific risk factors and common world factors, they cannot just relying on domestic and company's fundamental information.

If markets were completely integrated there would be no differences in expected returns and prices of assets at the same level of risk, regardless the market in which the assets are traded. Whereas, in segmented market, a common world factors of risk may have no explanatory power on the asset pricing model that used to estimate the expected returns. The disequilibrium in risk pricing across segmented markets leads to formation of internationally diversified portfolios. The portfolios are intended to reduce country-specific systematic risks that domestically would never be reduced by diversifying the holding assets. In segmented emerging capital markets that usually characterized by significant excess returns during stable condition compared to those in developed markets, would experience hot money (short-term) inflows from developed markets investors. The high mobility of hot money would destabilize the segmented market once negative signal exposed and raising the volatility (risk) of assets returns even to the higher level. However, the growing regional economic integration, the formation of free trade area (not only for labor and commodities, but also capitals), market liberalization, and economic policy harmonization that intensively took place in 1990s until recently have changed the degree of integrativeness among the world capital markets.

2.1.1. Research Objective

Measuring degree of comovement of prices and returns among emerging stock markets and developed stock markets during 2000 until early 2010 period is carried out to investigate the dynamics of the degree of integrativeness among the markets as responses to recent development in economic policies harmonization and financial openness as well as to understand the market behavior in responding market shocks on a market or country. In addition, by using minimum spanning tree (MST) algorithm which transform cross-correlation coefficients of stock market indexes and returns into pseudo distance measure, would produce graphs that indicate whether stock markets are clustered based on the region or organization that govern the economic policy harmonization or scattered arbitrarily, to show how effective such organizations in integrating the markets are.

2.2. Literature Review

The relationship between economic policies harmonization and the degree of capital market integration has long been studied, see for example the study of financial market integration in Europe by Altman (1965), Mandelson (1972), Forbes (1993), Buch (2000), Oh (2003), Guiso, Jappelli, Padula, and Pagano (2004), Askari and Chatterjee (2005), Birg and Lucey (2006), Christiansen (2007), Sifakis-Kapetanakis (2007), Alhorr, Moore, and Payne (2008), Claudia (2008), and recently the study of Kučerová (2009).

The rapid economic growth and regional economic harmonization in Asia also play an important role in fostering emerging capital markets to be more integrated to major developed capital markets. Study on emerging capital markets and or Asian capital markets integration into developed capital markets are Laurenceson (2003), Yang, Khan, and Pointer (2003), Mei-Chen (2005), Plummer and Click (2005), Genberg (2006), Jing and Young (2006), Ibrahim (2006), Ying and Feng (2006), Hatemi and Morgan (2007), Leijonhufvud (2007), Jeyanthi and Pandian (2008), Mukherjee and Bose (2008), Purfield, Kramer, and Jobst (2008), Bensidoun and Unal (2009), Mahmood, Wan Mansor and Dinniah (2009), Oh (2009), Raj and Dhal (2009).

Previous studies documented that there were significant increases in mobility of capital after market liberalization and free trade area formation. The benefits and costs of financial market integration in the perspective of countries initiating the process of integration were outlined by Agénor (2003). Recent studies of capital market integration benefits in the form of capital mobility, income convergence, and growth opportunity are Abiad, Leigh and Mody (2009) that support the findings of Bekaert, Harvey, Lundblad, and Siegel (2007).

Most methodologies in previous research that attempted to measure the degree of integrativeness utilized time series econometric models such as cointegration and

Granger causality test as in the study of Beine, Capelle, and Raymond (2008) and Alexakis (2009). Bekaert and Harvey (1995) proposed a methodology that allows for the degree of market integration to change over time, they also classified assumptions used in previous studies of asset pricing into three different categories: segmented markets, integrated markets, and partially segmented markets. A test on the model like Capital Asset Pricing Model (CAPM) using one country's data is an example of study that assumed that the market is segmented. Study on segmented capital market also carried out by Basak (1996). On the other hand, studies that took into account various variables from different countries or markets assumed that the markets are integrated. The studies of a world CAPM, a world CAPM with exchange rate, and a world consumption-based model are the examples of studies that assumed markets are integrated (see some references in Bekaert et al. (1995)). There are also some studies that did not assume the markets as segmented or integrated (mild segmentation models), rather they assumed that the degree of market segmentation/integration is fixed through time. The study of Errunza, Losq, and Padmanabhan (1992) is just an example of mild segmentation models. However, imposing one of those assumptions may lead to difficulties in interpreting the result. Rejection of a model may be interpreted, as the market is not efficient, rejection of the asset pricing model, or rejection of market integration.

2.3. Research Method

As an alternative to investigate the dynamic of the degree of integrativeness without making prior assumption of the existence of integrated or segmented markets, minimum spanning tree (MST) algorithm is applied. A spanning tree is a set of paths that link vertices or nodes (in this case markets indexes or markets returns) in such a way that there is one and only one path between any pair of vertices. MST algorithm would iterate such processes so that the total distance (in this case, a transformed measure of correlation coefficient) of paths in the tree is minimal.

The advantages of using MST are it produces clusters or structure of relationship among the markets being investigated and by observing the length of the trees over fixed time period intervals we can observe the degree of integrativeness throughout the observation period. Another advantage of MST application in this field is that it produces a multilateral measure of market integration (the length of MST is a single measure or index of the degree of markets integration) instead of bilateral measure (degree of integration of one market to another or to "world market") as found in the previous papers. Compared with bilateral measures such as the use of coefficient of correlation only (non-parametric) or time series analysis such as VAR, VECM, and its derivative analysis (Impulse response function, variance decomposition, Granger causality test, and etc.), this multilateral measure could be further used to find factors that able to explain the dynamism of markets integration degree in more parsimonious parametric models. Moreover, examination of markets integration using MST requires no prior assumptions on whether markets are fully integrated, partially integrated, or segmented.

2.3.1. Minimum Spanning Tree Algorithm

The use of minimum spanning tree in economics and finance research can be found in Hill (1992) in comparing price levels across countries, Hill (2004) for the same theme in the case of European Union countries, Hill (2001) in measuring inflation and growth rate, and Bonanno, Lillo, and Mantegna (2001) who tested the stability of MST in different time horizon to find the changes in hierarchical organization of a set of stocks.

The minimum spanning tree algorithm developed by Kruskal (1956), also known as *greedy algorithm*, would connect all vertices in a set of paths in which the total length of paths is minimal. The construction of creating a minimum spanning tree according to Kruskal is:

> *"Perform the following step as many times as possible: Among the edges of G not yet chosen, choose the shortest edge which does not form any loops with those edges already chosen. Clearly the set of edges eventually chosen must form a spanning tree of G, and in fact it forms a shortest spanning tree"*

Alternatively, the construction can be stated in an algorithm as follows:

```
sort the edges of G in increasing order by length
keep a subgraph S of G initially empty
   for each edge e in sorted order
   if the endpoints of e are disconnected in S
      add e to S
return S
```

Conditional correlation coefficient (estimated by utilizing GARCH or VECH) may be bias with regard to the presence of heteroskedasticity on market indexes and market returns as indicated in the study of Forbes and Rigobon (2002), in which the increasing volatility after a shock on a market tends to increase the coefficient correlation between those markets to another. However, the adjustment of conditional correlation measure requires that the market in crises has to be clearly defined and the point of time when the shock began has to be determined. Concerning to this finding, this paper use unconditional coefficient of correlation to avoid bias resulted from volatility burst in some periods during the analysis.

To examine the presence of market integration, cross-market correlation coefficients among stock markets indexes are transformed into ultrametricity distance measures as inputs to be processed in minimal spanning tree (MST) algorithm to find the least total paths distance that connect all of the nodes (stock markets indexes).[1] Pearson correlation is used to measure relationship between two stock markets returns (*x* and *y*), using following formula:

$$r_{X,Y} = \frac{n\sum X_i Y_i - (\sum X_i)(\sum Y_i)}{\sqrt{[n\sum X_i^2 - (\sum X_i)^2][n\sum Y_i^2 - (\sum Y_i)^2]}} \tag{2.1}$$

The correlation coefficient $r_{X,Y}$ has a value ranges from -1 to +1 to indicates perfect opposite relationship (X moves on the opposite direction to Y) to perfect relationship (X moves on the same direction to Y) respectively. The measure of relationship degree can be associated with a distance measure using following transformation:

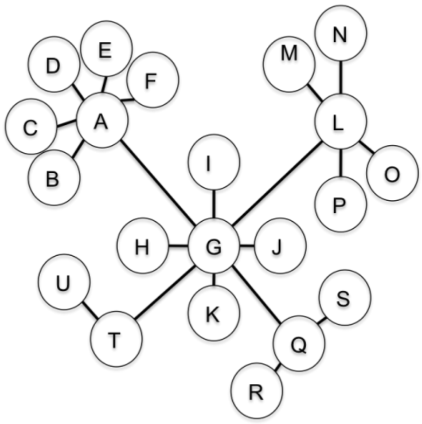
$$d_{X,Y} = \sqrt{2(r_{X,Y} - 1)^2} \tag{2.2}$$

$d_{x,y}$ value lies between the limits of 2√2 and 0, when $r_{X,Y}$ = -1 and $r_{X,Y}$ = +1 respectively. Since $r_{x,y}$ is symmetrical in nature; that is, the coefficient of correlation between *x* and *y* is the same as that between *y* and *x* and the coefficient of correlation of the same subject must be equal to 1 (the value of the diagonal on the coefficient of

[1] The author want to express gratitude to Paul A. Jensen from The University of Texas at Austin who developed Minimum Spanning Tree algorithm into Excel add-in and provides the add-in freely through http://www.me.utexas.edu/~jensen/ORMM and to Vladimir Batagelj and Andrej Mrvar from University of Ljubljana, Slovenia who developed Pajek Software for Network Analysis which can be accessed freely from http://pajek.imfm.si

correlations matrix), thus the ultrametricity distance measure has following properties: (1) $d_{x,y} = d_{y,x}$, (2) $d_{x,y} = 0$ for $x = y$ or $r_{x,y} = 0$, and (3) $d_{x,y}$ has negative linear relationship with $r_{x,y}$. The ultrametricity distance measure ($d_{X,Y}$) will be used as input in MST algorithm to find the minimum spanning of distances to connect all nodes (stock markets). A hypothetical spanning tree will look like the following figure.

Figure 2-1: Hypothetical Spanning Tree



From Figure 2-1 we may state node A, G, L, Q and T are stock market hubs since the other markets are better connected to them than the others to produce minimum total arc distances in the tree. In the case of hub-A, node B, C, D, E, and F are it's spokes. However, it is worth to note that MST graph does not indicate dependent or causal relationship between hub and spoke capital market, since it is derived from cross correlation coefficients that treat any vertices as independent variables.

Daily index and return data in local currency unit and in US Dollar were used in estimating cross-correlation coefficients. Concerning the different trading hours in each market, the data have been adjusted by lagging by one day for markets that the closing hour are at least 6 hours ahead of US stock market. The number of trading days varies across the stock markets and therefore listwise deletion was applied to obtain the same number of observations in each market. Cross-correlation coefficients are estimated using 41 trading days on each time window to obtain 30 time windows. The use of a fixed number of observations data and listwise deletion on each time window are to remove sample size effect so that the correlation coefficients are comparable from time to time and within the time window. As the main interests of this research are to cluster the structure of interrelationship among capital markets and to observe the dynamics of integration degree during the observation period and not to investigate the spillover effect or contagion effect of a crises market to the others, the use of unconditional correlation coefficients are sufficient although the interpretation of the results still has to take into account the bias resulted from the presence of heteroskedasticity. In addition, the use of adjusted conditional correlation coefficients as suggested by Forbes *et al.* cannot be established for each time window because of short observation time and the absence of source of shock identification.

Market Index vs. Market Return

Stock market index is a weighted average of listed stocks prices, where the weight of each stock is the ratio between the stock market capitalization and total market capitalization. Stock price reflects discounted value of future expected cash flows. In the discounting process, risk estimate would be central since it determines the discount rate. Risk can be decomposed into several factors of both country specific factors such as the real risk free rates (the difference between expected yield from risk free assets and inflation) and, if the markets are integrated, world factors (exchange rates, international purchasing power parity condition, interest rate differential, etc.). When index and returns are measured in local currency unit, the correlation between market index on a market and on another thus reflects the comovement of expectations toward domestic factors between both markets. Meanwhile, market return indicates the magnitude of the price (index) movement; it measures the effect of changes in risk factors toward the changes in future expected cash flows (price).

The coefficient of correlation between a pair of market indexes and coefficient of correlation between a pair of markets returns might be different in values, since investors in both markets might have different capacity in absorbing and processing information (asymmetric information). The true value of an asset as a result of changes in such factors is hard to observe, and the market might be in disequilibrium condition for some periods of time and as a result, the market is not informationally efficient. In addition, a change of a factor in one direction might be weighed differently to another, i.e. investors tend to weigh bad news greater than good news. In this case, we may expect that the market index coefficient of correlation is higher than market return coefficient, and vice versa for the other case. Daily market return is estimated using natural log *(ln)* difference of index level at time t and time $t-1$ ($R_{i,t} = ln(index_{i,t}) - ln(index_{i,t-1})$).

Index and Return in Local Currency Unit (LCU) and in US Dollar

World factors in this research are represented by exchange rates of home country toward US Dollars. Exchange rate is a composite measure and it may be affected by interest rate and inflation spread between home country and United States. However, the use of US Dollar in adjusting index and returns only eliminate the domestic factors but the US factors remain in the index and return. To dollarize index, each index is divided by corresponding exchange rate of home currency per US dollar value.

The difference between US Dollar and LCU correlation coefficients reflects the effect of world factors on comovement of prices and returns. If there is no significant difference between them, it can be interpreted that the domestic factors themselves already have comovement with the world factors.

2.4. Data And Summary Statistics

Daily market indexes are obtained from Yahoo Finance from the beginning of 2000 to April 30, 2010. There are 21 indexes that each represents capital market in a country as samples. Those indexes are composite stocks price indexes in respective markets as following abbreviation: AO (Australia), AEX (Netherland), ATX (Austria), BSE (India), CAC40 (France), DAX (Germany), FTSE100 (UK), HSI (Hong Kong), IBOVESPA (Brazil), IDX (Indonesia), IPC (Mexico), KLSE (Malaysia), KOSPI (Korea), MERVAL (Argentina), NK225 (Japan), SMI (Switzerland), SNP500 (US), SSECI (China), STI (Singapore), TSEC (Taiwan), and TSX (Canada). Indexes are classified as Developed Market and Emerging Market based on MSCI Market Classification (based on latest announcement of Market Classification Decision, June 15, 2009). The Developed capital markets in the sample based on the classification are Australia, Austria, France, Germany, UK, Hong Kong, Japan, Switzerland, US, Singapore, and Canada, while the remaining capital markets are classified as emerging capital markets. Corresponding daily exchange rates data are obtained from The Pacific Exchange Rate Service of The University of British Columbia's Sauder School of Business. Although several studies in this field use longer observation period, but concerning to the development in emerging markets such as China and prominent markets of ASEAN (such as Indonesia and Malaysia), prolonging the sample period would dismiss the contribution of these markets to the world capital markets interdependent structure. This is because the data availability and the degree of market openness to these markets took place only in the last 10 years.

There were 2695 observations during the period of analysis, but because of different holidays on the markets and listwise deletion, total trading days used in the analysis were 1236 observations for all samples. Finally, 30 time windows were constructed with time interval of 41 trading days on each.

Table 2-1: Summary of Annualized Statistics of Market Returns in National Currency

	Developed Markets				Emerging Markets			
Arithmetic Mean	Min	Max	Mean	Cross Section Variance	Min	Max	Mean	Cross section Variance
2000	-17.900	3.622	-4.697	40.806	-49.572	16.468	-12.807	335.518
2001	-17.463	3.247	-6.959	34.443	-10.262	13.537	0.931	80.688
2002	-21.703	0.099	-10.842	32.725	-8.498	15.374	-2.003	64.537
2003	0.171	13.144	6.754	17.898	4.098	30.074	17.628	80.862
2004	0.368	19.286	5.011	26.293	-6.986	17.309	5.957	59.136
2005	1.094	17.163	7.920	17.898	-3.659	18.575	7.675	59.338
2006	2.261	11.506	6.505	6.929	4.417	35.139	13.223	90.321
2007	-8.872	13.084	1.909	28.845	-2.684	28.359	11.593	90.406
2008	-51.351	-19.917	-28.021	77.108	-39.532	-7.571	-26.558	110.853
2009	2.763	17.941	9.657	16.729	8.048	23.627	18.964	25.646
2010*	-7.457	3.630	-0.199	11.621	-17.263	27.506	0.391	168.102
2000-10*	-6.443	1.460	-1.198	5.019	-0.872	6.673	3.489	5.937
Geometric Mean								
2000	-18.364	2.968	-5.139	41.251	-51.492	16.056	-13.749	349.048
2001	-18.209	3.046	-7.457	36.447	-10.978	12.473	0.097	79.514
2002	-23.198	-0.090	-11.503	37.789	-9.242	13.210	-2.765	59.128
2003	-0.785	12.983	6.349	19.210	3.817	29.295	17.227	79.077
2004	0.171	19.091	4.843	26.371	-7.363	16.879	5.448	59.219
2005	0.998	16.995	7.810	17.737	-4.069	18.313	7.354	59.081
2006	2.101	11.341	6.306	6.964	4.115	34.737	12.824	89.626
2007	-9.192	12.446	1.600	28.169	-3.179	27.253	11.045	87.124
2008	-53.536	-21.248	-29.576	80.961	-41.335	-8.783	-28.087	115.936
2009	2.094	17.338	8.987	16.266	7.407	23.113	18.247	25.545
2010*	-7.797	3.237	-0.444	11.858	-17.652	24.368	-0.206	150.474
2000-10*	-7.034	1.215	-1.695	5.307	-1.492	6.139	2.795	5.925
Variance								
2000	0.022	0.116	0.056	0.001	0.051	0.242	0.119	0.004
2001	0.019	0.094	0.063	0.001	0.044	0.286	0.106	0.006
2002	0.015	0.189	0.084	0.003	0.019	0.274	0.096	0.006
2003	0.011	0.121	0.051	0.001	0.016	0.098	0.051	0.001
2004	0.005	0.038	0.021	0.000	0.015	0.131	0.064	0.001
2005	0.009	0.021	0.014	0.000	0.007	0.076	0.041	0.001
2006	0.012	0.048	0.025	0.000	0.008	0.080	0.051	0.000
2007	0.024	0.081	0.039	0.000	0.032	0.139	0.069	0.001
2008	0.129	0.310	0.196	0.003	0.057	0.329	0.193	0.006
2009	0.047	0.146	0.085	0.001	0.039	0.143	0.091	0.001
2010*	0.016	0.050	0.031	0.000	0.022	0.404	0.077	0.015
2000-10*	0.031	0.086	0.062	0.000	0.041	0.141	0.087	0.001

**Data in 2010 are up to April, 30. Numbers are stated in percentage.*
Source: Yahoo Finance, computed by author

Table 2-2: Summary of Annualized Descriptive Statistics of Market Returns in US Dollar

	Developed Markets				Emerging Markets			
Arithmetic Mean	Min	Max	Mean	Cross Section Variance	Min	Max	Mean	Cross section Variance
2000	-20.249	2.454	-7.905	42.802	-55.092	17.259	-16.272	448.371
2001	-22.479	-1.867	-9.640	36.536	-11.813	15.104	-0.576	106.381
2002	-16.594	4.250	-7.371	27.345	-27.410	11.382	-5.863	103.990
2003	4.047	21.724	12.214	26.605	7.046	38.721	18.687	118.684
2004	2.252	24.715	7.450	33.743	-6.533	15.828	6.587	40.357
2005	1.094	11.754	4.821	7.987	-2.803	19.701	8.384	77.533
2006	2.980	14.380	8.464	9.356	4.489	32.698	12.857	79.721
2007	-6.725	12.897	4.955	30.493	-3.792	30.292	12.931	138.509
2008	-55.470	-20.314	-31.655	88.382	-46.338	-16.150	-33.479	96.989
2009	4.509	19.215	11.413	22.053	7.961	30.043	20.173	44.424
2010*	-16.413	5.100	-3.944	40.359	-18.034	34.437	2.417	228.476
2000-10*	-5.986	2.154	-0.781	5.459	-1.774	5.111	2.499	5.348
Geometric Mean								
2000	-20.775	1.734	-8.409	42.539	-57.309	16.840	-17.351	466.068
2001	-23.369	-2.192	-10.166	38.306	-13.241	14.509	-1.613	106.379
2002	-17.923	3.994	-8.001	30.495	-29.440	10.647	-6.972	114.784
2003	3.490	21.541	11.832	27.472	6.771	37.800	18.185	114.058
2004	2.005	24.449	7.216	33.606	-6.908	15.555	5.965	39.650
2005	0.998	11.542	4.668	7.843	-3.226	19.365	7.963	76.039
2006	2.745	14.186	8.213	9.458	4.163	32.307	12.332	79.758
2007	-7.006	12.257	4.588	29.638	-4.315	29.155	12.241	132.963
2008	-58.272	-21.553	-33.628	94.913	-48.423	-18.181	-35.707	103.837
2009	3.797	18.483	10.439	22.213	6.862	28.383	19.133	43.893
2010*	-17.008	4.836	-4.348	41.499	-18.432	30.964	1.657	205.917
2000-10*	-6.618	1.583	-1.378	5.576	-2.466	4.353	1.577	5.400
Variance								
2000	0.036	0.116	0.064	0.001	0.052	0.279	0.136	0.005
2001	0.041	0.113	0.066	0.000	0.044	0.284	0.131	0.006
2002	0.029	0.168	0.080	0.002	0.019	0.490	0.141	0.022
2003	0.017	0.099	0.048	0.001	0.016	0.125	0.063	0.002
2004	0.015	0.055	0.030	0.000	0.015	0.155	0.078	0.002
2005	0.012	0.029	0.019	0.000	0.008	0.122	0.053	0.001
2006	0.012	0.059	0.032	0.000	0.012	0.115	0.066	0.001
2007	0.029	0.081	0.046	0.000	0.043	0.156	0.087	0.001
2008	0.157	0.354	0.249	0.004	0.076	0.599	0.281	0.023
2009	0.077	0.213	0.123	0.001	0.056	0.210	0.132	0.002
2010*	0.024	0.086	0.051	0.000	0.038	0.447	0.097	0.017
2000-10*	0.054	0.092	0.075	0.000	0.047	0.204	0.116	0.002

**Data in 2010 are up to April, 30. Numbers are stated in percentage.*
Source: Yahoo Finance, computed by author

Emerging markets that mostly located in Asia seems to be the most diversified markets in terms of monetary policy. Exchange rate arrangements for most economies in the sample are independent floating rate and managed floating for ASEAN countries (Indonesia, Malaysia, and Singapore) and India, while pegging toward US Dollars is adopted in Argentina and China (crawling peg). Only Hong Kong SAR in the sample that uses currency board arrangement. The members of European Union (EU) in the sample are clearly the most homogenous samples in terms of both exchange rate arrangement and monetary policy framework that set inflation as the main target.

Equity financing through capital market in emerging markets are also relatively lower compares to those in developed market. Market capitalization as percentage of GDP in emerging markets are about 21% or lower, except in Brazil and Asian newly industrialized countries like China, India, and Malaysia. However, there were positive trends in the emerging markets that firms in the markets seek financing trough international capital markets although the capital markets performance in the end of 2008 severely affected by shocks in US markets, this is indicated from positive capital inflows from international capital markets as percentage of GDP, while the S&P Global Equity Indices for the markets are all negative. Higher inflation rate is also persistent characteristic of emerging markets.

Optimism was eventually recovered in 2009 as indicated by the increasing value of market capitalization in both US Dollars and local currency. In Brazil, India, and Indonesia the increase hit the record compared to other countries as the changes of market capitalization (in US Dollar value) are above 100%.

Other apparent distinctions between emerging and developed capital market are shown in Table 2-1 and 2-2. Emerging capital markets are highly characterized by higher returns and higher volatility than those in developed markets. It is also easily observed that between developed and emerging markets there exist comovement of returns and volatility when there were big shocks in the markets. The event of 9/11 in 2001, the collapse of Lehman Brothers in 2008, and worries over the impact of Greece economic crises on EU in the first quarter of 2010 have driven both emerging and developed markets to move in the same direction, especially when the returns are measured in US Dollar.

Efficient market hypothesis (EMH) suggests that all prices of assets reflect current information. Under informationally efficient market, information in the past has no explanatory power to the present price and thus there will be no one that can gain abnormal return using past information. In the simplest way to test the weak form-efficient market, there should be no autocorrelation in series of return. The presence of return autocorrelation means the current return can be predicted using past return itself. Table 2-3 presents the test of autocorrelation for market return in local currency (Panel A) and market return in US Dollar value (Panel B). US Dollar returns tend to have lower serial correlation in any order than returns in local currencies for developed capital markets, indicate that developed markets are more efficient when measured by a common world factor, except the newly developed market-Singapore, Japan, Austria and Canada. On the other hand, emerging capital markets tend to have lower serial correlation in local currency returns than in US dollar returns, except for Indonesia and Malaysia. However, it is inconclusive to say that developed markets are more efficient than emerging markets.

Table 2-3: Autocorrelation of Market Returns and US Dollar Market Returns

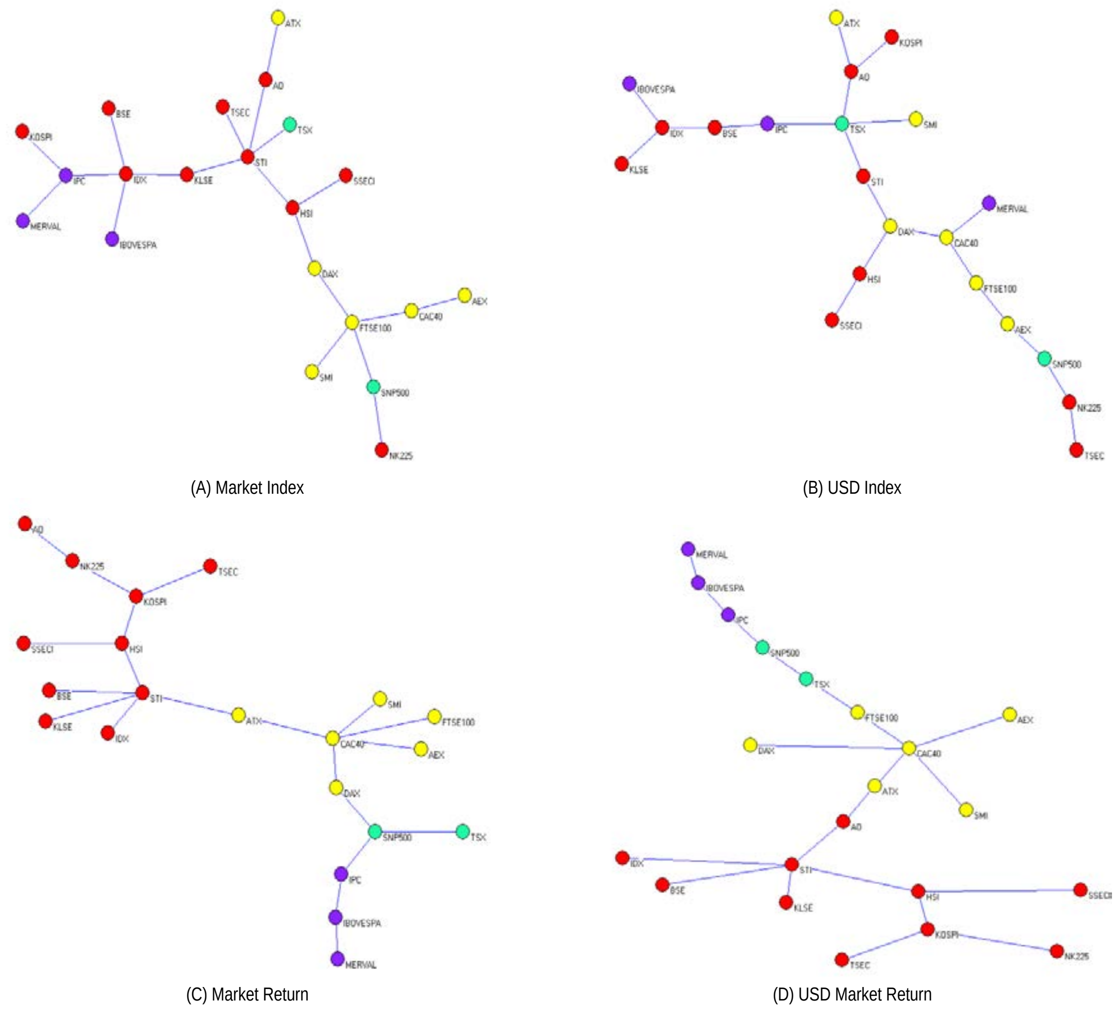
	Panel A: Market Returns in National Currency					Panel B: Market Returns in US Dollar				
Order:	1	2	3	4	5	1	2	3	4	5
Developed Markets										
AEX	-0.03	-0.01	***-0.09***	***0.07***	***-0.08***	-0.01	-0.03	**-0.08**	**0.08**	**-0.07**
AO	-0.03	0.00	-0.03	0.03	0.04	0.02	-0.01	-0.03	0.04	0.03
ATX	***0.05***	***-0.03***	***-0.02***	***0.02***	***0.01***	**0.06**	**-0.03**	**-0.03**	**0.05**	**0.02**
CAC40	***-0.05***	***-0.04***	***-0.07***	***0.07***	***-0.07***	**-0.03**	**-0.05**	**-0.06**	**0.08**	**-0.06**
DAX	***-0.04***	***-0.02***	***-0.04***	***0.06***	***-0.05***	-0.02	-0.02	-0.04	**0.06**	**-0.05**
FTSE100	**-0.06**	**-0.06**	**-0.10**	**0.11**	**-0.06**	**-0.04**	**-0.05**	**-0.09**	**0.09**	**-0.08**
HSI	-0.03	-0.01	-0.01	0.00	-0.03	-0.03	-0.01	-0.01	0.00	-0.03
NK225	-0.02	-0.01	-0.05	0.02	0.03	**-0.08**	**-0.01**	**-0.03**	**0.02**	**0.04**
SMI	0.01	-0.05	-0.06	0.06	-0.08	0.00	-0.05	**-0.06**	**0.07**	**-0.09**
SNP500	**-0.08**	**-0.09**	**0.04**	**-0.02**	**-0.02**	**-0.08**	**-0.09**	**0.04**	**-0.02**	**-0.02**
STI	0.01	0.02	0.01	0.02	0.02	0.03	0.03	0.00	0.03	0.03
TSX	-0.03	-0.06	0.03	0.01	-0.07	**0.06**	**-0.05**	**0.04**	**0.05**	**-0.06**
Emerging Markets										
BSE	**0.05**	**-0.04**	**-0.04**	**0.03**	**-0.01**	**0.07**	**-0.04**	**-0.03**	**0.04**	**0.00**
IBOVESPA	0.01	**-0.06**	**-0.05**	**0.00**	**-0.01**	**0.07**	**-0.05**	**-0.02**	**0.01**	**-0.01**
IDX	**0.13**	**-0.01**	**0.03**	**-0.01**	**-0.01**	**0.10**	**0.00**	**0.04**	**-0.01**	**0.00**
IPC	**0.11**	**-0.05**	**-0.03**	**0.00**	**-0.02**	**0.13**	**-0.03**	**-0.02**	**-0.01**	**-0.04**
KLSE	-0.03	0.02	0.02	0.01	0.02	-0.02	0.02	0.02	0.01	0.04
KOSPI	0.00	-0.04	0.00	-0.01	-0.01	0.03	-0.02	0.00	-0.02	-0.01
MERVAL	**0.06**	**-0.01**	**0.03**	**0.03**	**-0.01**	**0.07**	**-0.02**	**0.04**	**0.02**	**-0.01**
SSECI	0.00	-0.02	0.04	**0.05**	**-0.03**	-0.01	-0.03	0.03	**0.05**	**-0.03**

Numbers in bold face indicate significant serial autocorrelation at 5% level

2.5. Results

The minimum spanning trees in Figure 2-2 uses all observations data from the beginning of 2000 up to the end of April 2010. It is used as an overview of MST analysis that represents long-term interaction among capital markets in the sample. Total length of MST using market index, US Dollar index, market return, and US Dollar market return are 1.861, 1.463, 10.481, and 10.233 respectively. It is discernible on the length of MSTs that both index and market returns in US Dollar values are shorter than those in local currency units. It is also apparent that MSTs lengths of returns are longer than the length of MST indexes. Since the MST length is the total distances of edges that connect vertices (indexes or returns), and the distance measure is a transformed measure of correlation coefficient, the shorter the MST length, the more correlated those vertices are. The findings imply that the capital markets have more comovement as responses to market shocks but not in proportionate magnitude. The degree of market efficiency varies across the markets may explain this finding, as indicated by autocorrelation test in Table 2-3. Meanwhile, the shorter MSTs length of index and returns in US Dollar indicate that there are common world factors that attributable to the comovement.

Figure 2-2: World Capital Market Structure 2000-2010

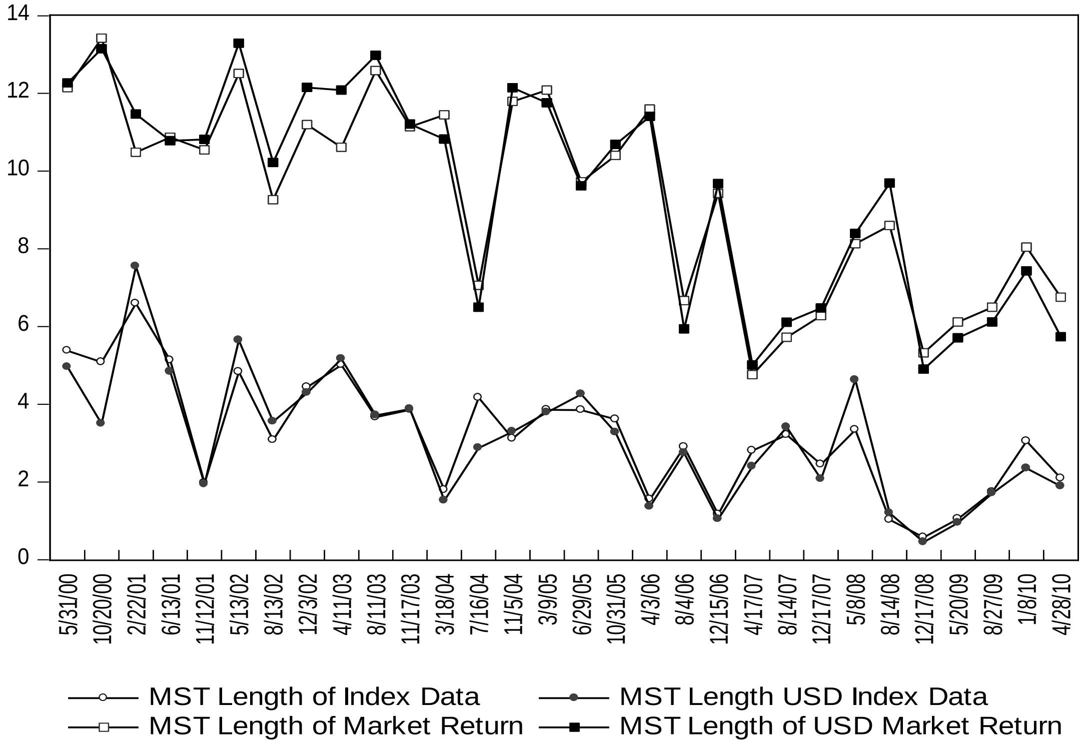


From Figure 2-2, it is also clear that MST of both market indexes in local currencies and market indexes in US Dollars (Figure 2-2 (a) and (b)) are more scattered than MST of returns (Figure 2-2 (c) and (d)) in which capital markets are clustered into its regional area. Since MSTs in indexes have shorter total distances compared with those in returns, they indicate that adjustment in stock prices in the markets on a shock in the other market occurred spontaneously and timely yet the magnitude of adjustment (returns) does not reflect the true changes as effect of the shock. It may indicate that there were overreactions in response to market shocks that occurred in different markets, no matters the distance or economic relation of the markets is. For example in Figure 2-2 (a), capital markets in Latin America: Argentina (MERVAL), Brazil (IBOVESPA) and Mexico (IPC) are closer to Indonesian Stock Exchange (IDX), meanwhile capital market in Austria (ATX) and Canada (TSX) is closer to Singapore (STI). Figure 2-2 (b) which is the least MST even shows the most scattered relationship among the markets; Argentina (MERVAL) is closely connected to France (CAC40), Austria (ATX) is connected to Australia (AO), and Brazil (IBOVESPA) is connected to Indonesia (IDX). In contrast, Figure 2-2 (c) and (d) that depict interrelation among capital markets in terms of both LCU and US Dollar returns, both show similar pattern of relationship, in which the capital markets are clustered into their regions and or regional economic organization that harmonize their economic policies.

The main hubs of Asian Pacific capital markets are Singapore, Hong Kong, Australia and Korea, they are connected each other in one cluster. The Australian capital market (All Ordinary index) seems as Asian Pacific main hub that transmitted both European markets (through Austria ATX, UK FTSE100 and France CAC40) and American markets via US SnP500. There are five among seven countries from European continent in the sample are using Euro as their single currency and only one country, Switzerland, that is not member of EU, it is not surprising that capital markets in Europe depicted in the MST graphs are among the most cohesive markets in terms of comovement of indexes and returns. Since Asian capital markets are among the most diverse capital markets with regard to size, financial depth, and monetary policy, the Asian capital markets cluster formed in the graphs of Figure 2-2 represent the impact of economic policy harmonization especially in trade and economic openness in which inflows of foreign capital has been encouraged by the governments to raise their domestic investment.

Analysis on the dynamics of short-term market integration degree throughout 2000 and first quarter of 2010 is summarized in Figure 2-3. Comparing between MST length of market indexes and market return in both local currency units and US Dollar values suggest that index data give more consistent results than return data with respect to the presence of common world factors represented by exchange rates.

Figure 2-3: The Dynamic of MST Length in 2000 - 2010:Q1



The US Dollar indexes produce shorter MSTs length compared with their values in local currency units, with exceptions on 11 out of 30 observations, while for returns data the exceptions are 17 out of 30 observations. Nevertheless, paired sample t-test in Table 2-4 Panel A and B indicate that there are no significant mean differences in MST length between market indexes in local currency units and US Dollar market indexes, as well as between market return in local currency units and US Dollar market returns. The findings suggest that domestic factors might already reflect the common world factors, they move in harmony. However, it is found that index data in both local currency units and US Dollar values always produce shorter MSTs length compared with those returns data and, statistically there are mean differences of MSTs length between index and market return in local currency units as well as in US Dollar values, as indicated in Table 2-4 Panel C and D. These findings are consistent with the long term MST analysis above.

Table 2-4: MST Length Mean Difference Paired Sample t-Test

	Panel A		Panel B	
	MST Length of Index	MST Length of USD Index	MST Length of Market Return	MST Length of USD Market Return
Mean	3.213	3.140	9.372	9.484
Variance	2.222	2.621	6.335	7.588
Corr. Coef.	0.938		0.978	
Mean Diff.	0.073		-0.112	
t-stat	0.704		-1.012	
p-value	0.487		0.320	
	Panel C		Panel D	
	MST Length of Index	*MST Length of Market Return*	*MST Length USD Index Data*	*MST Length of USD Market Return*
Mean	3.213	9.372	3.140	9.484
Variance	2.222	6.335	2.621	7.588
Corr. Coef.	30	30	30	30
Mean Diff.	0.513		0.549	
t-stat	-6.159		-6.344	
p-value	-15.554		-15.069	
Mean	0.000		0.000	

Although the degree of integration is time varying (as we can see from the length of MSTs that is volatile during the analysis period), yet we can observe that there is a negative trend for both LCU and US Dollar indexes and returns. By looking closer to the MST pattern for indexes data it seems that United States market still plays as the most influential market to other markets in the world as indicated by the shorter MST length when there was a shock in US market. There is also evidence that the cross-correlation coefficients are higher during the shock period, and thus the MST length become shorter. The two big shocks in US market that has greater influence over other markets around the globe are 9/11 in 2001 and the bankruptcy of Lehman Brothers in September 2008 as witnessed by the drop in MST length for the corresponding time windows (11/12/01 and 12/17/08).

Interest rate in US also used to be the reference for many investors in the world in estimating assets' future expected returns as the interest rate reflect the expected inflation premium and, the difference between domestic and US interest rate will determine the depreciation/appreciation of the exchange rates and thus will determine the real value of domestic assets in US Dollar value. However, the continuing lower interest rate in US since early 2000 up to mid 2004 was believed to be the main reason of later known as housing bubbles. The higher demand for houses in US and excess capital around the world has attracted capital inflows to US through financial market where mortgage backed securities, stocks, and other financial assets are traded. As a result, there was also a boom in financial assets investment in US, while this was happened; domestic investors in other markets seem weigh the information in a lesser degree than when the negative signal or shock was taken place. Thus, the distances among the markets were widening during this period as we can see in Figure 2-3 in within the first time window to 11/17/03 (except in time window 11/12/01 when 9/11 occurred). However, when Federal Reserved set the Fed Funds rate at the lowest level at 1% in July 2003 up to July 2004 (between time window 4/11/03 and 7/16/04) the degree of integration was rising again and the tendency onward is continued as the Feds started to raise the Fed Funds rate. Intuitively, by comparing the dynamic of MST length for Indexes data and returns data, we may witness that MST length for returns data is more volatile than that for indexes data.

Table 2-5: Trend of MST Length

	Index		USD Index		Return		USD Return	
	C(1)	C(2)	C(1)	C(2)	C(1)	C(2)	C(1)	C(2)
Coefficient	6.348	-1.260	14.931	-2.189	14.282	-1.973	14.931	-2.189
t-Statistic	10.501	-5.472	12.606	-4.852	13.051	-4.734	12.606	-4.852
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^2	0.517		0.457		0.445		0.457	

*Logarithmic Trend Model: MST Length = C(1) + C(2)*Ln(t), T=30 observations*

It is in line with the previous analysis that the effects of shocks in a market were absorbed differently in the other markets due to markets inefficiency or the presence of overreaction especially in the case of negative signal. In general, both market indexes and returns data produce shorter and shorter MSTs length as it can be observed in Figure 2-3 as well as on Table 2-5 that indicates that there are significantly negative trend in all MSTs length. In addition, the correlation of markets indexes responded shocks earlier than the markets returns. For example, when the US Federal Reserve started to lower its Fed Funds Rate on July 2003, the MST length of index data has hiked to the highest level since 9/11 event, yet the MST length of returns data increased in the following period (see Figure 2-3 on 4/11/03). The same cases also happened in the events of the end of low interest rate era (time window 3/18/04), the increasing interest rate in anticipating housing bubbles in US that lead to subprime mortgage crises (time window 8/4/06), the highest oil price in history (time window 8/14/08) and the collapse of financial institutions in US (time window 12/17/08), in which MST length of index data always leads the MST length of return data. These findings amplify the previous analysis that markets participants were very responsive toward such shocks but then adjust the magnitude of responses thereafter.

Selected MST figures are available for request and not presented in this paper to save space. The figures depicted the interrelationship between emerging capital markets and the developed capital markets. There are eight emerging capital markets in the sample, five of them are Asian markets and the remaining are Latin Americans. In general, as far as emerging capital market is concern, the Asian emerging capital markets are more frequently connected to developed capital market from Europe, moreover, the capital markets from Asia newly industrialized countries: China, India, Indonesia, Korea, and Malaysia, occasionally positioned as hubs or closely related to other developed markets, especially in the periods after 2006. Asian emerging capital markets also apparently clustered as one distinctive network compared with the American Latin capital markets. It is not surprising since Asian economies were growing rapidly in the last decade after recovered from severe economic crises in 1997. In addition, economic policy harmonization and trade liberalization are likely successful in Asian countries that it is believed to have contribution in explaining the emerging Asian capital market cluster.

2.6. Conclusions and Discussion

Comparing the MST approach and traditional ones in measuring the degree of market integration would provide us the advantages and potential drawbacks of those approaches. The traditional approach uses bivariate parametric model in which the degree of integration is measured by the presence of significant relationship between one market and another market (world market). Some papers used standardized available world index such as MSCI world index, the other papers used customizable index (the authors constructed the index by themself). The problem that might happen using this approach is that the authors neglected domestic bias where different investor from different country may have different ‘world market portfolio’. The rejection of the model (i.e. International CAPM) does not necessarily mean no integration between the market and the world stock market; instead, the appropriateness of the chosen world market portfolio should be reinvestigated. Other parametric model had to assume the category of integration (fully integrated, semi/partially integrated, not integrated) prior to hypothesis testing, the rejection of the hypothesis might be interpreted as rejection of market efficiency or specification error of the model, and might not be the rejection that markets were not integrated. Moreover, more often the models have less power and low goodness of fit (see for example Serita (1991)). The other popular approach is Granger Causality test. This method still does not show the dependency between two markets, it just show the ability of a lagged variable in explaining the variability of another variable (incremental predictability); even if a market Granger cause to another and vice versa (in the case of when feedback is present), it does not mean that the markets are integrated because the causality relationship between the markets does not occur at the same time, it just shows that market is not informationally efficient.

In contrast to the traditional approaches above, Minimum Spanning Tree is a non-parametric approach and has advantages. It does not test the relationship between a market and 'world market portfolio', but describe how close the relationship among the markets simultaneously. The length of MST measured how strong are the relationships among all markets being investigated. This measure does not depend on the existence of the true world market portfolio. More importantly, it does not require making any assumption about the category of integration, so the interpretation of the result is straightforward; the sorter the MST length is, the more integrated the markets are. The cross-correlation used in MST, although still cannot determine the exogeneity or dependency of a market to another, it is estimated using value of each market in level (simultaneously). By rolling the estimation window, one can observe the dynamics of the relationship among the markets in responding such events, the same benefit as using the parametric methods. MST can identify the structure of relationship among the markets; this is useful in identifying the presence of market cluster or segmentation. By observing the characteristic of each market, the underlying factor that form the cluster or market segment can be determined (i.e. cluster based on geographic proximity or monetary policy regime, etc.).
The degree of integration among capital markets in the world went dynamically along the observation period. The degree reached its peak especially when there were market shocks in one of prominent capital markets, yet world capital markets responded the shocks differently as the degree of markets' efficiency are not homogenous.

The markets also weighed negative signal (shocks) of world factor in higher degree compared with the positive signal as indicated by the higher correlation coefficients (and thus results in shorter MST length) during a period when market shock occurred.

However, the trend of the degree of integration is increasing that it is believed attributable to the process of economic policies harmonization and trade liberalization that took place more intensively and extensively since the last decade, especially in Europe and Asia, concluding that world capital markets are indeed become more integrated.

The important finding obtained by using MST approach is that although stock markets become more and more integrated, but the markets are not perfectly integrated. The latter conclusion was obtained by observing the structure of relationship produced in MST graph (Figure 2-2). We found that stock markets in Europe, America and surprisingly Asia formed distinctive clusters (especially when they were measured in returns). These clusters highlight the geographic proximity and or regional economic organization as factors that determined the comovements of stock markets returns rather than the development stage of the markets (i.e. emerging versus developed markets). However, as the MST length become shorter and shorter, it indicates that those clusters also become more correlated.

On the other hand, the existence of market inefficiency (as indicated by the overreaction of negative signals (i.e. market shocks or economic crises) in both developed and emerging markets bears cost to the economies, as discussed in Agénor (2003), in terms of loss of macroeconomic stability, pro-cyclicality of short-term flows, contagion and volatility of capital flows. During the observation period of this research (2000-2001Q1), the source of market shocks clearly different to the situation in 1990s, in which the period is highly colored with shocks in United States of America (9/11 tragedy, subprime mortgage crises, and the bankruptcy of some financial institutions) compared to crises in developing Asian countries in 1996-1998. Previous research in early 2000s that used data in 1990s explained the pro-cyclicality of short-term flows, herding, contagion and volatility of capital flows related to deteriorating countries' creditworthiness of countries in crises (Dadush, Dasgupta and Ratha, 2000), financial openness and exchange rate regimes (Clark, Zenaidi and Trabelsi, 2008) as well changes in countries' risk and market efficiency (Forbes and Rigobon, 2002) in developing countries that had caused shocks in the other market. But, the findings in this research also showed that during the last decade, crises in developed countries may produce similar effect to the other market as ever happened before 1990s caused by developing countries, although the questions on how severe and disperse of the effect to world capital markets and economies were not investigated yet in this paper.

Implication to these findings are: First, for investors who look for internationally diversified portfolio with long-term investment horizon would gain diminishing effect by investing in many foreign stocks in different stock markets. This is because markets become more integrated that the returns are covaried so that the expected risk diversification effect is diminished. However, ones can invest in stocks from different market segments (clusters) to gain maximum risk diversification. Second, since the stock markets become more and more integrated, one should be more cautious on shocks that occur in other markets. The contagion effect is much easier to be transmitted to other markets, especially when the source of shock is from influential market. The MST graph can be used as guidance to minimize the contagion effect by investing in markets that are indirectly connected. Third, for markets regulators, as they open up the market and let the capital movements easier than before, such precautionary system to anticipate the contagion effect needs to be established. Collaboration among markets regulators is needed not only during harmonization of rules and regulations, but also when facing a crisis by releasing a common set of actions.

Finally, the use of minimum spanning tree can be extended to further examine economic and financial market integration, including the bond markets and banking systems. Other alternatives of pseudo distance measures can be applied to see whether the relationship structure is affected by such measures.

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Chapter 3

GLOBAL STOCK MARKET LANDSCAPE: AN APPLICATION OF MINIMUM SPANNING TREE TECHNIQUE

GLOBAL STOCK MARKET LANDSCAPE: AN APPLICATION OF MINIMUM SPANNING TREE TECHNIQUE*

ABSTRACT

This paper analyzes the degree of integration among 22 stock markets from Asia Pacific, Europe, and America from 2000 to 2010. Unlike previous literature on capital market integration, this paper used the minimum spanning tree technique to measure the degree of integration of the markets simultaneously or on a multilateral basis (on a set of markets) instead of on a bilateral basis (a relationship between two markets). A measure of consistency of the minimum spanning tree (MST) structure over observation periods was developed. Findings show that the degree of integration is dynamic but tends to increase (markets are becoming more integrated). However, the stock market integration is incomplete; market segments based on geographic proximity with an internationally diversified portfolio offer gains in a strongly integrated world financial market.

3.1. Background

Financial market integration between two countries occurs when the countries let capital flow in and out freely; participants (investors) can buy and sell assets on both markets. As a result, comparable assets traded on the markets should be at the same price level relative to their risk and the comovements of the returns. In an equity market, an investor may diversify his/her portfolio by investing in foreign stocks. Cross-border stock listing and securitization of non-traded foreign stock or market index in the form of an Exchange Traded Fund (ETF) have created more opportunities for investors in domestic markets to gain access to foreign assets. As equity markets are not completely integrated, idiosyncratic risk or country specific risk could be reduced or even be completely eliminated by diversifying the assets internationally. Many studies have investigated the dynamics of the degree of capital market integration, and in most, a common conclusion is that the markets are indeed becoming more and more integrated. However, the more important question is whether those markets are completely or partially integrated. If they are completely

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integrated, international diversification is useless. Yet if the markets are partially integrated, investors may reap the greater benefit of international diversification. The next question is how the markets interrelate: Are they regionally segmented? Or are they more integrated based on the level of sophistication (developed vs. emerging)? Answers to these questions would assist investors in forming an internationally diversified portfolio.

The degree of market integration can be observed from several perspectives. Kearney & Lucey (2004) surveyed the previous literature and outlined approaches to measure the degree of integration. The first approach is the use of the law of one price, in which the rates of return of financial assets with similar risk characteristics and maturity are equalized across markets. The second approach is an indirect measure, which utilizes two concepts: (i) international capital market completeness and (ii) domestic investment and a world saving relationship (see, e.g., Tullio & Luigi, 2011; Schularick & Steger, 2010). Evidence in prior literature indicates that there is substantial integration among both the developed and the emerging markets. However, as the degree of integration is dynamic, benefits of diversification also vary over time.

This paper does not focus on the relationship between domestic investment and world saving but rather invokes the first approach of the law of one price by observing comovement of stock market returns and investigates international equity market completeness by trying to find clusters of equity markets. The clusters might be based on geographic proximity or market sophistication level. Unlike prior literature that investigated capital market integration by applying an (international) asset pricing model, this paper applies a non-parametric method to observe the dynamics. The method is called Minimum Spanning Tree (MST), usually applied in logistic or transportation problems. This paper investigated the dynamics of stock market integration among both the developed and emerging stock markets in three continents: Asia, Europe, and America.

Other non-parametric methods previously applied in measuring the degree of capital market integration dynamics include the use of Dynamic Eigenvalue analysis by Lucey and Aggarwal (2010) and the Principal Components Approach (Chen & Woo, 2010). The earlier method successfully observes the dynamics of the degree of market integration and the link between the measure and political economic events in European countries. However, the method could not identify whether European stock markets are completely or partially integrated, only that the markets become more integrated and that the dynamics could be linked to such events. The last question can be solved using the Principal Components Approach (Chen & Woo, 2010). However, using the approach to observe the degree of integration of a country in the world economy is computationally demanding and involves many macroeconomic indicators. The latter requires at least two stages: In the first stage, we construct a convergence index based on macroeconomic indicators; in the next stage, we compute the weights of the index and compare them with those of other indicators. The approach is feasible when applied to cross-section data in certain observation periods.

Another term used to describe the level of completeness of market integration is globalization versus regionalization. Grauwe and Zhang (2011) found that regionalization is a relatively recent event in East Asia and that the process is market-driven rather than formal institutional-driven, as in Europe. The East Asian financial crisis of 1997–1998 forced the countries to learn to establish a more resilient domestic economic and financial system and a better functioning global financial system. As a result, although institutionally, East Asian countries are not formally integrated, intra-regional trade and cross-border investments (both direct and portfolio investment) increased substantially in recent years. While European countries are in economic crisis, East Asian economies are among the highest growing in the world. This indicates that regionalization is more likely to happen in East Asian countries, so the world markets are not completely integrated.

This paper offers an alternative measure of the degree of integration using a multilateral-based measure by observing the dynamics of MST length over the observation period. This paper addresses the following research questions: Are the markets becoming more integrated? Are there market clusters (market segmentation or regionalization), or are markets fully integrated (globalization)? How strong is the developed and emerging market relationship and inter-regional relationship? What factors drive the degree of integration? Numerical analysis of the graph is also carried out to measure consistency of the MST structure.

3.2. Literature Review

The main contribution of this study is to provide an alternative solution to the wealth allocation problem in investment portfolio formation, focusing on whether an internationally diversified portfolio is still useful in reducing diversifiable risk. Through international diversification, provided that stock markets around the world are not completely integrated, one may obtain an optimal portfolio in which it has a minimum country-specific risk. More recently, the portfolio selection methods have vastly developed. For instance, Rather (2012) compared the performance between the basic Mean-Risk Model and Mean-Risk Diversification Model. In both models, normal distribution is used to calculate the probability of likely losses of portfolio. Variables other than risk and expected return to obtain an optimal portfolio have also been developed and investigated (e.g., Xidonas, 2010, which included the investor's specific preferences and behavior in solving the portfolio selection problem). This paper does not provide a direct answer to the portfolio selection problem in the international diversification setting. Instead, it provides an answer to the basic and prerequisite question of whether international diversification will be useful to observe the dynamics of market integration degree and to whether the equity markets are globalizing (complete integration) or regionalizing (partial/segmented integration). These answers will assist investors in forming internationally well-diversified portfolios.

Previous research of financial market integration measured the degree of integration using a bilateral-based method rather than a multilateral-based method. The former measure studies the comovements of returns in a pair of markets or alternatively studies the relationship between one market and the "world market" using a synthetic internationally diversified portfolio as a proxy (e.g., MSCI World Index). The use of such an index is often found in examination of an asset-pricing model such as the capital asset pricing model (CAPM). Fama and French (2004) summarized some important empirical examinations of CAPM and concluded that those examinations did not actually test the model; CAPM has never been tested, and the prospects for testing it are not satisfactory. The CAPM test based on cross-section regression as in Fama and MacBeth (1973) assumes that the market is efficient. The homogeneous expectation prevails, and the market is in an equilibrium state. According to Black (1972), any weighted average market portfolio is always efficient and is a good proxy for the market portfolio. However, the assumptions are the main critics of the model; rejection of the tested model can be interpreted as the violation of the assumption (that the proxy for market portfolio is inefficient) and not the rejection of the CAPM itself. Haugen and Baker (1991) found that such a market weighted index is not efficient; thus, the market-matching strategy is not a good investment strategy. This issue becomes relevant when CAPM is applied to price international assets; the proxy does not assure that it is mean-variance efficient. Thus, a model such as CAPM or its extension (see, e.g., French & Poterba, 1991; Fama & French, 1998; Das & Uppal, 2004; Fernandes, 2005; Wu, 2008) is not suitable to examine whether a stock market is integrated in the world market.

Besides the potential problem with the appropriateness of the world market portfolio proxy, measuring the degree of market integration using a parametric model might also deal with the fitness use of specific estimation method for statistical data properties. For instance, in the international CAPM tests, the parameters ignored the fact that most stock markets' time series data exhibit a GARCH structure.[1] This might affect the efficiency of the estimated parameters. Shahabuddin (2010) also observed that particular time series data with specific data properties would produce different forecast values when different estimation methods were applied. Thus, the use of a non-parametric method in this paper should avoid the disadvantages of using such parametric methods.

The non-parametric measures in market integration studies measure the degree of integration based on comovements of returns or prices, and the coefficient of the correlation between a pair of markets is frequently used. Cross-correlation coefficients then become the main indicators of integration. One of indicators of market integration is the presence of a contagion effect, or a significant increase in cross-market links after a shock to a country (or group of countries). Forbes and Rigobon (2002) analyzed the effect of the volatility burst during a period of crisis on the robustness of conditional and unconditional coefficients of correlation in spotting a contagion effect and interdependence between two stock markets. They argued that a conditional cross-correlation coefficient is subject to volatility bias; the coefficient

[1] Maekawa and Setiawan (2012) found evidence of the presence of a multivariate GARCH error structure in the stock markets of the United States, Japan, and Malaysia. They have developed an unrestricted VEC-GARCH model based on a modified FGLS estimator to tackle the issue (see Ch. 6).

would increase during the period of high volatility (during a crisis or shock) and lead to an incorrect conclusion of a contagion effect during a crisis. Yet this was merely an effect of the volatility burst (when a coefficient after a shock is as high as it was before the shock, there is an interdependence relationship).

Once the comovement measure is defined, the MST method is applied. MST is a technique under graph theory. MST is used to model a situation where a group of agents (represented by a node) want a particular service provided by a common source or provider. However, agents do not care whether they are connected directly or indirectly to the source. MST will find a network (undirected arcs) to connect all of the nodes (including the source) in the least total distance (cost). In this paper, the "distance" is a transformation value of the coefficient of correlation of returns between two nodes (stock market indexes). The algorithm to find the optimal spanning tree has been developed recently. Hiremath and Hill (2007) developed a new greedy algorithm (another name for an MST algorithm) for the more complex variant of the classic knapsack problem. Kozanidis et al. (2005) developed a new method to solve a similar problem and added new constraints (equity or budget constraints). Lorenzo and Lorenzo-Freire (2009) investigated the characteristics of the source and obtained the sharing function associated with cost allocation rules in MST. More recently, Hougaard et al. (2010) attacked a similar problem in obtaining the sharing function by highlighting the special role of the source and developed a method to identify the upper bound on cost sharing. The recent studies in developing the MST algorithm also emphasize how agents group or merge (e.g., Bergantiños & Gómez-Rúa, 2010; Gómez-Rúa & Vidal-Puga, 2011). These studies sought to characterize each agent and/or find common properties of agents such that the agents could be merged or grouped to make MST more efficient. Yet this paper assigned attributes to a node (equity market) based on market sophistication level (emerging market or developed market) and geography (Asia, Europe, or America), observing the strength and the dynamics relationship among the groups.

Apart from the methods used in measuring the degree of integration, most studies show that the capital markets are becoming more integrated as a result of economic liberalization, monetary and market union, harmonization of regulation of international trade in both goods and services, and also several crises or market shocks.

The relationship between economic policy harmonization and the degree of capital market integration has long been studied, including the study of financial market integration in Europe by Altman (1965); Mandelson (1972); Forbes (1993); Buch (2000); Guiso, Jappelli, Padula, and Pagano (2004); Askari and Chatterjee (2005); Birg and Lucey (2006); Christiansen (2007); Sifakis-Kapetanakis (2007); Alhorr, Moore, and Payne (2008); Claudia (2008); and Kučerová (2009).

Application of MST in economics and finance can be found in Hill (1992), which compared price levels across countries. Hill (2004) studied the same theme in the European Union countries. Hill (2001) measured inflation and growth rates, and Bonanno, Lillo, and Mantegna (2001) tested the stability of MST over different time horizons to find changes in the hierarchical organization of a set of stocks. However, study of the application of MST in measuring the equity market integration degree is a new phenomenon.

3.3. Methodology

3.3.1. Minimum Spanning Tree

A tree is a set of acyclic edges that connect all nodes in an undirected graph. If the number of nodes is N and the distance between node i and j is d_{ij}, then the number of edges in the tree is $N-1$. We can compute the total distance of edges that connect all nodes as D. The number of possible trees from N nodes is N^{N-2}. In this paper, the nodes represent stock exchanges with $N=22$ while the distance d_{ij} is a transformed measure of correlation coefficient, ρ_{ij}, between market returns of stock market i and j. Setiawan (2011) applied the MST to measure the degree of integration based on unconditional correlation. This paper extends this by considering a conditional correlation and comparing the results. The estimation methods of the correlation coefficients are discussed in the next section. Let us define the pseudo-distance between node i and j at time t as follows:

$$d_{t,ij} = \sqrt{2(1-\rho_{t,ij})^2} \tag{3.1}$$

Because $-1 < \rho_{t,ij} < 1$ for $i \neq j$ and $\rho_{t,ij} = 1$ for $i=j$, and $\rho_{t,ij} = \rho_{t,ji}$, the number of d_{ij} to be estimated is only $N(N-1)/2$ as the matrix of distance as well as matrix of correlation are symmetrical. The distances or correlation coefficients are on the off-diagonal of the matrix. The transformation fulfills the axiom of a metric: (i) $d_{t,ij} = 0$ if $i=j$ or if $\rho_{t,ij} = 1$ when $i \neq j$; (ii) $d_{t,ij} = d_{t,ji}$ and (iii) $d_{t,ij} = d_{t,ik} + d_{t,kj}$.

A spanning tree has the least total distance of edges that connect all nodes. This paper describes the strongest (closest) structure of relationship among stock markets and defines the degree of integration (strength of relationship) as *D*, the total distance of edges of the tree. D_t is the minimum total distance of edges of a tree observed at time *t*. By observing D_t over time ($t=1, 2, 3,\ldots T$), we will be able to observe the dynamics of the degree of integration among the stock markets. When $N=22$, there are approximately 7.054 x 10^{26} (22^{20}) possible trees produced at time *t*; from that number of trees, we need only find one tree that has the least D_t.

Fortunately, there is an efficient algorithm that requires only a few steps of iteration to find the least D_t, known as the MST algorithm or greedy algorithm developed by Kruskal (1956). The algorithm starts with the graph of forest *F* that graphs edges of all possible connections among nodes:

sort the edges of F in increasing order by length
keep a subgraph S of F, initially empty
for each edge e in sorted order if the endpoints of e are disconnected in S
add e to S
return S

The iteration is complete when all nodes in subgraph *S* are connected by edge(s). The MST algorithm is available in many mathematical computer programs that make the computation faster and more efficient.

The MST offers advantages in measuring the degree of stock market integration. (i) It provides the ability to assess the degree of integration of a set of stock markets (multilateral/multivariate) simultaneously. Most previous studies in this field measure only the bilateral degree of integration by utilizing a parametric model (such as the International Capital Asset Pricing Model/I-CAPM) or non-parametric model (conditional/unconditional cross-correlations). (ii) By observing D_t over a period of time, one can perform further analysis using parametric models to find factors contributing to the dynamics of stock market integration in a more parsimonious model. (iii) It provides graphical analysis to identify the structure of relationship of the stock markets.

To utilize the latter MST advantage, it is important to understand the following properties of MST:

P1. If the number of nodes is *N*, the number of acyclic edges (*E*) in MST is *N-1*.

$$E = N - 1 \tag{3.2}$$

The types of possible connection in a tree are presented in Figure 3-1 (a).

P2. If nodes are associated with some attributes (i.e., region or market class), we can group the nodes according to the attributes. But group in an MST graph is defined as at least two connected nodes with the same attribute. The maximum number of edges ($E_{gg'}^{max}$) that connect nodes between the group *g* and *g′ (non-group g nodes/g complements)* must be *max*(N_g, $N_{g'}$)*,* where N_g and $N_{g'}$ is the number of nodes in group *g* and *g′,* respectively. See Figure 3-1 (b).

$$E_{gg'}^{max} = \max(N_g, N_{g'}) \tag{3.3}$$

P3. If the number of groups in a tree is *G* (a sub-set of a group is treated as if it were a group) and when members of each group build a tree within the group as in Figure 3-1 (c), the number of edges connecting all groups is *G – 1*. The number of nodes in the tree, *E*, can be restated as follows:

$$E = (\sum_g^G N_g) - 1 \tag{3.4}$$

The number of edges that form a sub tree of full connections within group *g*, E_g, following (1) is $N_g - 1$, so (3.4) can also be stated as follows:

$$E = (\sum_g^G E_g) + (G - 1) \tag{3.5}$$

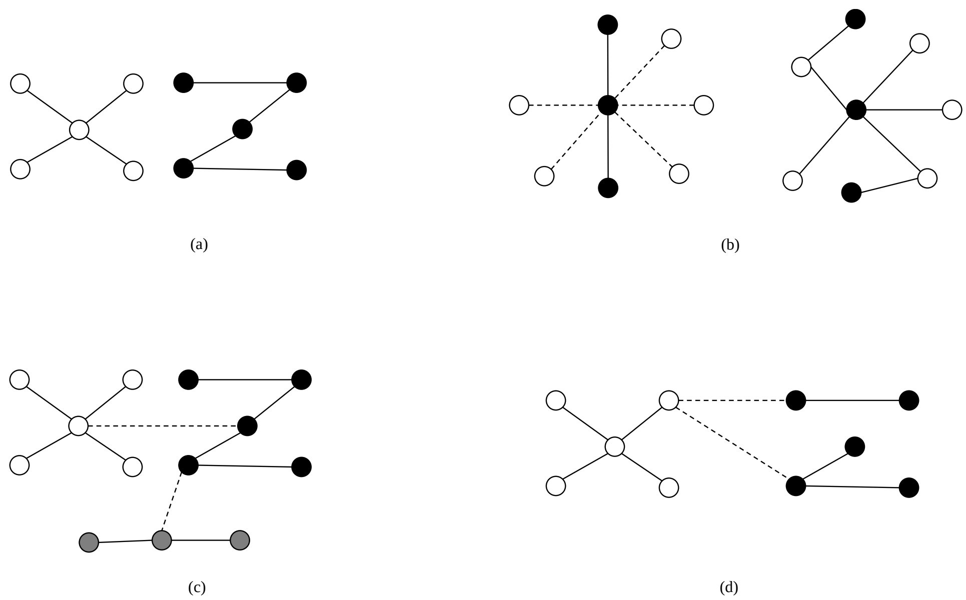
However, if a pair of groups (i.e., *g* and *h*) is connected by more than one edge (nodes in one or both groups do not form sub trees with all edges connected to other nodes within groups), the groups may comprise sub groups as in Figure 3-1 (d):

$$E = (\sum_{g,h}^G \tilde{E}_{gh}^{max}) + (G - 1)\,, for\ g \neq h \tag{3.6}$$

where $\tilde{E}_{gh}^{max}$ is E_{gh}^{max}, which has a unique value from pairs of groups combined and formed by G groups.

The following is an example of the case of property P3 to illustrate equations (3.5) and (3.6). If we have four groups (G=4), g_1, g_2, g_3 and g_4, which has Ng nodes on each group (the subscript denotes group name), and within the group, the nodes form a tree, then there are G – 1 edges that connect those four groups by one edge on each pair of groups. This explains the last term (G – 1) in equation (3.5) and (3.6). The first term in equation (3.5), $\sum_{g}^{G} \mathrm{E_g}$, is the sum of number of edges within each group. However, if there is more than one edge that connects nodes between groups, then we have six possible connections of nodes between groups (computed from the formula of combination $G!/2!(G\text{-}2)!$). Those pairs are g_1g_2, g_1g_3, g_1g_4, g_2g_3, g_2g_4, and g_3g_4.

Figure 3-1: Hypothetical Spanning Tree



(a) *Connection types: star (white nodes) and chain (black nodes). The number of edges on each tree is equal to number of nodes – 1.*
(b) *Left: Black nodes have a full within-group connection; white nodes do not form a group. The dashed lines represent a group to non-group connection. Right: Black and white nodes are not two different groups; thus, the color is not a group attribute. Both left and right graphs show no inter-group connection.*
(c) *White nodes, black nodes, and grey nodes are three distinctive groups; the maximum inter-group connection is equal to the number of groups – 1.*
(d) *White nodes form fully within group connections while black nodes consist of two sub-set groups. The number of inter-group connections (sub-groups are treated as if they were separate groups) is equal to the number of groups – 1.*

On each pair, the maximum possible number of edges is defined in (3.3). Suppose that the number of nodes on each group is ordered such that $N_1>N_2>N_3>N_4$. Only three unique $\tilde{E}_{gh}^{max}$ are available: $\tilde{E}_{12}^{max} = \tilde{E}_{13}^{max} = \tilde{E}_{14}^{max}$, $\tilde{E}_{23}^{max} = \tilde{E}_{24}^{max}$, and $\tilde{E}_{34}^{max}$. The number of edges that connect these four groups is at least three ($G - 1$). In total, the number of edges in the MST would be as defined in (3.5).

In addition, graphical analysis was performed to find clusters; the likelihood of connection or relationship between groups (based on class of stock market or based on regional area) could be identified. As shown in the properties of MST above, especially with regard to property P3, we cannot draw a conclusion about the tendency or likelihood of a relationship between a pair of groups only from the frequency of edges that connect nodes in those two groups during the observation period. The number of nodes in each group determines the maximum number of possible edges on each observation time. Using the frequency alone will produce a bias measure when we try to compare it with the frequency of the other pairs of group connections unless the number of nodes on each group is equal. To overcome this problem, let us define a measure of connection likelihood (CL_{gh}) between group g and h as follows:

$$CL_{gh} = \frac{\sum_{t=1}^{T} E_{t,gh}}{T E_{gh}^{max}} \tag{3.7}$$

where T is the length of the observation period. The value of CL_{gh} must be within a range of zero to one; the higher the value, the more likely that group g and h have a strong relationship (in this case, strong comovement of returns).

In addition, the graphical structure of the relationship in MST might be sensitive to the method for measuring the pseudo distance, D_t. The structure of relationship is determined by a list of edges connecting the nodes produced by the MST algorithm for each observation t over the observation period T. Let us write $c_{i,t} = j$ when node i at time t is connected to node j. Frequency that node i at time t is connected to different node as that in t-1 during T observations is denoted by F_i. The average frequency of connection changes for all nodes is computed by $\bar{F} = \frac{\sum_{i=1}^{N-1} F_i}{(N-1)T}$. The measure of MST structure consistency S is then defined as follows:

$$S = \sqrt{\frac{\sum_{i=1}^{N-1} \frac{F_i}{N-1} (\frac{F_i}{N-1} - \bar{F})^2}{N-1}} \tag{3.8}$$

where $F_i = \sum_{t=1}^{T} \Delta c_{i,t}$, $\Delta c_{i,t} = 0$ for $c_{i,t} = c_{i,t-1}$, and $\Delta c_{i,t} = 1$ for $c_{i,t} \neq c_{i,t-1}$.

Equation (3.8) is similar to a standard deviation formula with a probability of $F_i/(N-1)$, $\forall i$. If the structures of connection in the MSTs are stable, then we expect that *S* should converge to zero. The value of *S* can be interpreted as a percentage of changes in MST structure relative to the number of observations. For example, if *T=100* and *S=0.1,* the MST structure has changed the equivalent of 10 times in 100 observations.

3.3.2. Cross-Correlation Coefficient

Forbes and Rigobon (2002) found that the conditional correlation may be biased toward volatility burst during periods of crisis, so this paper investigates the significance of the difference in MST structure consistency with regard to the method used in computing the pseudo distance.

The matrix of cross-correlation coefficients is estimated on each sample period for the conditional one and estimated on each rolling window with a fixed window size of 60 weeks (about one year) for the unconditional one.

Conditional correlation is obtained from the conditional variance-covariance matrix; one-step ahead estimation based on any past information is relevant. The conditional variance-covariance matrix is obtained by running a multivariate GARCH-Diagonal BEKK model as specified in the following equations.

The mean equations for the continuously compounding returns are regressed against a constant and stated in vector form as follows:

$$R_t = C_t + u_t \tag{3.9}$$

where R_t, is a column vector of markets returns; $C_t = [c_{1,t}\ c_{2,t}\ \dots\ c_{i,t}\ \dots c_{N,t}]'$ is vector of constants; and $u_t = [u_{1,t}\ u_{2,t}\ \dots\ u_{i,t}\ \dots u_{N,t}]'$, where $u_t \sim N(0, H_t)$. The market return of the stock market *i* as an element of R_t is computed as $r_{i,t} = \log\left(\frac{P_{i,t}}{P_{i,t-1}}\right)$ so that $R_t = [r_{1,t}\ r_{2,t}\ \ldots r_{i,t}\ \ldots\ r_{N,t}]'$.

The conditional variance-covariance matrix H_t is estimated by the Diagonal BEKK model (Engle & Kroner, 1995):

$$H_t = \Omega\Omega' + A'u_{t-1}u'_{t-1}A + B'H_{t-1}B \tag{3.10}$$

where Ω is the lower triangular matrix, and *A* and *B* are diagonal matrices. The terms on the right side of equation (3.10) are set in quadratic form to ensure that the conditional variance-covariance matrix H_t is positive semidefinite (PSD). Equation (3.10) yields the conditional variance of stock market *i*, and the conditional covariance between stock market *i* and *j* is stated in equation (3.11) and (3.12), respectively.

$$h_{ii,t} = \Omega_{ii}^2 + a_{ii}^2 u_{ii,t-1}^2 + b_{ii}^2 h_{ii,t-1} \tag{3.11}$$

$$h_{ij,t} = \Omega_{ij}^2 + a_{ij}^2 u_{ii,t-1} u_{jj,t-1} + b_{ij}^2 h_{ii,t-1} h_{jj,t-1} \tag{3.12}$$

where $h_{ij,t}$, Ω_{ij}, a_{ij}, and b_{ij} are elements of matrix Ω, *A*, and *B*; the subscript *i* and *j* represent the row and column for respective matrices. The conditional correlation between stock market returns *i* and *j*, ρ'_{ij} is then computed as

$$\rho'_{ij,t} = \frac{h_{ij,t}}{h_{ii}^{1/2} h_{jj}^{1/2}} \tag{3.13}$$

The coefficient matrices are obtained by maximizing the sum of the log likelihood equation l_t as follows:

$$l_t = -\frac{1}{2} N \log(2\pi) - \frac{1}{2}\log(|H_t|) - \frac{1}{2} u_t{}' H_t^{-1} u_t \tag{3.14}$$

where *N* is the number of mean equations equal to the number of stock markets as a sample.

The unconditional correlation coefficient between stock market *i* and *j*, $\rho_{ij,t}$, is estimated from historical data from *t–60* until *t*. The unconditional variance covariance matrix at time *t* is defined as

$$E_t[(R_t-\mu_t)(R_t-\mu_t)'] = \begin{bmatrix} \sigma_{11,t} & \sigma_{12,t} & \cdots & \sigma_{1N,t} \\ \sigma_{21,t} & \sigma_{22,t} & \cdots & \sigma_{2N,t} \\ \vdots & \vdots & & \vdots \\ \sigma_{N1,t} & \sigma_{N2,t} & \cdots & \sigma_{NN,t} \end{bmatrix} = E_t[R_t R_t'] - \mu_t \mu_t'$$

$$= E_t[R_t R_t'] - \mu_t \mu_t' \quad (3.15)$$

where $\mu_t = \begin{bmatrix} \mu_{1,t} \\ \mu_{2,t} \\ \vdots \\ \mu_{n,t} \end{bmatrix} = \begin{bmatrix} E[R_{1,t}] \\ E[R_{2,t}] \\ \vdots \\ E[R_{2,t}] \end{bmatrix} = E[R_t]$

By dividing $\sigma_{ij,t}$ by $\sigma_{i,t}\sigma_{j,t}$, we obtain the unconditional correlation matrix:

$$Corr_t = \begin{bmatrix} 1 & \rho_{12,t} & \cdots & \rho_{1N,t} \\ \rho_{21,t} & 1 & \dots & \rho_{2N,t} \\ \vdots & \vdots & & \vdots \\ \rho_{N1,t} & \rho_{N2,t} & \cdots & 1 \end{bmatrix} \quad (3.16)$$

3.4. Data and Samples

Weekly stock market indexes from the beginning of 2000 until the end of 2010 are used as samples and are collected from Yahoo Finance. All stock market indexes are in adjusted USD and in logarithmic form. The first order difference of log index represents the index return. There are 22 stock markets, comprising both emerging and developed stock markets from three continents: Europe, Asia Pacific, and America. All seven European stock markets are categorized as developed stock markets and are members of the European Union (except Switzerland and Israel) and only the United Kingdom is an E.U. member not using the euro. Asia Pacific stock markets comprise four developed stock markets and six emerging markets. There are five American stock markets (two developed markets and three emerging markets). The respective indexes and their statistical figures are shown in Table 3-1. From the table, we can observe that emerging stock markets outperform the developed ones in terms of arithmetic mean of the returns. However, the emerging markets are also riskier than the developed ones when we compare standard deviation of the returns. In addition, the table also computes the annualized geometric mean of returns[2] to indicate investor wealth changes when investing personal wealth over the observation period from the beginning of 2000 to the end of 2010. On average, investors who invested their wealth in Asia Pacific markets, which are dominated by emerging

[2] Geometric mean (G(R)) is computed as an exponent of the sum of the log gross return (Gross Return at *t* $=P_t/P_{t-1}$), where *P* is price of the index. The annualized geometric mean of return is computed as {G(R)-1}x48.

markets, would be wealthier than those who invested their wealth in other markets. This is typical of the difference between emerging and developed markets, and it indicates that those two classes of market could offer different coefficients of variation that characterize the risk-return profile of each market class. The investor may combine assets with different coefficients of variation into a portfolio to fit the investor’s risk-return preference; thus, the statistics presented in the table indicate that international diversification might be useful.

Table 3-1 also shows that some stock markets have significant return autocorrelation. Autocorrelation in returns indicates that the respective market is not efficient in terms of information, at least in the semi-strong form. Thus, historical information is still useful in estimating current return or price. All market return time series are stationary, based on an individual unit root test (Augmented Dickey-Fuller and Phillips-Perron test) and a panel unit root test (Levin, Lin, and Chu t-statistic); the null hypothesis that time series have a unit root is rejected at the 1% level. The latter data properties assure us that the use of the time series of returns in the parametric model would satisfy the stability condition of regression.

3.5. Findings

3.5.1. The Dynamics of World Stock Markets Integration

Time-varying degree of integration or MST length based on conditional and unconditional correlations are presented in Figure 3-2. It is apparent for the unconditional one that the degree of integration is dynamic and has a negative trend, meaning that the markets are becoming more integrated. Meanwhile, the MST length estimated from conditional correlation is more erratic compared with the unconditional one. Nevertheless, both measures have a negative trend (for conditional correlation-based MST, the negative trend can be observed after 2005).

The significant drop in MST length occurs during highly volatile periods, such as recession periods at the end of 2001 and in 2008. This happened not only to conditional correlation-based MST but also to unconditional MST. This indicates that shocks to the U.S. market were contagious.

Table 3-1: Sample Descriptive Statistic of 2000 – 2010

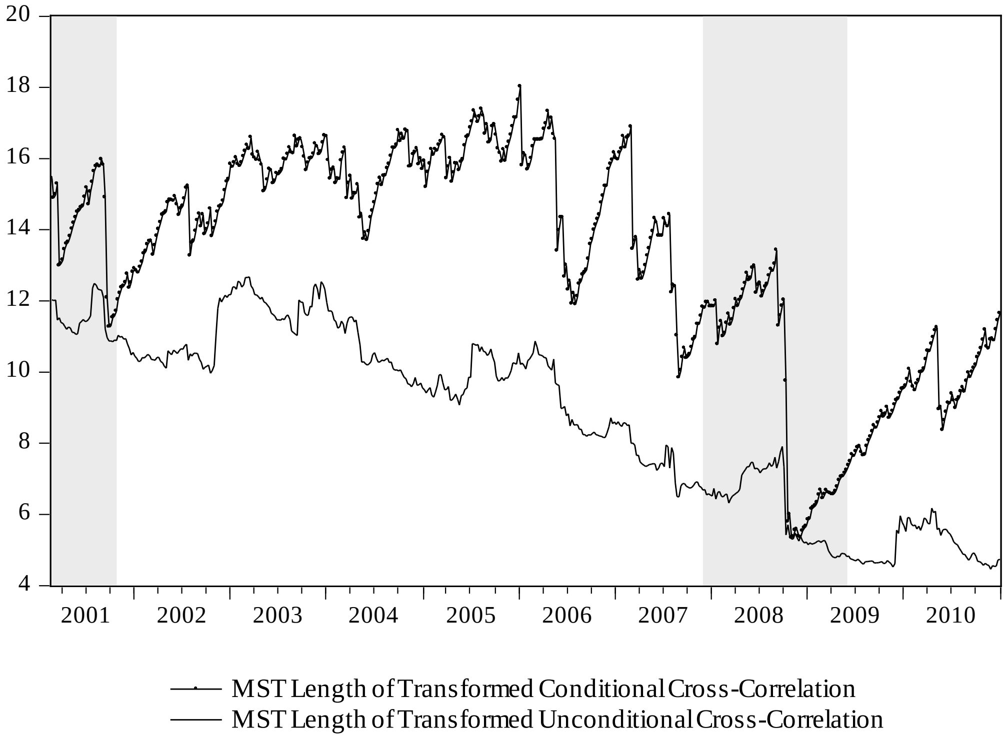
			Annualized Arithmetic		Annualized Geometric		Autocorrelation at lag:						
Country	Index Name and Code		Mean	Std. Dev.	Mean	Std. Dev.	1	2	3	4	5	15	30
EUROPE			0.030	0.245	-0.003	0.035							
EUROLAND			*0.022*	*0.262*	*-0.015*	*0.038*							
Netherland	AEX General	AEX	-0.033	0.256	-0.067	0.037	0.060	0.029	-0.057	0.010	0.015	**0.057**	-0.028
Austria	ATX	ATX	0.107	0.281	0.064	0.041	0.038	0.037	0.020	0.103	0.048	**0.046**	-0.063
France	CAC40	FCHI	-0.014	0.245	-0.047	0.035	-0.009	0.024	-0.048	-0.008	0.003	**0.050**	-0.019
Germany	DAX	GDAXI	0.028	0.265	-0.011	0.038	0.013	0.049	**-0.116**	**0.033**	-0.001	**0.037**	-0.025
NON-EURO			*0.040*	*0.223*	*0.013*	*0.032*							
United Kingdom	FTSE100	FTSE	-0.014	0.219	-0.040	0.032	-0.077	0.025	**-0.085**	0.035	0.029	**0.071**	**-0.034**
Switzerland	Swiss Market	SSMI	0.037	0.206	0.014	0.030	**-0.184**	**0.107**	**-0.116**	**0.052**	**-0.007**	**0.041**	**-0.022**
Israel	TA-100	TA100	0.096	0.244	0.065	0.035	**-0.093**	**0.117**	**0.100**	**-0.012**	**-0.011**	**-0.015**	**-0.073**
ASIA PACIFIC			0.059	0.252	0.024	0.036							
DEVELOPED			*0.029*	*0.233*	*-0.001*	*0.034*							
Australia	All Ordinaries	AORD	0.080	0.248	0.046	0.036	-0.016	0.065	-0.037	0.002	0.028	**0.039**	-0.005
Hong Kong	Hang Seng	HSI	0.026	0.238	-0.005	0.034	-0.024	0.053	-0.023	0.076	0.002	-0.005	-0.016
Japan	Nikkei225	N225	-0.034	0.222	-0.059	0.032	-0.044	0.069	-0.045	0.008	-0.002	0.012	0.022
Singapore	Straits Times	STI	0.043	0.225	0.015	0.032	0.022	0.032	-0.010	0.061	0.040	0.026	0.017
EMERGING			*0.079*	*0.264*	*0.041*	*0.038*							
India	BSE30	BSESN	0.119	0.279	0.079	0.040	0.070	0.107	**-0.011**	**0.042**	-0.002	**0.081**	**-0.049**
Indonesia	IDX Comp.	IDX	0.129	0.293	0.085	0.042	**0.082**	**0.090**	**0.201**	**0.056**	**0.081**	**0.085**	**0.069**
Malaysia	KLSE Comp.	KLSE	0.074	0.168	0.061	0.024	**0.105**	**0.095**	**0.012**	**-0.012**	**0.088**	**0.053**	0.043
South Korea	KOSPI	KS11	0.062	0.338	-0.002	0.049	-0.064	-0.014	0.016	0.021	0.011	**-0.002**	**0.026**
China	Shanghai Comp.	SSEC	0.083	0.246	0.052	0.035	0.040	0.059	**0.103**	0.019	**0.033**	**-0.008**	**0.015**
Taiwan	Taiwan Weighted	TWII	0.009	0.262	-0.028	0.038	-0.016	0.051	0.078	0.033	0.057	-0.021	**0.073**
AMERICA			0.074	0.305	0.019	0.044							
DEVELOPED			*0.031*	*0.217*	*0.005*	*0.031*							
United States	S&P500	GSPC	-0.014	0.189	-0.033	0.027	-0.043	0.063	**-0.100**	**-0.024**	**0.054**	**0.095**	**-0.011**
Canada	S&P TSX Composite	GSPTSE	0.076	0.245	0.044	0.035	-0.064	0.066	-0.057	0.025	0.043	**0.076**	**0.026**
EMERGING			*0.103*	*0.363*	*0.028*	*0.052*							
Brazil	IBOVESPA	BVSP	0.136	0.414	0.041	0.060	**-0.108**	**0.093**	**0.050**	0.029	**-0.036**	**0.003**	**-0.072**
Argentina	MERVAL	MERV	0.043	0.380	-0.040	0.055	0.003	0.071	0.011	0.078	-0.061	0.078	**-0.006**
Mexico	IPC	MXX	0.130	0.297	0.084	0.043	-0.034	0.024	-0.007	0.008	-0.010	0.071	0.047

**Bold face indicates that autocorrelation is significant at a 5% level. Source: Yahoo Finance and author computation. The stock market returns are in USD.*

However, the MST length drop in 2008 was more severe than that during the 2001 recession period because the nature of the two recessions was different. The 2001 recession period was triggered by the burst of the dot-com bubbles when many Internet or high-tech companies were in financial distress, an event more likely in developed stock markets than in emerging ones.

In addition, the deepest drop in MST length in 2001 was coincident with the September 11 attacks, which had a severe impact on the United States rather than other markets. Meanwhile, the 2008 recession was triggered by the U.S. subprime mortgage crisis or housing bubble, yet it caused a disruption in the financial system not only in the U.S. but in nearly all other countries. The largest drop in MST length in 2008 was coincident with the bankruptcy of Lehman Brothers.

Figure 3-2: The Degree of Integration



MST length represents the measure of the degree of integration among stock markets being studied. Its value is derived from correlation coefficients of connected markets in the MST graph. Therefore, the length is an inverse function of the coefficient. The shorter the length (distance), the more correlated the markets. Both estimations of cross-correlation coefficients were estimated using weekly USD value market returns during the sample period of 2000–2010. The unconditional cross-correlation coefficients were estimated using rolling window estimation with window size of 60 observations (about one year). The shaded areas represent U.S. recession periods based on NBER's Business Cycle Dating Committee report.

The unit root tests assessed whether the stock markets are becoming more integrated. The idea behind the test is to identify whether the degree of integration is stationary or a random walk. Because the MST length in Figure 3-2 also shows a stochastic trend, the unit root test performed in the following model is based on the assumption that the time series D_t (MST length) is a random walk with a drift around a stochastic trend, and the unit root test is specified following the Augmented Dickey-Fuller (ADF) test:

$$\Delta D_t = \beta_1 + \beta_2 t + \delta D_{t-1} + \sum_{l=1}^{L} \gamma_l . \Delta D_{t-l} + \epsilon_t \tag{3.17}$$

The null hypothesis is that $\delta = 0$; that is, the D_t is non-stationary. The lag order (L) is determined by Akaike Information Criterion. It is expected that $\beta_2 < 0$ will indicate that the degree of integration is diminishing or that the stock markets are becoming more integrated. The results in Table 3-2 confirm that both measures of the integration degree are non-stationary and have a negative trend.

Table 3-2: Unit Root Test of D_t

	β_1	β_2	δ	Prob.(τ)
MST ConCor	0.4159	-0.0003	-0.0239	
t-stat.	***3.2656***	***-2.4132***	*-3.1225*	0.1020
MST UnCor	0.3399	-0.0004	-0.0256	
t-stat.	***2.5822***	***-2.5769***	*-2.6809*	0.2450

MST ConCor and MST UnCor are D_t based on conditional correlation and unconditional correlation, respectively. The bold face t-statistic value indicates that the coefficient is significantly different from zero at a 5% level.

The average of D_t is 13.177 and 8.734 for conditional and unconditional correlation MST, respectively. Those numbers are equivalent to the average of the cross correlation coefficient of 0.556 and 0.706 for the respective correlation coefficient methods. To identify which stock market has significant influence on the comovements of stock markets returns, VAR (vector autoregression) analysis was performed. Because the time series D_t and stock market indices are non-stationary, the VAR was estimated for the first difference of D_t and the markets returns. Based on MST graphs produced in each observation period or sample window (for rolling window unconditional correlation), the prominent stock markets frequently in the position as a hub market are France/Germany, United Kingdom, Singapore, and United States. These stock markets also represent their regional area. By choosing only the representative markets, we can avoid multicollinearity in the VAR model. As a control variable, world oil prices were included in the model. The lag selection is based on the information criterion (Akaike Information Criterion).

Table 3-3: VAR Analysis of Conditional Correlation-Based MST Length

	ΔMST_t	$R(FTSE)_t$	$RGDAXI)_t$	$R(GSPC)_t$	$R(STI)_t$	$R(OIL)_t$
ΔMST_{t-1}	-0.049469	0.000987	-0.002040	-0.000251	**0.006875**	**0.006799**
	(0.04175)	(0.00297)	(0.00361)	(0.00260)	(0.00295)	(0.00384)
ΔMST_{t-2}	-0.014731	-0.004041	-0.004595	-0.001778	0.002094	0.003062
	(0.04009)	(0.00285)	(0.00346)	(0.00250)	(0.00283)	(0.00369)
$R(FTSE)_{t-1}$	**3.010351**	**-0.262530**	**-0.218710**	0.034162	-0.053608	0.192915
	(1.23571)	(0.08781)	(0.10671)	(0.07701)	(0.08725)	(0.11375)
$R(FTSE)_{t-2}$	-1.341625	-0.093991	0.035492	0.047607	0.087730	-0.105149
	(1.25529)	(0.08921)	(0.10840)	(0.07823)	(0.08863)	(0.11556)
$RGDAXI)_{t-1}$	0.848889	-0.000490	0.006419	-0.016516	0.086746	-0.081441
	(1.03465)	(0.07353)	(0.08934)	(0.06448)	(0.07305)	(0.09525)
$RGDAXI)_{t-2}$	-0.764575	-0.063743	-0.108644	-0.086705	-0.091165	0.021173
	(1.03128)	(0.07329)	(0.08905)	(0.06427)	(0.07282)	(0.09493)
$R(GSPC)_{t-1}$	0.854334	**0.257940**	**0.274723**	-0.014445	**0.307076**	0.018704
	(1.22374)	(0.08696)	(0.10567)	(0.07626)	(0.08640)	(0.11265)
$R(GSPC)_{t-2}$	**3.290848**	**0.223819**	**0.269603**	**0.141439**	**0.231733**	-0.027133
	(1.22049)	(0.08673)	(0.10539)	(0.07606)	(0.08618)	(0.11235)
$R(STI)_{t-1}$	0.779846	0.000306	-0.005835	-0.055375	**-0.185812**	**0.221766**
	(0.80645)	(0.05731)	(0.06964)	(0.05026)	(0.05694)	(0.07424)
$R(STI)_{t-2}$	**2.228570**	0.042625	0.002808	-0.004232	-0.039438	0.095284
	(0.77932)	(0.05538)	(0.06730)	(0.04857)	(0.05503)	(0.07174)
$R(OIL)_{t-1}$	0.664060	-0.006373	-0.027781	-0.020626	0.004560	**0.202935**
	(0.46844)	(0.03329)	(0.04045)	(0.02919)	(0.03307)	(0.04312)
$R(OIL)_{t-2}$	-0.000158	**-0.056333**	-0.033320	-0.020773	-0.045527	-0.011531
	(0.45424)	(0.03228)	(0.03922)	(0.02831)	(0.03207)	(0.04182)
C	0.002752	-4.72E-05	0.000793	2.63E-05	0.001475	0.001477
	(0.01853)	(0.00132)	(0.00160)	(0.00115)	(0.00131)	(0.00171)
R-squared	0.165349	0.045373	0.038329	0.017042	0.097484	0.125395
F-statistic	9.211911	2.210144	1.853322	0.806179	5.022645	6.666855

Standard errors is in (), and bold face indicates that the parameter is significant at a 5% level.

Table 3-4: VAR Analysis of Unconditional Correlation-Based MST Length

	ΔMST_t	$R(FTSE)_t$	$RGDAXI)_t$	$R(GSPC)_t$	$R(STI)_t$	$R(OIL)_t$
ΔMST_{t-1}	0.049334	-0.006358	-0.003926	-0.001535	-0.005622	-0.007297
	(0.04650)	(0.00716)	(0.00862)	(0.00608)	(0.00700)	(0.00891)
ΔMST_{t-2}	0.008423	0.003476	0.002168	6.38E-05	**0.014633**	**0.019419**
	(0.04641)	(0.00714)	(0.00861)	(0.00607)	(0.00698)	(0.00889)
$R(FTSE)_{t-1}$	-0.724656	**-0.285030**	**-0.253056**	-0.020724	**-0.164980**	**0.274918**
	(0.64792)	(0.09973)	(0.12018)	(0.08476)	(0.09751)	(0.12414)
$R(FTSE)_{t-2}$	0.253604	-0.108160	0.007100	0.038770	0.021807	-0.117358
	(0.65348)	(0.10059)	(0.12121)	(0.08549)	(0.09835)	(0.12520)
$RGDAXI)_{t-1}$	-0.274576	-0.038069	-0.043379	-0.050198	0.120233	-0.110552
	(0.53980)	(0.08309)	(0.10012)	(0.07062)	(0.08124)	(0.10342)
$RGDAXI)_{t-2}$	-0.542162	-0.086818	-0.140479	-0.088268	-0.070520	-0.016015
	(0.53845)	(0.08288)	(0.09987)	(0.07044)	(0.08104)	(0.10317)
$R(GSPC)_{t-1}$	**1.442529**	**0.327682**	**0.383956**	0.089358	**0.331615**	-0.000959
	(0.66299)	(0.10205)	(0.12297)	(0.08673)	(0.09978)	(0.12703)
$R(GSPC)_{t-2}$	0.478704	**0.293416**	**0.358748**	0.174075	0.327554	0.024835
	(0.66225)	(0.10194)	(0.12284)	(0.08663)	(0.09967)	(0.12689)
$R(STI)_{t-1}$	0.253434	0.026799	0.011161	-0.028482	**-0.138125**	**0.213957**
	(0.41183)	(0.06339)	(0.07639)	(0.05387)	(0.06198)	(0.07890)
$R(STI)_{t-2}$	0.652477	0.030985	0.011887	-0.017934	-0.052963	0.129146
	(0.40425)	(0.06223)	(0.07498)	(0.05288)	(0.06084)	(0.07745)
$R(OIL)_{t-1}$	-0.226452	0.007405	-0.033139	-0.032652	0.014929	**0.188244**
	(0.24059)	(0.03703)	(0.04463)	(0.03147)	(0.03621)	(0.04610)
$R(OIL)_{t-2}$	-0.271870	**-0.065159**	-0.043166	-0.027987	-0.025299	-0.024099
	(0.22988)	(0.03539)	(0.04264)	(0.03007)	(0.03460)	(0.04405)
C	-0.012710	0.000291	0.001257	0.000373	0.002050	0.001890
	(0.00927)	(0.00143)	(0.00172)	(0.00121)	(0.00139)	(0.00178)
Adj. R-squared	0.006315	0.029484	0.026955	-0.002976	0.078437	0.111688
F-statistic	1.270636	2.293647	2.179616	0.873654	4.624385	6.354054

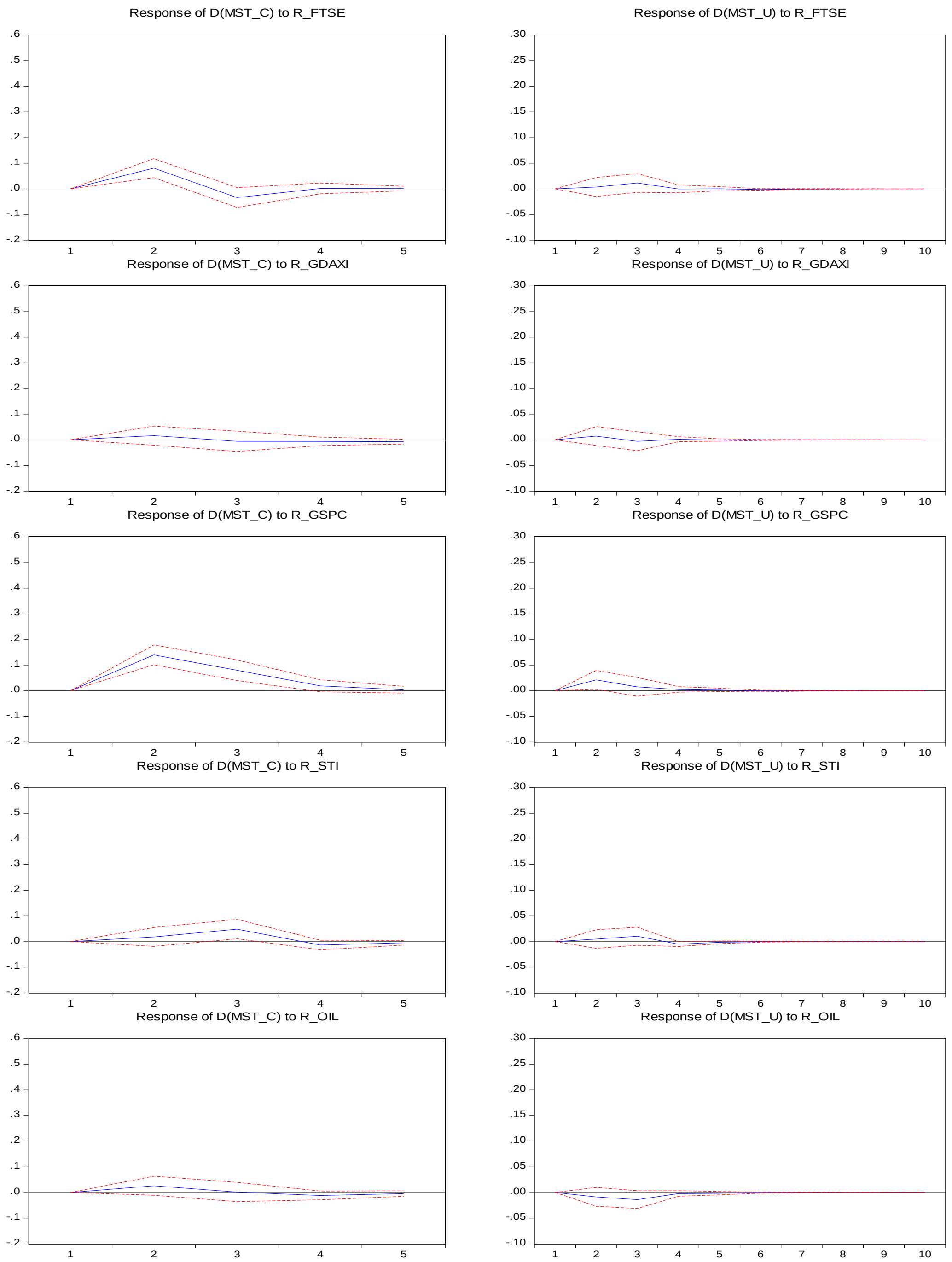
Standard errors is in (), and the bold face indicates that the parameter is significant at a 5% level.

In Table 3-3, the variations of conditional correlation-based MST length can be explained by variations in stock returns of the United Kingdom (FTSE), the United States (GSPC), and Singapore (STI). The U.S. stock market is also the most influential one as its lagged returns are able to explain the variations of returns in European stock markets (U.K. and Germany [3]) and the Asian stock market (Singapore). Meanwhile, the Singaporean stock market (STI), which is the hub of Asian emerging markets and the Japanese stock market, is highly affected by the variations of other markets (as shown by the significant coefficient of lagged MST length on STI returns). As previously discussed, the conditional correlation-based MST is more volatile and more sensitive to volatility bias; therefore, the variation of MST length can be explained more by market returns. In contrast, the unconditional correlation-based MST is only explained by the variations of U.S. stock market returns (Table 3-4). Table 3-3 and 3-4 both show that oil price shock is not an eminent factor that drove the integration of the markets.

The results of impulse response function analysis in Figure 3-3 and variance decomposition in Figure 3-4 are in line with the latter analysis. The US stock market shocks contributed to about 11% of the changes in the degree of integration (unconditional correlation-based MST), while the others only 3% or lower.

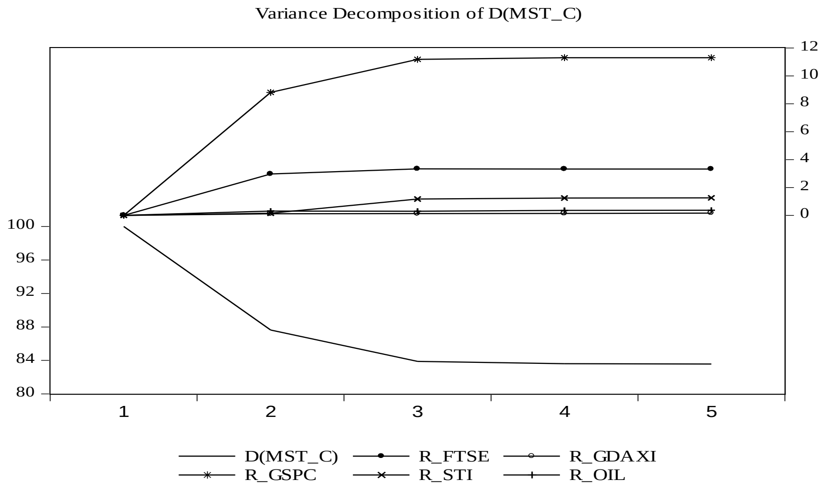
[3] Replacing the German stock market with the French did not significantly change the results as both markets are highly correlated. The United Kingdom is selected to represent the non-euro European market.

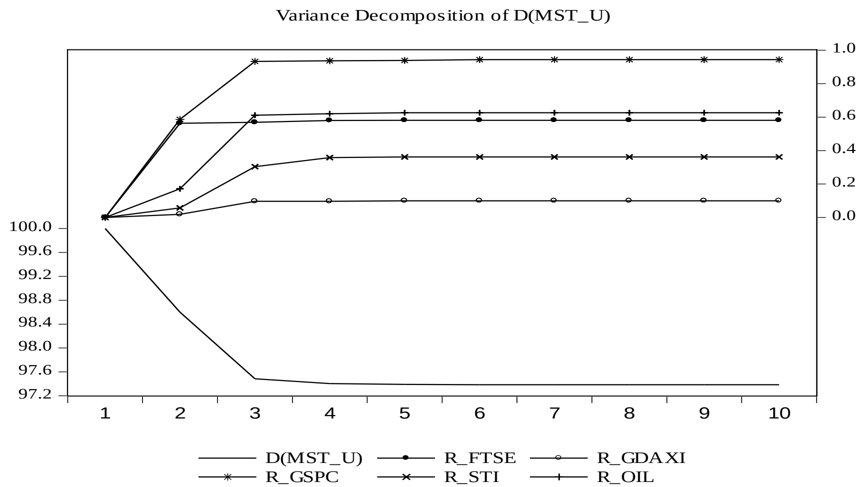
Figure 3-3: Impulse Response Function



The responses are in Cholesky one standard deviation innovation; the dashed line represents ± 2 S.E. D(MST_C), and D(MST_U) is the first difference of conditional and unconditional correlation-based MST length, respectively. Market returns (with R_ prefix) are computed based on USD market indices.

Figure 3-4: Variance Decomposition





D(MST_C) and D(MST_U) are the first differences in conditional and unconditional correlation-based MST lengths. Market returns (with R_ prefix) are computed based on USD market indices and use the right axis.

3.5.2. The Structure of Relationship of the World Stock Markets

Graphs of stock market structure based on constant conditional correlation (CCC) and unconditional correlation for full sample periods are not apparently different in each MST graph structure using conditional correlation and rolling window unconditional correlation estimations.

Figure 3-5 and 3-6 show that there are apparent clusters based on geographic proximity. The most consistent cluster is the Asian stock market, with the Singaporean stock market as the hub. The next eminent cluster is the European stock market. The exception is the Israeli stock market (geographically closest among samples). The American stock markets are also clearly clustered in CCC-based MST and scattered in an unconditional correlation-based MST.

Figure 3-5: MST Graph Based on Conditional Constant Correlations 2000 – 2010

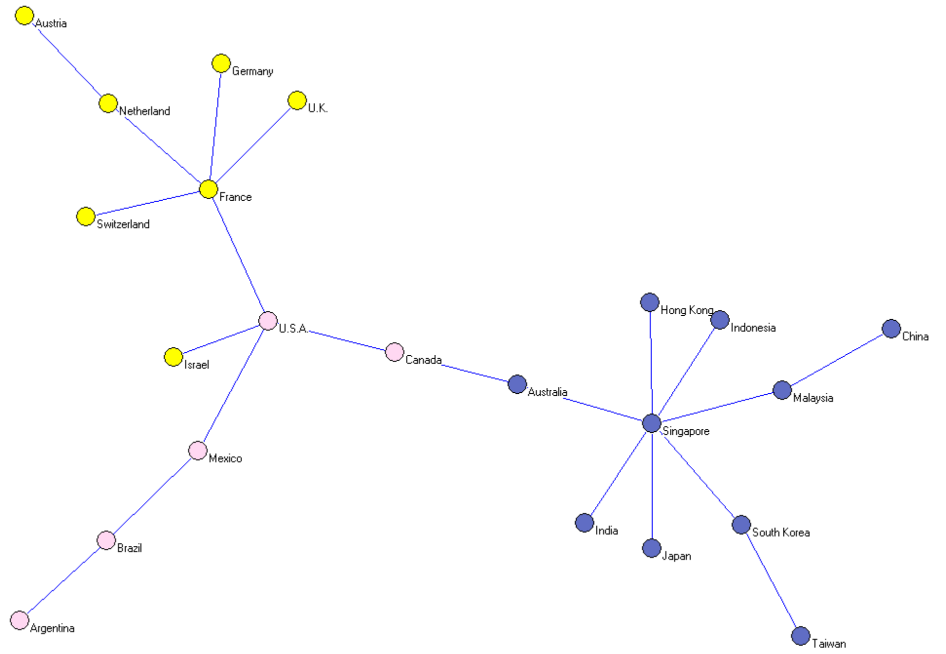
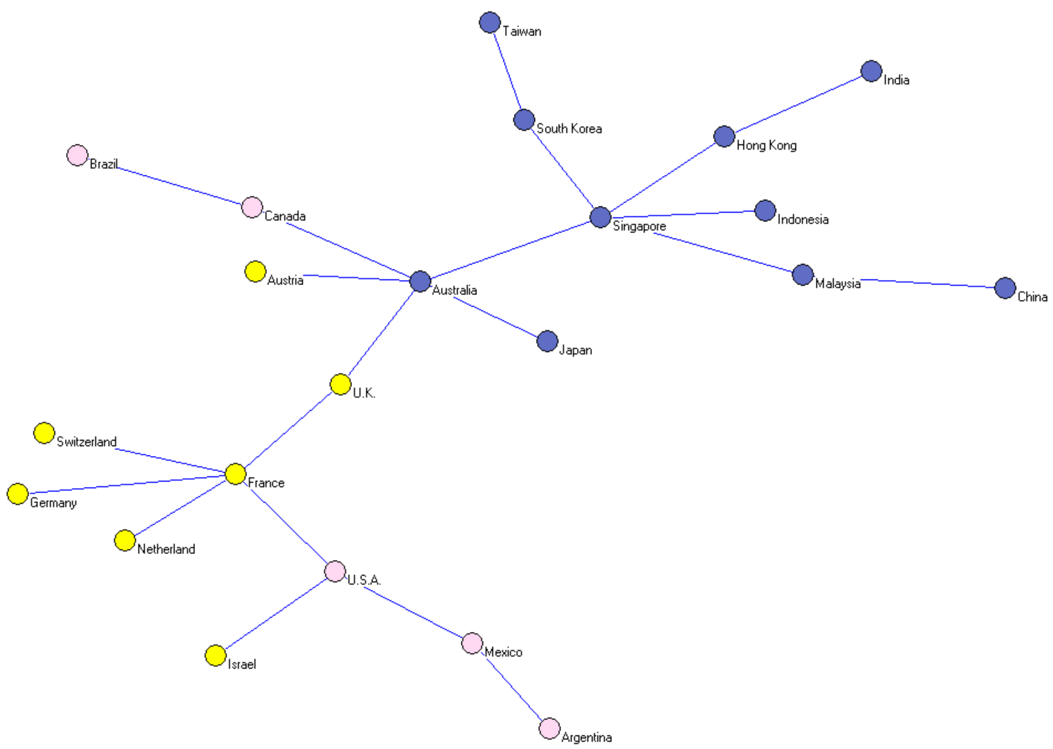


Figure 3-6: MST Graph Based on Unconditional Correlations 2000 – 2010



The structure of the relationship among stock markets is relatively consistent. As shown in Table 3-5, on average, a conditional correlation-based MST produced a 7.84 percent variation in the relationship structure among 574 trees. The unconditional one only produced a 4.31 percent variation on the relationship structure among 515 trees. The unconditional correlation-based MST produced a more consistent structure of relationship than the conditional one, possibly due to the volatility bias, which affects conditional correlations more. Therefore, an unconditional correlation-based MST is more appropriate for analysis of the interdependence structure of the stock market. However, both types of MSTs produce a similar structure of relationship.

Table 3-5: Consistency of MST Structure

Nodes:	Panel A: MST Structure - Conditional Cross-Correlation				Panel B: MST Structure - Unconditional Cross-Correlation			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
AORD	115	20.034	4.621	0.043	76	13.240	2.588	0.009
ATX	77	13.415	-1.999	0.005	55	9.582	-1.070	0.001
BSESN	121	21.080	5.666	0.068	79	13.763	3.111	0.013
BVSP	119	20.732	5.318	0.059	68	11.847	1.195	0.002
FCHI	26	4.530	-10.884	0.054	22	3.833	-6.819	0.018
FTSE	57	9.930	-5.484	0.030	35	6.098	-4.555	0.013
GDAXI	34	5.923	-9.491	0.053	30	5.226	-5.426	0.015
GSPC	88	15.331	-0.083	0.000	68	11.847	1.195	0.002
GSPTSE	83	14.460	-0.954	0.001	71	12.369	1.717	0.004
HSI	99	17.247	1.833	0.006	61	10.627	-0.025	0.000
IDX	86	14.983	-0.431	0.000	65	11.324	0.672	0.001
KLSE	75	13.066	-2.348	0.007	67	11.672	1.020	0.001
KS11	82	14.286	-1.128	0.002	74	12.892	2.240	0.006
MERV	123	21.429	6.015	0.078	66	11.498	0.846	0.001
MXX	78	13.589	-1.825	0.005	58	10.105	-0.548	0.000
N225	94	16.376	0.962	0.002	60	10.453	-0.199	0.000
SSEC	129	22.474	7.060	0.112	85	14.808	4.156	0.026
SSMI	73	12.718	-2.696	0.009	26	4.530	-6.122	0.017
STI	111	19.338	3.924	0.030	94	16.376	5.724	0.054
TA100	115	20.035	4.621	0.043	70	12.195	1.543	0.003
TWII	73	12.718	-2.696	0.009	54	9.408	-1.244	0.001
$\bar{F}$	15.414				10.652			
Consistency of the structure (S)	7.838				4.314			

All numbers are stated in percentages except for numbers in column (1). The number of nodes presented in this table is equal to the number of edges = 21 (N-1). Columns (1), (2), (3), and (4) show the frequency of connection changes (F_i), Weight (W_i=F_i/N-1), deviation $(W_i - \bar{F_i})$, and $W_i(W_i - \bar{F_i})^2$ respectively. The average of frequency of connection changes is $\bar{F} = \frac{\sum_{i=1}^{N-1} F_i}{(N-1)T}$ where $F_i = \sum_{t=1}^{T} \Delta c_{i,t}$, $\Delta c_{i,t} = 0$ for $c_{i,t} = c_{i,t-1}$ and , $\Delta c_{i,t} = 1$ for $c_{i,t} \neq c_{i,t-1}$.

The MST Structure consistency is defined as in equation (7): $S = \sqrt{\frac{\sum_{i=1}^{N-1} \frac{F_i}{N-1}(\frac{F_i}{N-1} - \bar{F})^2}{N-1}}$

Table 3-6 shows that stock market clusters are more apparent on the basis of geographic proximity rather than stock market class (developed or emerging market). This is consistent with the MST graphical analysis. Strong interdependence based on market class is only detected for developed markets while the emerging markets tend to have more relationships with developed markets. Meanwhile, clustering based on geographic proximity can be detected in Asian and European markets where the connections within the same region are more likely than those between markets in that region and the other. For inter-regional connection, the Asian stock markets tend to be more connected with the European markets than the North American markets. It is similar to the relationship structure depicted in Figure 3-6, where the European stock markets are in the middle of the network graph connecting the Asian and the American markets.

Table 3-6: MST Structure: Inter-Groups Connection Likelihood

Group Connection	Conditional Cross-Correlation			Unconditional Cross-Correlation		
	Edges/Total Edges (1)	Max Number of Possible Edges (2)	Connection Likelihood (3)	Edges/Total Edges (1)	Max Number of Possible Edges (2)	Connection Likelihood (3)
Based on Market Class						
Developed-Developed	52.36	61.90	84.59	49.17	61.90	79.43
Emerging-Developed	37.47	61.90	60.53	35.18	61.90	56.83
Emerging-Emerging	10.16	38.10	26.68	15.64	38.10	41.07
Based on Region						
Asia Pacific-Asia Pacific	28.28	42.86	65.99	35.73	42.86	83.37
Europe-Europe	24.39	28.57	85.37	23.80	28.57	83.30
North America-North America	1.37	4.76	28.75	1.28	4.76	26.80
South America-South America	1.97	9.52	20.64	4.52	9.52	47.48
Asia Pacific-South America	1.94	42.86	4.53	2.48	42.86	5.78
Asia Pacific-Europe	17.50	42.86	40.82	10.17	42.86	23.73
Europe-South America	8.61	28.57	30.14	5.71	28.57	19.97
North America-Asia Pacific	2.65	42.86	6.17	3.17	42.86	7.40
North America-Europe	9.02	28.57	31.56	7.40	28.57	25.89
North America-South America	4.28	9.52	44.95	5.75	9.52	60.39

All numbers are in percentages. A connection in a group (e.g., a Europe-Europe connection) is a kind of tree in which the nodes in the groups form fully within group connections as in Figure 3-1 (c). Therefore, the sum of the maximum number of possible edges (as a percentage of total edges) of a set of connections (Europe-Europe, Asia Pacific-Asia Pacific, North America-North America, and South America-South America) added by (G-1)T/ET is equal to one, which is the application of equation (4). Both sides are multiplied by T and divided by ET. Equation (4) can also be applied to the case of group connection of developed-developed and emerging-emerging. Meanwhile, the sum of the maximum number of possible edges as a percentage of total edges of group connections (Asia Pacific-South America or Asia Pacific Europe, Europe-South America or North America Europe, and North America-South America) added by (G-1)T/ET is equal to one, which is the application of equation (5). Both sides are multiplied by T and divided by ET. This is similar to an example presented in Figure 3-1 (d). Connection likelihood is computed by dividing column (1) by column (2). This is the application of equation (6).

Although Asian economies are not as politically integrated as those in Europe, economic harmonization and market liberalization in Asia integrated the markets. The cohesiveness of Asian stock market integration is shown by the connection likelihood in Table 3-3, where Asia Pacific-to-Asia Pacific connection likelihood is as high as that for the Europe-to-Europe. The results show that such harmonization and liberalization affects economies. In this paper, the emerging markets dominate the samples of Asian stock markets; it is evident that the emerging markets also correlate strongly with returns to the European and American markets, which are dominated by developed stock markets.

3.6. Conclusion

The stock markets have become more integrated in the last decade. The degree of integration is dynamic, but it is higher during high volatility periods than during tranquil periods. The length of conditional and unconditional correlation-based MST showed large drops in response to U.S. stock market shocks, indicating that the degree of integration was driven by such crises or recessions. This paper shows that MST as a non-parametric method is useful and as powerful as other parametric methods in measuring the degree of market integration. In addition, by applying MST, we do not need to assume that the markets are completely integrated. Most parametric models (like the International CAPM) assume the completeness or incompleteness of market integration before estimating the wanted parameters. The MST reveals the structure of relationship among the markets and exhibits regional clustering and/or sophistication level clustering.

The results also showed that there were contagion effects (not just interdependence) of U.S. shocks to other markets in the world. It implies that the U.S. stock market is still the most influential market in the world.

World stock market integration is not complete; there are regional clusters. This finding indicates that the world stock markets are regionally segmented, but these regional segments are becoming blurred. This implies that as the markets are becoming more integrated, the benefit of forming an internationally diversified portfolio is diminishing. However, as the markets are not completely integrated, one can invest in stocks from different market segments (clusters) to gain maximum risk diversification. For instance, an investor should consider assets to be included in his or her portfolio not only based on the sophistication level of the market but also based on regional segment. In the Asia Pacific region, regionalization as well as globalization takes place concurrently. Investors in this region may be benefited more than those in Europe by being able to diversify their portfolio by investing in assets within the region but among different market classes.

The use of MST length (D_t) as a proxy to the degree of integration is useful in optimum international portfolio selection. Intuitively, because the objective of portfolio selection is to reduce diversifiable risk, the investor should pick stocks from markets that are less correlated to the measure D_t for his/her portfolio. Thus, D_t can be used as an alternative to the world market proxy. If an asset's returns have higher correlation to D_t then the covariance between that asset's returns and the world market portfolio is also high. Such an asset is said to have more common world risk factor than country or market specific risk. Consequently, that kind of asset would not be able to contribute much in reducing the diversifiable risk in the context of international portfolio selection. The application of MST in portfolio optimization and asset pricing is subject to future research. Comparing the portfolio performance based on a MST-based portfolio selection approach and other standard efficient mean-variance approaches will assess the prospects of this new approach.

Finally, the use of MST can be extended to further examine economic and financial market integration, including the bond markets and banking systems. The results in this paper are limited to a sample observation period and sample stock market indexes. It would be interesting to see a kind of "structural break" of the relationship among the sample stock market during the crisis period and bubble episode. This is an issue for future research. Other alternatives of pseudo distance measures can be applied to assess whether the relationship structure is also affected by such measures.

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Chapter 4

THE EFFECT OF FOREIGN DIRECT INVESTMENT IN INDONESIA

THE EFFECT OF FOREIGN DIRECT INVESTMENT IN INDONESIA*

ABSTRACT

Determinants of Foreign Direct Investment (FDI) inflows and its relationship with economic development and the degree of economic openness (trade) in Indonesia were examined using VAR model during observation period of 1970-2009. The main finding of this paper is that FDI inflows are affected by the degree of economic openness rather than economic performance (GDP per capita). Descriptive analysis on the relationship between FDI and other factors such as political stability, average minimum wage per sector, and corruption perception index were also carried out and I concluded that those variables to some extents influenced the FDI inflows.

4.1. Background

Many countries in the world have promoted freer capital mobility by opening up their economies in order to gain economic benefits such as higher economic growth, creating more job opportunities to the people and accessing capital from abroad to attain competitive advantage. The forms of international resource movement can be in the form of portfolio investment and direct investment. Portfolio investments are more liquid since they are financial assets such as bonds, stocks (less that 10% ownership of a firm), and other kinds of financial asset in national currency that can flow into a country easily and quickly as well as go out when unfavorable situation takes place. Financial crises during the last decade have proven that portfolio investment is subject to be the source of economic destabilization, it increases volatility of returns in the domestic markets of especially emerging markets. That is because the main motive of portfolio investment is risk diversification; investors need to rebalance their international portfolio of financial assets once a shock in a country takes place that increases their risk and then move the capital to other countries that are safer while at the same time maintaining their target of rate of returns.

More integrated capital markets make the situation more complex, since a crisis in a country may affect other countries. It creates more difficult tasks for international fund manager in attaining risk diversification objective. On the other hand, foreign

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direct investment (FDI) is regarded as more stable and longer-term one since it involves the decision of acquiring physical assets or a firm, establishing production facilities, or developing supply chain network. An open economy that want to attract FDI usually provides incentives such as favorable tax treatment, more relax capital control that govern the profit remittance, simpler procedures or bureaucracy or greater availability of infrastructure. Horizontal integration and vertical integration are the other motives for companies investing abroad, besides avoiding import tariffs imposed by host country. These motives become more prominent as many countries have reduced or even removed tariffs barrier as a result of free trade agreements.

However, there are still discussions over the determinant factors of FDI and its relationship to economic growth. In the classic textbook of international economics, Salvatore (2011, p.403) shows that the inflow of FDI to the USA had fluctuated according to the economic conditions. It seems to be cyclical, rising during period of high growth and falling during period of recession or slow growth. That fact has raised questions on whether FDI really contributed to economic growth or it affected on the opposite direction. Other recent researches on developing countries also show that FDI has positive contribution to economic growth (Ciburiene (2010), Ekanayake and Ledgerwood (2010), Hailu (2010), OIadipo (2010), Constant and Yaoxing (2010)). Meanwhile, Žilinskė (2010) found a mixed result that FDI has both positive and negative effects to developing economies. In ASEAN countries, third-country effects and regional integration are significant determinants of FDI (Uttama and Peridy, 2009).

Political stability is also believed to be an important determinant of FDI inflows. Study of Kim (2010) found interesting results. He found that countries with high level of corruption of government and low level of democracy have higher FDI inflows. The findings propose caveats that FDI may be the source of bribery or corruption practices of government officials and if that is the case then FDI contribution to the people’s welfare must be the continuous subject of research.

Indonesia as one of the prominent economies in ASEAN is in the middle of international capital movements. Indonesia is the fourth largest country in terms of population after China, India, and USA. With regards to the demographic structure and stronger households' purchasing power, Indonesia is a labor-surplus country as well as a vast potential market. Another feature of Indonesia is that it becomes one of the largest democratic countries, in which although in the earlier period its political circumstances were volatile, the recent development shows that Indonesia is capable to resolve the political turmoil to sustain its economic development as well as to play a greater role in International context. As a member of G20, the role that Indonesia plays in global economy is increasingly recognized. Previously Indonesia contributed to the establishment of APEC (Asia Pacific Economic Cooperation), which in February 1994 in Bogor, Indonesia, set the Bogor Goals of "free and open trade and investment in the Asia-Pacific by 2010 for developed economies and 2020 for developing economies." The commitment to an open economy continues by supporting AFTA (ASEAN Free Trade Agreement) in 1992, which then developed into ACFTA (ASEAN-China Free Trade Agreement) that became effective in 2010. However, the economic performance of Indonesia after 1970 has been colored by economic and political upheaval as well as turmoil. Until 1996, on average the economy grew more than 5% and even reached almost 7% in 1995. Financial crises that started in Thailand in 1996 has contagious effect to Indonesia, created not only economic turmoil but also political catastrophe that made the recovery take the longest period compared with other Asian countries affected by the crisis. The economic crisis has developed into multidimensional crises thereafter. Moreover, after many believed that the economy has recovered in 2005, not long after then Indonesian economy was affected by subprime-mortgage crisis in US. The dynamics of economic and political conditions in Indonesia makes the researches on factors determining FDI, trade, and economic growth became more complex and different results from the previous studies are expected. This is the main motive of writing this paper.

4.2. Literature Review

Foreign direct investment as a form of international resource movements become more intensified when more and more countries agree to open their economy so that resources can be moved freely across borders. Unlike portfolio investment, i.e. one in financial assets, direct investment involves rigorous analysis such as feasibility studies etc. by international and multinational companies since it deals with long-term decision. Once the decision was made, it would be very difficult to withdraw the invested capital in the near future. Therefore, the study of FDI inflows to the receiving economy must involve factors in the current states and the previous states (lagged variables) using relatively long observation period.

One of the basic theories that explain the international resource movement is Heckscher-Ohlin (H-O) model, in which it explains the motive of investing in other country in search for higher returns. In the two-nation model, H-O model described that returns on capital are originally higher in the nation having the lower overall capital-labor ratio. That basic model seems appropriate to describe the movement of capital from developed countries to developing or less developed countries. However, in the real world, developing countries are not only regarded as receiving countries of foreign investment but they are also doing investment abroad although the amount of outward FDI and portfolio investment of developing countries are still much lower than those of developed countries. Analysis of FDI inflows thus cannot just relying on differences in capital-labor ratio only that measure the stage of economic development of a country but also other factors that reflect the other motive of international investment, that is risk diversification. A country would be more likely to be a receiving country of international investment if it is an open economy so that foreign investors would be able to diversify their investment by investing in an economy that welcome them. As a consequence, a measure of economic openness is one of important variables to be considered in this paper. The other variable that is relevant is the economic growth per capita since it reflects the economic development stage of a country that simultaneously has relationship with the inflows of FDI.

Buch and Pierdzioch (2001) studied the determinant of Gross Capital Flow as an effort to measure the degree of economic integration. They used gross capital inflows instead of net capital flows (saving-investment correlation) since that approach will not only analyze capital market integration (portfolio investment) but also the real capital mobility that may also reflects the degree of portfolio diversification. The model used by Buch et al. (2001) is motivated by model of Golub (1990). The explanatory variables are country size (log population), the state of development (log of GDP per capita) and the degree of openness (volume of trade relative to GDP). In that paper, it is found that FDI inflows are affected by trade (total export and import) to GDP ratio and GDP per capita.

As the results of study by Kim (2010), non-economic factors such as political stability, the degree of democracy, favorability of regulations to foreign investment may be also important in determining the inflows of capital to an economy.

4.3. Data and Methods

In this paper, the objective is to describe the relationship among FDI inflows, economic growth, and economic openness. The other variables such as the labor wage and corruption perception index are reviewed briefly through simple descriptive statistic analysis because of the lack data availability for longer period.

The variables used in econometric model are FDI inflows as the percentage of GDP (FDI/GDP), log GDP per capita (Log GDP/capita), and trade (total export and import) to GDP ratio (Trade/GDP). Unlike in Buch et al., variable log population is not included in the analysis since in this paper the object of analysis is only one country while in Buch et al. they study European countries, in which comparing the economic size among the countries become relevant.

The data of FDI inflows is obtained from UNCTAD Statistic database and the other economic data are obtained from IMF Statistics. The data are in annual basis from 1970 to 2009. The dynamic time series analysis is used to investigate the interplay among those three variables.

In determining the appropriate econometric model, Augmented Dickey-Fuller (ADF) univariate unit root test was applied to test the stationarity of the time series data. The unit root test for these three variables is shown on Table 4-1. The result on Table 4-1 shows that the three time series data in level have unit roots but the test on their first difference shows that the data are stationary. Cointegration test using data in level has been performed (not presented here), although it is found that at least one cointegration equation exists but the vector error correction model (VECM) is not stable, and therefore vector autoregression (VAR) using data in first difference is more appropriate for the analysis.

Table 4-1: Unit Root Test for FDI/GDP, Log GDP/Capita, and Trade/GDP

Series	Series Form	Included in Equation	Lag Length	ADF t-statistic	Prob.
FDI/GDP	Level	intercept	1	-2.442764	0.1373
FDI/GDP	1st Diff.	none	1	-4.417891	0.0001*
Log GDP/Cap	Level	intercept & trend	1	-3.223390	0.0952
Log GDP/Cap	1st Diff.	none	1	-3.405824	0.0012*
Trade/GDP	Level	intercept	1	-1.804621	0.3727
Trade/GDP	1st Diff.	none	1	-7.128459	0.0000*

Null hypothesis is series has unit root and (*) indicates that the null hypothesis is rejected at 1% significant level. Lag length is determined based on Akaike Information Criterion (AIC).

Table 4-2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-21.17806	NA	0.000832	1.422239	1.556918*	1.468168*
1	-16.84307	7.649979	0.001099	1.696651	2.235367	1.880369
2	-11.37165	8.689905	0.001372	1.904215	2.846967	2.225720
3	7.130671	26.12092*	0.000813*	1.345255*	2.692043	1.804548
4	14.64857	9.286812	0.000951	1.432437	3.183263	2.029519
5	21.55611	7.313870	0.001211	1.555523	3.710385	2.290393

** indicates lag order selected by the criterion*
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

In order to specify the lag order of VAR model, information criteria are used as presented on Table 4-2. Although based on Schwars information criterion (SC) and Hannan-Quinn information criterion no lag model is chosen but considering that the effect of one variable to another in this study may need time to take effect and based on Akaike information criterion (AIC), the 3rd order VAR seems more appropriate to be applied. Based on lag order selection criteria, the model is formulated as follows:

$$y_t = \mu + \Gamma_1 y_{t-1} + \Gamma_2 y_{t-2} + \Gamma_3 y_{t-3} + \epsilon_t \tag{4.1}$$

where y_t = [*D(FDI/GDP) D(Log GDP/Cap) D(Trade/GDP)*]' and *D* indicates that the respective variables are in their first-order difference form, μ is vector of constant terms and Γ_p is a matrix of coefficients of regression with *p* = [1 3].

The use of VAR model above will be used to provide additional analysis; Granger causality test, Impulse response function (IRF) and Variance Decomposition. The Granges causality test is defined by Granger (1969) and Sims (1972) as a test of whether a lagged value of a variable, let say x_{t-1}, have explanatory power in a regression of a dependent variable, y_t, on its lagged value (y_{t-1}) and x_t. In this paper the aim of the test is mainly to examine whether FDI inflows contributed to the economic growth and trade or on the contrary that FDI inflows requires economic growth and trade. If the last statement is the case, then it means that it is more likely the motive of FDI is dominated by the search for higher return and safer place to invest, although sequentially FDI may contribute to the growth of the economy and promoting trade (more open economy) thereafter.

The Granger causality test is performed based on *Wald* statistic that is distributed according to χ^2-distribution. Greene (2008, p. 697) criticizes the use of *Wald* statistic in which its critical value is based on χ^2-distribution rather than *F*-distribution as the test statistic may be a bit optimistic and does not account for the fact that the asymptotic covariance matrix is estimated using a finite sample. However, he mentioned that *Wald* test or its transformation to an approximate F statistic should be more generally applicable and usable. Moreover, the sample size in this study is not so large (39 observations) so that the use of χ^2-distribution should be appropriate and the resulted critical value will converge to its transformed value in *F*-statistic.

The Impulse Response Function (IRF) is used to identify the effect of a shock (innovation) on a variable to the other variable over time, whether after the shock the affected variable will respond to it and then return to the equilibrium or the response is persistent (never achieve the equilibrium again). Meanwhile, Variance Decomposition is a technique to decompose the variance of a variable whether it can be explained by the variance of the other variable.

Before arriving at the discussion on the result from econometric model, descriptive analysis is performed to analyze the relationship between FDI and other variables not included in the model. This is done because some data such as corruption perception index, average minimum wage, FDI in sectoral data, are not sufficiently available to perform time series analysis.

4.4. Descriptive Analysis

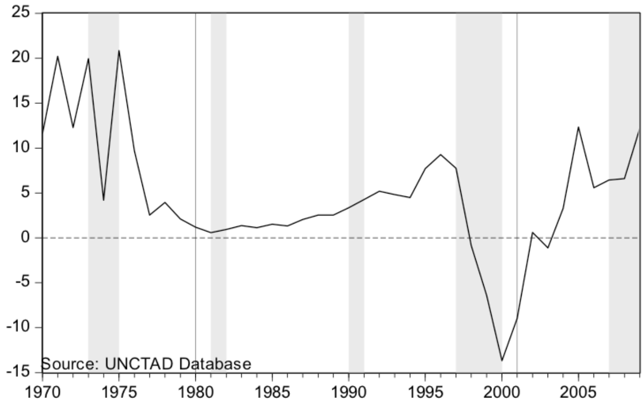
An FDI inflow in Indonesia since 1970 till 2009 varies. Its dynamism seems to follow the economic performance and global economic condition. Figure 4-1 shows that although FDI is a kind of long-term investment that should be not liquid and not easy to be withdrawn, but the volatility of FDI inflows are coincides with economic and political shocks. The shaded areas on figure 4-1 represent economic crises and political turbulence both domestic and international.

For about 15 years since 1980 the FDI inflows in Indonesia were rather stable, positive and increasing. But, from 1998 till 2000 Indonesia experienced negative FDI inflows (disinvestment). This period is characterized by political unrest following economic crises triggered by currency crises in Thailand in the mid 1996.

In 1998 the Soeharto’s administration that had been ruling for 32 years was collapse and created unprecedented uncertainty in almost any economic and social dimensions of the people. Coupled with the economic crises, the new administration under Habibie was unable to regain the people’s trust. And in 2002 Indonesia even lost one of its provinces, East Timor. The province became an independent country (Timor Leste) through a referendum held in 1999.

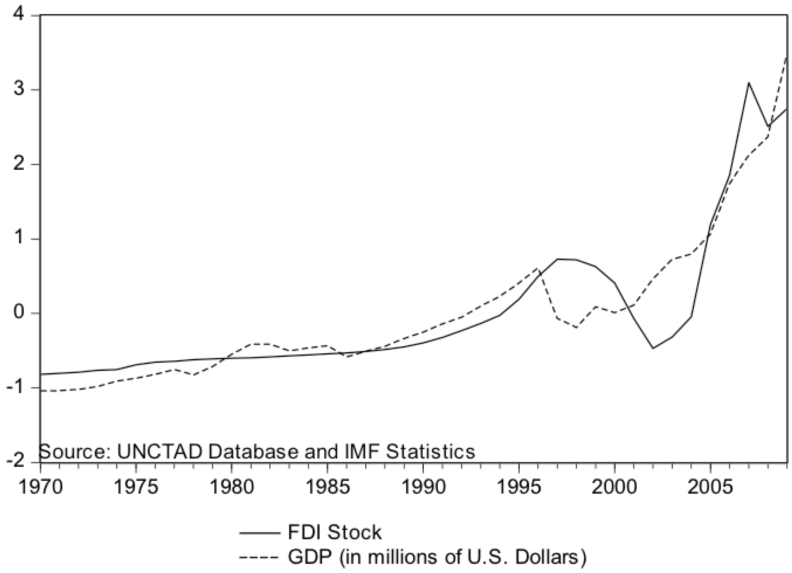
This situation has grinded investors trust on the prospect of Indonesian economy, and had increased the country risk that led many foreign companies to leave Indonesia or to move to other countries. Although the situation was a little bit resolved in 2000 after President Abdurahman Wahid was elected, the new administration was politically unstable, because the president came from a political party that was a minority in the parliament. And the president could not keep the power balance inside the parliament that was in euphoria of democracy after more than 30 years of repression in the Soeharto era. President Wahid was then impeached by the parliament in the mid 2001 and replaced by the former vice president, Megawati. The general election for parliament representatives and the first direct election of president were held in 2004, which heated up the political situation again and resulted in the negative FDI inflows. The negative FDI inflows in 2004 were caused by the investors’ precautionary action in anticipating the uncertainty that might result from the series of election. However, the uncertainty was resolved after all the general election was successfully done and the new president was elected and FDI inflows came back to the former level.

Figure 4-1: FDI Flows as Percentage of GDP



Shaded area indicates recessions in both US and Japan

Figure 4-2: FDI Stock and GDP 1970-2009*



**Data were normalized*

The story told us that although FDI is a kind of long-term investment and should be illiquid, the innovation in technology, financial system, and more open economy has proven that FDI becomes less illiquid and easily move out from a country with economic and political instability. That is to say, country risk is nowadays an important determinant of FDI inflows.

The relationship between FDI and economic growth as shown in Figure 4-2 seems to be positive. However, there is a cyclical trend as follows: (1) when FDI fueled economic growth (when FDI stock line is below the GDP line) and (2) when the GDP growth is the prerequisite for FDI to flow in (when the FDI stock line is above the GDP line). This brief analysis will be verified again through more rigorous econometric model on the next section, yet Figure 4-2 provides an instant notion that indeed FDI and economic development moved in almost the same direction.

Figure 4-3 depicts the relationship between FDI stock and value of international trade (export and import) and it is discernable from the figure that the relationship is positive although it is worth mentioning a caveat in interpreting this figure. The changes of FDI stock are seemingly in line with the changes of GDP (Figure 4-1), and therefore one should not draw a conclusion that FDI stock that drive the export and import activities based on the positive correlation among them alone, since the domestic investment and other factors (household consumption, government spending, global economic condition, non-economic factors such as politic, etc.) might also contribute to the growth. This can be verified through the analysis of variance decomposition to measure how much is variance of economic growth can be explained by FDI. Meanwhile, Figure 4-4 shows that the employment is continuously increasing while FDI stock is volatile. This indicates that the relationship between FDI and employment is weak. This is not consistent with one of motives of FDI receiving country in attracting FDI that is creating jobs. However, it does not necessarily mean FDIs in Indonesia cannot absorb the abundant labor force (albeit unskilled labor might still be dominant), but we may say that FDIs' contribution in reducing unemployment is still minor.

Figure 4-3: The Effect of FDI on Trade

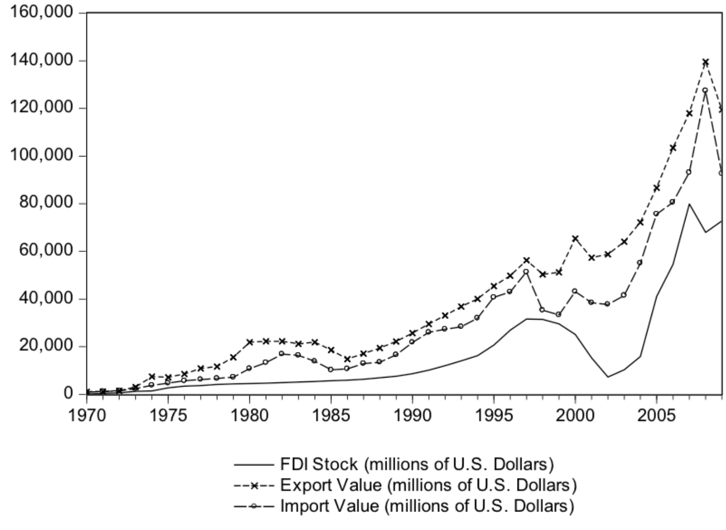


Figure 4-4: The Relationship Between FDI and Employment

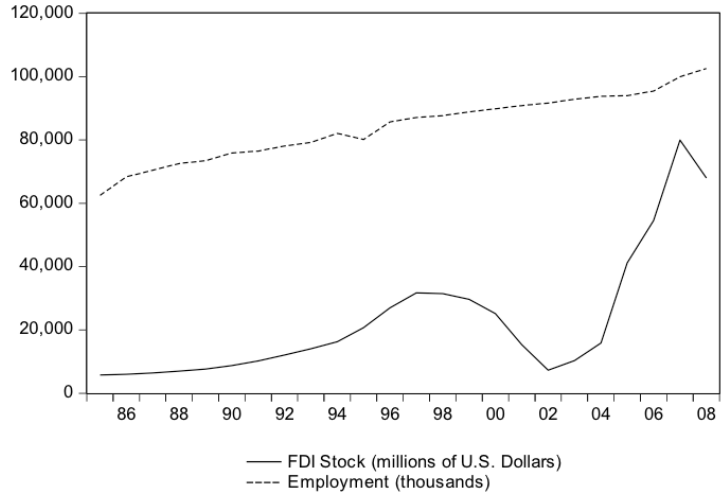


Table 4-3: Foreign Direct Investment 2005-2008

No.	Sector	2005		2006		2007		2008	
		P	I	P	I	P	I	P	I
I	Primary Sector	44.0	402.3	39.0	533.0	62.0	599.3	55.0	335.7
1	Food Crops & Plantation	17	171.5	13	351.9	16	219.1	10	147.4
2	Livestock	3	52.8	7	18.8	7	45.7	1	4.5
3	Forestry	2	118.8	1	31	0	0	0	0
4	Fishery	7	5.8	5	32.8	5	24.7	3	2.4
5	Mining	15	53.4	13	98.5	34	309.8	41	181.4
II	Secondary Sector	335.0	3500.6	363.0	3619.2	390.0	4697.0	495.0	4515.4
6	Food Industry	46	603.2	45	354.4	53	704.1	42	491.4
7	Textile Industry	31	71.1	61	424	63	131.7	67	210.2
8	Leather Goods & Footwear Industry	6	47.8	11	51.8	10	95.9	20	145.8
9	Wood Industry	18	75.5	18	58.9	17	127.9	19	119.5
10	Paper & Printing Industry	6	9.9	16	747	11	672.5	15	294.7
11	Chemical & Pharmaceutical Industry	41	1152.9	32	264.6	32	1611.7	42	627.8
12	Rubber & Plastic Industry	27	392.6	33	112.7	36	157.9	50	271.6
13	Non Metallic Mineral Industry	11	66.2	7	94.8	6	27.8	11	266.4
14	Metal, Machinery & Electronic Industry	87	521.8	86	955.2	99	714.1	141	1281.4
15	Medical, Precision, Optical Instrument, Watches & Clock Industry	2	3.1	1	0.2	1	10.9	7	15.7
16	Motor Vehicle & Other Transportation Equipment Industry	31	360.6	28	438.5	38	412.3	47	756.2
17	Other Industry	29	195.9	25	117.1	24	30.2	34	34.7
III	Tertiary Sector	528.0	5008.1	467.0	1839.5	530.0	5045.1	588.0	10020.6
18	Electricity, Gas & Water Supply	2	68.7	3	105.3	3	119.3	4	26.9
19	Construction	35	921.9	18	144.2	16	448.2	21	426.7
20	Trade & Repair	261	383.6	266	434.3	312	482.9	375	582.2
21	Hotel & Restaurant	33	180.3	31	111.2	22	136.4	22	156.9
22	Transport, Storage & Communication	53	2946.8	37	646.9	43	3305.2	35	8529.9
23	Real Estate, Industrial Estate & Business Activities	5	208.3	16	254	8	64.5	19	174.9
24	Other Services	139	298.5	96	143.6	126	488.6	112	123.1
	TOTAL	907.0	8911.0	869.0	5991.7	982.0	10341.4	1138.0	14871.7

Source: Ministry of Industry of Republic of Indonesia
Note: P: Total of issued Permanent Licenses, I: Value of Direct Investment Realization in Millions of U.S. Dollars

Table 4-3 might provide explanation to the weak relationship between FDI and employment. With regard to the level of technology adoption, it is common for developing countries to maintain labor-intensive industries in primary or secondary sector.

Table 4-4: Average Regional Minimum Wage (IDR per month)

Sector	2010	2009
Non-sector	844,864.50	819,015.19
Food	918,833.33	NA
Manufacture	941,400.00	NA
Trading/Services	971,054.00	NA
Others	1,027,944.50	971,624.00
Textile/Garment	1,044,875.00	735,900.00
Mining	1,098,744.33	905,199.00
Automotive	1,300,000.00	NA
Oil & Gas	1,319,000.00	1,298,000.00
Property/Real Estate	1,328,000.00	NA
Insurance	1,357,000.00	NA

Source: HRCentro

The statistical data in Table 4-3 shows that total value of FDI realization in both primary and secondary sector is still below the value of FDI realization in tertiary sector. Moreover, the largest proportion of FDI in tertiary sector is in communication industry, which is not export-oriented industry but its existence is to serve a huge domestic market, especially for mobile communication services, e.g. the two main players in mobile communication services in Indonesia are Telkomsel and Indosat which occupy more than 70% of total market share, and Temasek Group, a state holding company of Singapore, owns about half of the ownership of these two companies through its subsidiaries (Singtel and STT).[1]

The largest value of FDI in secondary sector is in metal, machinery, and electronics industries. These industries are known as labor-intensive industries. Manufacturing facilities of multinational companies (MNCs) and original equipment manufacturers (OEM) are types of companies in these sectors. They are usually motivated by the availability of cheap labor in order to keep the production cost at the low level.

Data gathered by HRCentro (Table 4-4) show that manufacturing industry is industry among the lowest minimum wage payers. During the new order era[2], the government promoted the political stability to attract foreign investment and to maintain economic growth by means of union busting, etc. The government only allowed and recognized one labor union that was more favorable to company’s interests rather than protecting

[1] The Commission for the Supervision of Business Competition (KPPU) of Republic of Indonesia penalized Telkomsel and Indosat in 2007 due to infringement of the Law no. 5/1999 on the Prohibition of Monopoly Practices and Unfair Business Competition. Temasek, a state-owned holding company of Singapore, held majority of the two companies’ shares that after the verdict was forced to release one of them. These two companies were also alleged for practicing cartel in text services.

[2] New order era is a political term created under Soeharto’s administration that refers to the start of the administration to signify the changes of economic and political de1velopment strategy in 1970s to 1997.

the labor rights (including wage negotiation between labor and company). Formally, this practice ended when the government lifted up the regulation when the Law no. 21/2001 was enacted soon after the ratification of the International Labor Organization (ILO) 1987 Convention. Moreover, Indonesia is still among the lowest rank countries in the corruption perception index (Table 4-5). It indicates that the economic development and FDI are not strong enough to improve corporate governance and business competition. These facts are in line with the findings of Kim (2010).

Table 4-5: Indonesia Corruption Perception Index

Year	Rank	Score
2001	88	1.9
2002	96	1.9
2003	122	1.9
2004	133	2.0
2005	137	2.2
2006	130	2.4
2007	143	2.3
2008	126	2.6
2009	111	2.8
2010	110	2.8

Source: Transparency International

Data as of the second quarter of 2010 show that Singapore is the largest investors through FDI in Indonesia with US$ 1.6 billion investment value and 156 licenses. The amount accounts for 41% of total direct investment in Indonesia. Singapore is already the largest investors in Indonesia for the last 5 years. However, Singapore investment in Indonesia is concentrated on Batam, Bintan and Karimun island which are nearby area of Singapore, thus geographic proximity is a prominent factor that determines the FDI.

The next largest source of FDI inflows are Hong Kong, United States of America, Japan, and Netherland with the value of investment realization in 2010 of US$ 0.8 billions, US$ 0.3 billions, US$ 0.2 billions and US$ 0.2 respectively. The other countries invested as much as US$ 0.8 billions. These data indicate that trade liberalization including the free trade agreement in regional area such as AFTA did not significantly increase capital mobility in the form of FDI, it is more likely that such liberalization ease the formation of portfolio investments or expansion of market for international or global products rather than FDI.

4.5. Vector Autoregressive (VAR) Analysis

The estimated parameters of VAR model are presented on Table 4-6. Using annual data from 1970 to 2009, I got 39 observations for each variable, yet the use of 3rd lag order in the model made the number of observation is adjusted to 36 observations. The goodness of fit as measured by R^2 for *D(FDI/GDP), D(Log GDP/Cap)* and, *D(Trade/GDP)* are more than 30% and the *adjusted* R^2 are more than 11%. The variance of lagged variables simultaneously can explain the variation of *D(FDI/GDP),* while for *D(Log GDP/Cap)* and *D(Trade/GDP),* the respective variables statistically has no power to explain their variation as shown by the *F statistic*. Thus, the model will be more able to explain the determinant factors of FDI inflows rather than GDP and Trade, in which it is the objective of this paper. However, it should be noted that in VAR model, the parameters in one equation resulted from the interaction with the other equations in the model.

Stability test on the model (not presented here) has been performed and there are no roots of characteristic polynomial exceeding unity. It indicates that the model is stable and further analysis on the parameters can be done.

Table 4-6 shows that FDI inflow is affected by first and third lag-order of *Trade/GDP* but unexpectedly in negative sign. It shows that the involvement of Indonesia in promoting trade liberalization by joining WTO, APEC, AFTA had proven Indonesia as a more open economy and, the degree of openness has positive contribution to the economic development as it is shown by positive coefficient of *D(Trade/GDP(-1)* on *D(GDP/Cap)*, but unfortunately the trade and investment liberalization in the Asian region and the world has made Indonesia less attractive for foreign investors, mainly due to its political instability in the last decade that makes Indonesia take longer time to recover from Asian economic crises. However, a simultaneous relationship between FDI inflows and GDP per capita in the model is not found.

Table 4-6: VAR Estimation

	D(FDI/GDP)	D(Log GDP/Cap)	D(Trade/GDP)
D(FDI/GDP(-1))	-0.423988***	0.004410**	-0.002360
	(0.15870)	(0.00251)	(0.00314)
	[-2.67166]	[1.75388]	[-0.75054]
D(FDI/GDP(-2))	-0.059071	-0.001063	0.000157
	(0.17160)	(0.00272)	(0.00340)
	[-0.34423]	[-0.39093]	[0.04614]
D(FDI/GDP(-3))	-0.239246*	-0.004851**	0.006454**
	(0.15032)	(0.00238)	(0.00298)
	[-1.59153]	[-2.03667]	[2.16713]
D(Log GDP/Cap(-1))	3.626539	0.455958**	-0.066344
	(13.2240)	(0.20954)	(0.26199)
	[0.27424]	[2.17596]	[-0.25323]
D(Log GDP/Cap(-2))	15.69421	-0.145698	0.030713
	(14.5414)	(0.23042)	(0.28809)
	[1.07928]	[-0.63232]	[0.10661]
D(Log GDP/Cap(-3))	-13.88929	0.000373	0.013285
	(13.4107)	(0.21250)	(0.26569)
	[-1.03569]	[0.00176]	[0.05000]
D(Trade/GDP(-1))	-20.79100**	0.326008**	-0.385811
	(12.0662)	(0.19120)	(0.23906)
	[-1.72308]	[1.70509]	[-1.61390]
D(Trade/GDP(-2))	-10.79528	0.201720	-0.407691
	(12.5165)	(0.19833)	(0.24798)
	[-0.86249]	[1.01708]	[-1.64407]
D(Trade/GDP(-3))	-48.22805***	-0.077575	0.236502
	(11.7292)	(0.18586)	(0.23238)
	[-4.11180]	[-0.41739]	[1.01774]
μ	0.374405	0.018039	0.015836
	(1.10855)	(0.01757)	(0.02196)
	[0.33774]	[1.02696]	[0.72105]
R-squared	0.511094	0.344883	0.414276
Adj. R-squared	0.341857	0.118111	0.211525
F-statistic	3.019992	1.520838	2.043278
Akaike AIC	6.165787	-2.123930	-1.677147
Schwarz SC	6.605653	-1.684064	-1.237281
Akaike information criterion		1.957067	
Schwarz criterion		3.276666	

Standard errors in ( ) & t-statistics in [ ]
** significant at 10%*
*** siginifact at 5%*
**** significant at 1%*

Table 4-7: VAR Granger Causality Test

Dependent variable: D(FDI/GDP)			
Independent variable	Chi-sq	df	Prob.
D(Log GDP/CAP)	2.210843	3	0.5298
D(TRADE/GDP)	17.04494	3	0.0007
All	19.62952	6	0.0032

Dependent variable: D(Log GDP/CAP)			
Independent variable	Chi-sq	df	Prob.
D(FDI/GDP)	6.892569	3	0.0754
D(TRADE/GDP)	4.871385	3	0.1815
All	10.27995	6	0.1133

Dependent variable: D(TRADE/GDP)			
Independent variable	Chi-sq	df	Prob.
D(FDI/GDP)	5.395625	3	0.1450
D(Log GDP/CAP)	0.073160	3	0.9949
All	5.808379	6	0.4450

Granger Causality Test presented on Table 4-7 confirms such result as GDP per capita does not Granger cause FDI and vice versa (at 5% significance level). It may indicate that Indonesia is more likely to be the production base for FDIs of both export oriented and domestic oriented foreign companies as a result of deregulation in investment and commitment to the free trade, yet contribution of FDI to the economy is still minor.

In line with the above analysis, analysis on Impulse Response Function (IRF) presented in Figure 4-5 shows that FDI Inflows is more affected by a shock in Trade to GDP ratio. It takes about five years after a shock in Trade/GDP when FDI inflows will turn back to its equilibrium state, while a shock in FDI inflows itself will be adjusted quickly in the following year.

This result may indicate that FDI inflow is more affected by global economic factors that determine international trade rather than domestic factors only (i.e. economic growth). Variance decomposition analysis in Figure 4-6 shows that about 34% of variance of FDI/GDP can be explained by variance of Trade/GDP, meanwhile variance of GDP per capital is only able to explain 10% of FDI/GDP variance.

The competition in attracting FDI among the emerging countries becomes intensified in the last decade. With this respect, Indonesia should still continue its struggle in inviting FDI that is more resilient to the economic shock, albeit it is more vulnerable to the global economic shocks recently. Improvements in investment regulation, infrastructures and adoption of good governance principles become more and more important to win the competition. FDI should not only be targeted for sectors that provide more jobs but also for export oriented and more value added industries so that the contribution to economic development may be increased. Moreover, cheap labor is no longer an effective campaign to attract FDI, and even the global market nowadays pays more attention to the environmental issues and protection of labor rights in which more environmental friendly products and no sweats products are welcome, and therefore tackling these issues should be part of strategy in inviting more FDIs.

Figure 4-5: Impulse Response Function of FDI, Trade and GDP

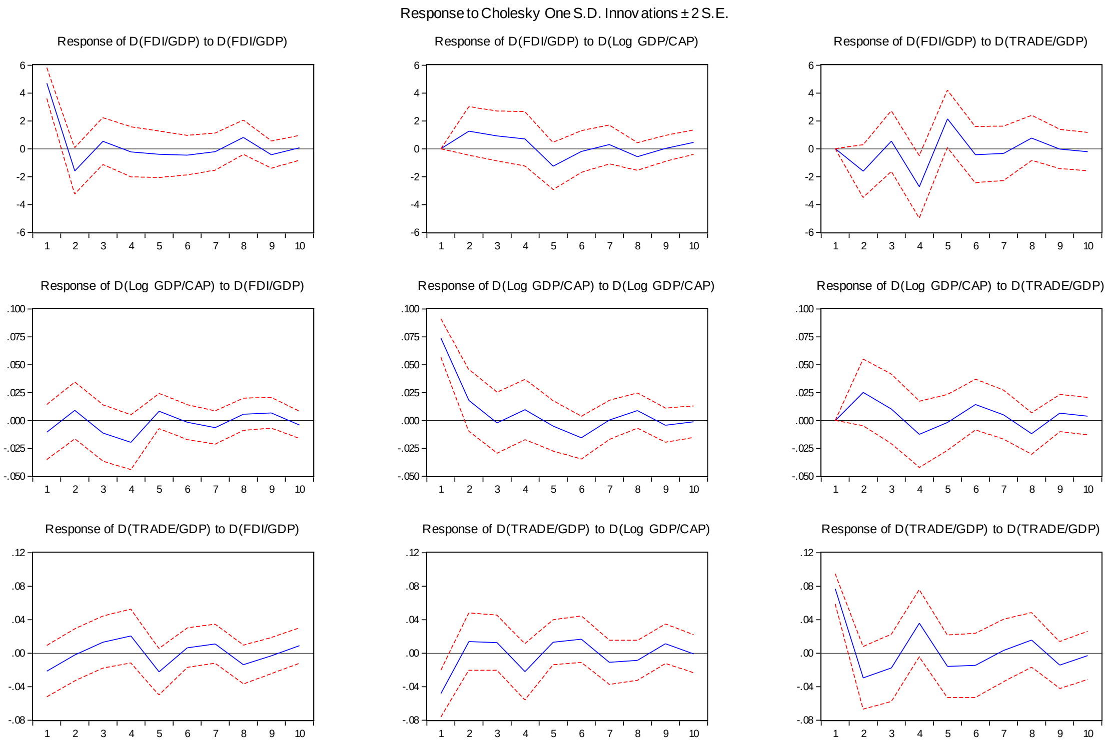
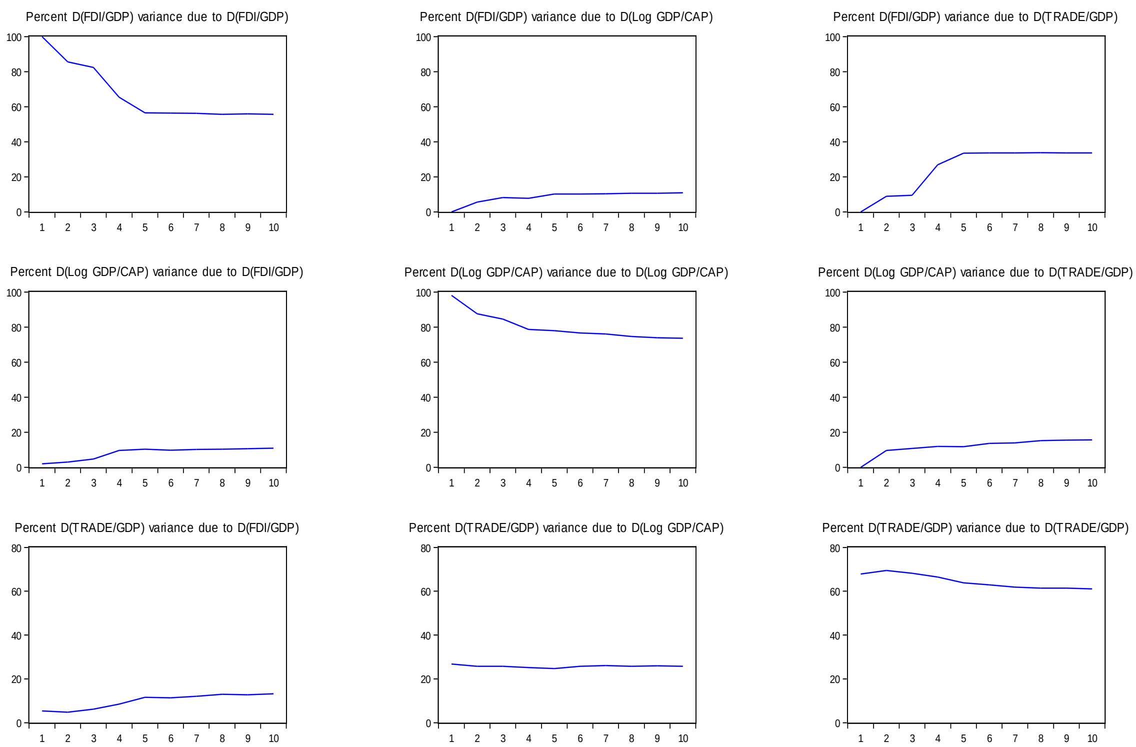


Figure 4-6: Variance Decomposition of FDI, Trade, and GDP



4.6. Conclusions

As a result of innovation in technology, more integrated and open economies in the world, FDI is no longer too sticky and illiquid as perceived in the past; it is more flexible, movable and become more responsive to shocks in economic and non-economic factors such as political and social conditions. The findings of this paper support those arguments; both descriptive statistic analysis and VAR analysis found that FDI inflows in Indonesia were very dynamic. Qualitative analysis through descriptive statistic shows that FDI in Indonesia is highly affected by non-economic factors, mainly by political condition. Meanwhile, findings in VAR analysis show that FDI is more resilient to the domestic economic shocks, yet more responsive to shock in international trade. However, it is also found that FDI contribution to the economic development and social welfare is still not significant yet. The insignificant effect of FDI on Indonesian economy may be attributed to some factors: (1) sectors in which the FDI flows in is still dominated by tertiary sector which is non-labor-intensive and domestic market oriented industries, (2) the amount of FDI stock is not large enough to fuel up the economy, this may be caused by economic shocks and political instability that interrupted FDI inflows during the last 10 years, and (3) poor regulations in promoting good corporate governance and poor performance in eradicating corruption practices has made Indonesia less attractive to foreign investors. In international investors' perspective, Indonesia is often characterized as a high cost economy because of its inefficiency, lack of infrastructure, and corruption practices.

To be more attractive for FDI to come in, such policies as improvements in investment policies, infrastructure, regulations on business competition, and law enforcement to reduce the uncertainty are needed. FDI is still a potential source of resources to push the economic growth and to signify its effect to the economy, FDI should be aimed more at value added and export oriented industries, not just industries that their objective is to serve the huge domestic market as their market expansion base.

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Chapter 5

REEXAMINATION OF INTERNATIONAL CAPM WITH DYNAMIC BETA: A SUR WITH AND WITHOUT GARCH

REEXAMINATION OF INTERNATIONAL CAPM WITH DYNAMIC BETA: A SUR WITH AND WITHOUT GARCH

ABSTRACT

Considering the heteroscedasticity and cross-correlation in the error terms of international stock market returns, the International Capital Asset Pricing Model (CAPM) is reinvestigated under the Seemingly Unrelated Regression (SUR) and SUR with GARCH (SUR-GARCH) frameworks. We modify Feasible Generalized Least Square (FGLS) estimators to take into account multivariate GARCH error structures in estimating the model. A world market portfolio was constructed to ensure that the market portfolio is mean-variance efficient under no restriction on short selling and borrowing at a riskless rate. CAPM fits well only on the ex-post *SUR test, but it is rejected on SUR-GARCH for both* ex-ante *and* ex-post *tests. However, this paper finds that CAPM could be applied for most stock market indexes when each equation in a SUR system was analyzed individually.*

5.1. Background

The basic objective of forming a portfolio is to diversify the assets' risks and returns so that the portfolio attains a particular target of expected return with minimum variance or attains maximum expected return within specified variance. The diversification may take place within a market by mixing assets that have non-perfect correlation with each other. In a broader setting, the assets included in the diversification process may come from different markets and even from across the borders of economies or countries. In this setting, when the markets become more integrated, the comovement of assets' returns tends to be higher.

The main motivation of this paper is to investigate the presence of benefits of forming an internationally well-diversified portfolio. The Capital Asset Pricing Model (CAPM) was applied to examine whether investors in different stock markets require different international market risk premia for each offshore asset (proxied by national stock market indexes).

The results are expectedly able to show the effects of recent developments in various stock markets and economies, especially to see the impact of policies that foster freer flows of capital across the borders. By constructing an internationally diversified portfolio (world market portfolio) that is mean-variance efficient and tangent to the capital market line, the International CAPM was tested. If the stock markets in the sample are perfectly integrated, the price premia of world market (beta) risk across stock markets should be identical. Moreover, if the world market portfolio is regarded as the common world factor and it is the single factor in the asset-pricing model, we should expect that the residuals represent the idiosyncratic risk of each market. When markets are completely integrated, the common world factor must be able to fully explain the variants of the excess expected returns, thus the idiosyncratic risk of a market should be uncorrelated with that in the other markets. However, when the markets are not completely integrated or are only partially integrated, we should expect that the idiosyncratic risks are not orthogonal but that they are cross-sectionally correlated. Previous empirical works show that world financial markets are not completely integrated (see extensive surveys in Buch (2010)), so we should not assume the orthogonality of the CAPM residuals across the markets.

The world market portfolio was constructed by estimating expected returns and conditional variance-covariance matrices at every observation using the Vector Error Correction Model with GARCH (VEC-GARCH) model. The portfolio is derived from an efficient frontier such that it is always mean-variance efficient. Market risk, beta, is assumed to vary over time and is measured based on the conditional covariance between the asset and the world market portfolio. The international assets pricing model was examined under the Seemingly Unrelated Regression (SUR) and SUR-GARCH frameworks. To take into account the multivariate GARCH error structure, the standard FGLS needs to be adjusted, and we call it the modified FGLS estimator (mFGLS).

5.2. Literature Review

The Capital Asset Pricing Model (CAPM) of the independent work of Sharpe (1964), Lintner (1965), and Mossin (1966) has raised debates over its usefulness and theoretical soundness since the model was introduced. Fama and French (2004) summarized some important empirical tests on CAPM, concluding that tests based on cross-section regression (e.g. Fama and MacBeth, 1973) and time series regression (e.g. Gibbons, Ross and Shanken, 1989) do not test the CAPM. Those tests only examine whether a specific proxy for the market portfolio is efficient. Furthermore, they conclude that CAPM has never been tested, and that the prospects for testing it are not satisfactory. Previous literature supporting these findings include among others Fama and French (1992) and Chan, Hamao and Lakanishok (1991), who argue market risk beta is not the only factor that explains the expected return of an asset, and Kothari, Shanken and Sloan (1995) who find only a weak relationship between beta and expected return. Other supporting arguments for rejecting the CAPM are unrealistic assumptions (like homogeneous expectations and investors' sole attention to the mean-variance of one-period portfolio returns) and the presence of market anomalies (e.g. the overreaction hypothesis of deBondt and Thaler (1987)). The alternative models to CAPM that partly tackle such issues are Arbitrage Pricing Theory (APT) and Intertemporal CAPM.

However, despite those critics, the standard CAPM is still the most practically applied and widely adopted model used by financial practitioners. The following is some recent literature supporting the CAPM. Levy (2010) shows that CAPM works under both the expected utility theory framework and prospect theory framework. Tests based on *ex-post* data by Levy (2008) also show that the weak relationship between beta and expected return occurs in the sub-period selected for such testing, which implies that CAPM may work well in other particular periods.

There is also an important caveat for testing CAPM that is the appropriateness of the proxy for the market portfolio. The CAPM test based on cross-section regression, as in Fama and MacBeth (1973), assumes that the market is efficient, homogeneous expectations prevail, and the market is in an equilibrium state, such that according to Black (1972) any weighted average market portfolio is always efficient and it is a good proxy for the market portfolio. However, these assumptions are the main basis for critiques of the model, so that rejection of the test model might be interpreted as the violation of the assumption (that the proxy for market portfolio is inefficient) and not the rejection of the CAPM itself. Haugen and Baker (1991) show the evidence that such a market weighted index is not efficient and thus a market-matching strategy is not a good investment strategy. This issue becomes relevant when CAPM is applied for pricing international assets (such as the Exchange Traded Fund (ETF) that directly tracks stock market indices in different countries), so using a synthetic world market index (e.g. MSCI World Index) does not guarantee that the index represents the true market portfolio on which all assumptions behind the CAPM are based. This issue has already been discussed by Black and Litterman (1992), who analyze global portfolio optimization methods. More on this issue will be discussed in the section on our research method. Previous work on international asset pricing that utilizes such a world index can be found in the work of French and Poterba (1991), Fama and French (1998), Das and Uppal (2004), Fernandes (2005), and Wu (2008) among other abundant literature in this area.

The development in econometric areas such as non-stationary and heteroscedasticity models has contributed to testing the CAPM and its extension. Bollerslev, Engle and Wooldridge (1988) applied the GARCH model to test conditional (time varying beta) CAPM. Engel and Rodrigues (1989) tested International CAPM using time varying covariance, and found that the estimation method performed is much better than that if constant variances are used. Tsuji (2009) tested conditional CAPM and Conditional Consumption-CAPM using Japan datasets and found that conditional CAPM works better than the competing model. In contrast, Kumar, Sorescu, Boehme and Danielsen (2008) find that multiple risk factors help explain the expected return in the US markets instead of the single market risk in the conditional CAPM. This result confirms the findings by Lewellen and Nagel (2006).

5.3. Methods

The proposed test model is aimed at examining the relationship between the expected returns of national stock market indexes and world market portfolio returns. The national stock market indexes are weighted averages of the constituent stock prices based on either market capitalization (e.g. S&P500 Index) or liquidity (e.g. Nikkei 225). The riskless asset is proxied by government securities; 3-month T-Bill.

In previous international CAPM literature, the MSCI world index or other ETFs that consist of national market indexes were used as a proxy of the world market portfolio. It should be noted that such an index weighs the composing asset based on market capitalization or liquidity where the weight is always nonnegative. It means that the world market portfolio consists of assets in a long position. Meanwhile the CAPM assumes that unrestricted short selling of those assets is allowed. One may argue that we can short sell the index instead of short selling its composing assets. However, the strategy of short selling the world market index does not ensure that the portfolio is efficient and tangent to the capital market line. To overcome these problems, the world market portfolio is constructed following Merton's (1972) procedure and Tobin's separation theory (Tobin, 1958) to guarantee that the portfolio is not only mean-variance efficient, but also located at a point that is tangent to the capital market line.

5.3.1. Expected Return and Conditional Variance-Covariance Matrix

Considering that stock markets are in long-run equilibrium with other markets, and disturbance errors of the estimation model are correlated and heteroscedastic, the VEC-GARCH model is applied to estimate the expected returns of each national market index and their conditional variance-covariance matrix. The VEC-GARCH model consists of mean equations and variance equations as follows.

The mean equations (the unrestricted Vector Error Correction Model (VECM)) is

$$\boldsymbol{R}_t^d = \widehat{\boldsymbol{C}} + (\widehat{\boldsymbol{\Pi}})\boldsymbol{M}_{t-1}^d + \widehat{\boldsymbol{\Phi}}\boldsymbol{R}_{t-1}^d + \hat{\boldsymbol{\varepsilon}}_t \tag{5.1}$$

where

$\boldsymbol{R}_t^d$ $=$ $[\Delta m_{1,t}\ \Delta m_{2,t} \ldots \Delta m_{i,t} \ldots \Delta m_{N,t}]'$ is a vector of first order difference of log national market indexes at time *t*, where $\Delta m_{i,t} = r_{i,t} = log\left(\frac{m_{i,t}}{m_{i,t-1}}\right)$ is also the national market return at time *t*.

$\boldsymbol{M}_{t-1}^d = [m_{1,t-1} \ldots m_{i,t-1} \ldots m_{N,t}]'$ is a vector of first order lagged of log national market indexes

$\widehat{\boldsymbol{C}}$ $=$ $[\hat{c}_1\ \hat{c}_2 \ldots \hat{c}_i \ldots \hat{c}_N]'$ is a vector of constant terms

$\widehat{\boldsymbol{\Pi}}$ $=$ *NxN* matrix of error correction coefficients. When $rank(\widehat{\boldsymbol{\Pi}}) < N$, $\widehat{\boldsymbol{\Pi}}$ can be decomposed into $\boldsymbol{AB}$ by the Granger representation theorem, where $\boldsymbol{A}$ is the vector of coefficients of cointegrating equations (adjustment parameters) and, $\boldsymbol{B}$ is a vector of cointegrating coefficients.

$\boldsymbol{\Phi}$ $=$ $\begin{bmatrix} \varphi_{11} & \cdots & \varphi_{1N} \\ \vdots & \ddots & \vdots \\ \varphi_{P1} & \cdots & \varphi_{NN} \end{bmatrix}$ is an NxN matrix of *VAR* parameters

$\boldsymbol{\varepsilon}_t$ $=$ $[\varepsilon_{1,t}\ \varepsilon_{2,t} \ldots \varepsilon_{i,t} \ldots \varepsilon_{N,t}]'$ is the vector of disturbance errors, where $\boldsymbol{\varepsilon}_t \sim (0, \widehat{\boldsymbol{H}}_t)$

and the variance equation (Diagonal BEKK Model, Engle and Kroner (1995)) is

$$\widehat{\boldsymbol{H}}_{\mathrm{t}} = \widehat{\boldsymbol{\Psi}}\widehat{\boldsymbol{\Psi}}' + [\widehat{\boldsymbol{A}}_1\widehat{\boldsymbol{A}}_1']\odot[\hat{\boldsymbol{\varepsilon}}_{\mathrm{t-1}}\hat{\boldsymbol{\varepsilon}}_{\mathrm{t-1}}'] + [\widehat{\mathbf{A}}_2\widehat{\mathbf{A}}_2']\odot\widehat{\boldsymbol{H}}_{\mathrm{t-1}}, \tag{5.2}$$

where $\widehat{\boldsymbol{H}}_t$ is an *N*x*N* conditional variance-covariance matrix (its diagonal elements are conditional variances, $[\hat{\sigma}_t^2(r_i)]_{ii}$, and the off-diagonal elements are conditional covariances, $[\hat{\sigma}_t(r_i r_j)]_{ij}$, where $i \neq j$, for i and j=[1 N]), $\widehat{\boldsymbol{\Psi}}\widehat{\boldsymbol{\Psi}}'$, $\widehat{\boldsymbol{A}}_1\widehat{\boldsymbol{A}}_1'$, and $\widehat{\boldsymbol{A}}_2\widehat{\boldsymbol{A}}_2'$ are a diagonal matrix of constants, coefficients of ARCH terms, and coefficients of GARCH terms, respectively, and $\odot$ is the element by element (Hadamard) product operator.

The parameters in the mean equations and the variance equations may theoretically be estimated by the maximum likelihood estimator (MLE). However, when the system is large as in our case, MLE often produces inaccurate results because too many parameters need to be estimated such that the optimization of the log likelihood function fails. To overcome this problem, the mean equation (VECM) parameters are estimated like those in the SUR system, using the modified FGLS estimator that takes into account the GARCH error structure. This estimation strategy is also used in testing the CAPM and will be explained later.

For estimating the conditional variance of realized returns, the mean equation in equation (5.1) was replaced by $\widetilde{\boldsymbol{R}}_t = \widehat{\boldsymbol{C}} + \hat{\boldsymbol{\varepsilon}}_t$, and the conditional variance-covariance matrix was estimated by Diagonal BEKK. Henceforth, accents " $\tilde{}$ " and " $\breve{}$ " are used for indicating variables based on the realized return and the estimated expected return, respectively.

5.3.2. World Market Portfolio Formation

A world market portfolio was constructed by assuming that unrestricted short selling and borrowing at riskless rates in the home market are allowed. The assumptions were made to follow the underlying assumptions in CAPM.

The proportion of each asset in an efficient portfolio was obtained by minimizing the objective function of portfolio variance with respect to the following constraints: [1] a set of target portfolio expected returns, and [2], the sum of the proportion of each asset (including riskless assets) is equal to one. When short selling is prohibited, constraint [2] is modified by adding a restriction on the proportion of each risky asset to vary between 0 and 1, yet in this paper the proportion is unrestricted to indicate that the short selling can be done without any restriction.

Suppose that country *i* is our focus of analysis and call it the home country. Portfolio P consists of riskless assets available in domestic market *i* and *N* international risky portfolios $(m_1^d, \dots, m_i^d, \dots m_N^d)$. The rate of return of P is the weighted average of the rate of return of its composing assets. Our objective is to construct a world market portfolio denoted by M that consists of risky portfolios only (proxied by market indexes). Let us define $r_{f,t}$, $\boldsymbol{\omega}_{\mathrm{t}} = (\omega_{1,\mathrm{t}} \dots \omega_{\mathrm{i,t}} \dots \omega_{\mathrm{N,t}})'$, $\boldsymbol{e}$ as the riskless rate of return, with vectors of proportions of risky assets in portfolio M and vectors of one respectively. Constraint [2] implies that $(1 - \boldsymbol{\omega}'\boldsymbol{e})$ is the proportion of riskless assets in portfolio P. Applying constraint [2] to the expected returns on risk free assets and the risky assets definition, the expected return of P may be stated as:

$$\check{r}_{\mathrm{t}}^{\mathrm{P}} = [r_{\mathrm{f,t}} + \boldsymbol{\omega}_{\mathrm{t}}'(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e})] \tag{5.3}$$

Using the conditional variance-covariance matrix $\widehat{\boldsymbol{H}}_t$ from (5.2), the variance of portfolio P at time *t* is computed by,

$$\widehat{\sigma}_{\mathrm{t}}^2(\check{r}^{\mathrm{P}}) = \boldsymbol{\omega}_{\mathrm{t}}'\widehat{\boldsymbol{H}}_{\mathrm{t}}\boldsymbol{\omega}_{\mathrm{t}}. \tag{5.4}$$

The optimal weight of the *N* risky assets and risk-free asset was obtained by solving the following optimization problem:

$$\min_{\omega_{\mathrm{t}}} \frac{1}{2}\boldsymbol{\omega}_{\mathrm{t}}'\widehat{\boldsymbol{H}}_{\mathrm{t}}\boldsymbol{\omega}_{\mathrm{t}} + \lambda\{\check{r}_{\mathrm{t}}^{\mathrm{P}} - [r_{\mathrm{f,t}} + \boldsymbol{\omega}_{\mathrm{t}}'(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e})]\}. \tag{5.5}$$

The first-order condition of (5.5) leads to the following solution:

$$\boldsymbol{\omega}_{\mathrm{t}}^* = \lambda\widehat{\boldsymbol{H}}_{\mathrm{t}}^{-1}(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e}). \tag{5.6}$$

Taking $\boldsymbol{\omega}_t^*$ from (5.6) and applying the $\boldsymbol{e}'\boldsymbol{\omega}_t^* = 1$ restriction, we may obtain λ:

$$\boldsymbol{e}'\boldsymbol{\omega}_{\mathrm{t}}^* = \mathbf{e}'[\lambda\widehat{\boldsymbol{H}}_{\mathrm{t}}^{-1}(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e})] = 1$$
$$\lambda = m = [\alpha - \delta r_{\mathrm{f,t}}]^{-1} \tag{5.7}$$

where $\alpha = \breve{\boldsymbol{R}}_t^{d\prime}\widehat{\boldsymbol{H}}_t^{-1}\boldsymbol{e}$ and $\delta = \boldsymbol{e}'\widehat{\boldsymbol{H}}_t^{-1}\boldsymbol{e}$.

From (5.6), the expected return of risky portfolio M is $\check{r}_t^M = \boldsymbol{\omega}_t^{*\prime}\breve{\boldsymbol{R}}_t^d$ and the variance of portfolio P will be equal to the variance of portfolio M defined as $\widehat{\sigma}_t^2(\check{r}^P) = \widehat{\sigma}_t^2(\check{r}^M) = \boldsymbol{\omega}_t^{*\prime}\widehat{\boldsymbol{H}}_t\boldsymbol{\omega}_t^*$. Define $\widehat{\boldsymbol{\sigma}}_t(\check{r}^M)$ as the *nx1* vector of covariance of the tangency portfolio M with each of the risky asset. Then using (5.6) and (5.7), we have

$$\widehat{\boldsymbol{\sigma}}_{\mathrm{t}}(\check{r}^{\mathrm{M}}) = \widehat{\boldsymbol{H}}_{\mathrm{t}}\boldsymbol{\omega}_{\mathrm{t}}^* = m(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e}) \tag{5.8}$$

Pre-multiplying (5.8) by $\boldsymbol{\omega}_t^{*\prime}$, we have $\widehat{\sigma}_t^2(\check{r}^M)$ restated as

$$\widehat{\sigma}_{\mathrm{t}}^2(\check{r}^{\mathrm{M}}) = \boldsymbol{\omega}_{\mathrm{t}}^{*\prime}\widehat{\boldsymbol{\sigma}}_{\mathrm{t}}(\check{r}^{\mathrm{M}}) = m\boldsymbol{\omega}_{\mathrm{t}}^{*\prime}\left(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e}\right) = m(\check{r}_{\mathrm{t}}^{\mathrm{M}} - r_{\mathrm{f,t}}) \tag{5.9}$$

Rearranging (5.8) and substituting for *m* from (5.9), we have the CAPM:

$$\left(\breve{\boldsymbol{R}}_{\mathrm{t}}^{\mathrm{d}} - r_{\mathrm{f,t}}\boldsymbol{e}\right) = \frac{1}{m}\widehat{\boldsymbol{\sigma}}_{\mathrm{t}}(\check{r}^{\mathrm{M}}) = \frac{\widehat{\boldsymbol{\sigma}}_{\mathrm{t}}(\check{r}^{\mathrm{M}})}{\widehat{\sigma}_{\mathrm{t}}^2(\check{r}^{\mathrm{M}})}(\check{r}_{\mathrm{t}}^{\mathrm{M}} - r_{\mathrm{f,t}}). \tag{5.10}$$

The LHS of (5.10) is the expected excess return from each asset, while on the RHS, $\frac{\widehat{\boldsymbol{\sigma}}_t(\check{r}^M)}{\widehat{\sigma}_t^2(\check{r}^M)} = \widehat{\boldsymbol{\beta}}_t$ is the vector of time varying betas of each risky asset, and $(\check{r}_t^M - r_{f,t})$ is the expected market risk premium that prevails for all risky assets. Note that because we are assuming that short selling is unrestricted, $\check{r}_t^M$ is always nonnegative, and the portfolio M is always in the efficient frontier of portfolio P (the risk-free and risky assets portfolio). However, elements of $\breve{\boldsymbol{R}}_t^d$, the estimated expected return of each asset could be positive or negative. When the expected return of an asset is negative, it will be more likely to be short sold. Thus, $\widehat{\boldsymbol{\sigma}}_t(\check{r}^M)$ is not always positive. As a result, we may find that an asset's beta and the beta risk premium are negative[1].

5.3.3. Testing Conditional CAPM

The capital asset pricing model in equation (5.10) will serve as our test model. In addition, because we consider international assets, we must include additional risk factors other than the world market risk (represented by the betas) that indicate the required adjustment for the excess return. In this paper, we include exchange rate returns in the model. We can consider the international CAPM being tested in this paper as involving ETFs that track directly the respective stock market indexes. Therefore, like the CAPM test for assets traded in one market, we can ignore the

[1] See Pennacchi (2008) pp. 37-60 for a more detailed derivation of the market portfolio.

transaction cost of acquiring the cross-border assets. The test model is defined in a system equation as follows:

$$\boldsymbol{ER}_{\mathrm{t}} = \hat{\hat{\alpha}} + \hat{\boldsymbol{\beta}}_{\mathrm{t}}'\hat{\hat{\boldsymbol{\theta}}} + \Xi_{\mathrm{t}}'\hat{\hat{\boldsymbol{\xi}}} + \boldsymbol{\eta}_{\mathrm{t}} \tag{5.11}$$

where $\boldsymbol{ER}_t$ and $\hat{\boldsymbol{\beta}}_t$ are vectors of excess returns and market betas as defined in (5.10), Ξ_t is the vector of exchange rate returns for the respective markets. The vectors of estimated coefficients are $\hat{\hat{\boldsymbol{\alpha}}}$, $\hat{\hat{\boldsymbol{\theta}}}$, and $\hat{\hat{\boldsymbol{\xi}}}$.

CAPM is said to work well when all elements in $\hat{\hat{\boldsymbol{\alpha}}}$ are statistically not different from zero (the test does not reject $H_0^1\colon \hat{\hat{\alpha}}_{\mathrm{i}} = 0, \forall i$). However, evaluating $\hat{\hat{\alpha}}_{\mathrm{i}}$ individually will show the applicability of CAPM for pricing that asset. In addition, if markets are fully integrated, we expect that the (beta) market risk premium for every market is homogenous. However, since short selling is allowed, the negative betas and risk premia are possible. Thus, the homogeneity test was carried out by taking the absolute values of the premium (the test does not reject $H_0^2\colon |\hat{\hat{\theta}}_1| = |\hat{\hat{\theta}}_2| = \cdots = |\hat{\hat{\theta}}_{\mathrm{N}}|$). Rejection of the null hypothesis indicates that markets are not fully integrated, in other words, the risk is priced differently for different assets, and that is a violation of the law of one price. The elements in $\hat{\hat{\boldsymbol{\xi}}}$ show the additional risk price required with respect to the exchange rate changes. As exchange rate policies are different across countries, we expect that the estimated coefficient in $\hat{\hat{\boldsymbol{\xi}}}$ will be higher for countries that adopt free float regimes than those that adopt fixed exchange rate or dollar pegged regimes. Moreover, exchange rates against the US Dollar in emerging markets also tend to be more volatile than those in developed countries, thus it is also expected that the estimated coefficient is significantly different from zero for countries with a non-fixed exchange rate regime.

If the markets are not fully integrated, the unexpected returns or idiosyncratic risk in one stock market may affect or spill over to the others. Moreover, we also found common cyclicality of business cycles in the stock markets. Therefore, we are assuming that the error terms $\boldsymbol{\eta}_t$ have multivariate GARCH error structure. In order to estimate the parameters, we apply SUR with GARCH (SUR-GARCH) estimation. Estimation from the standard SUR was also presented to see the effect of ignoring the

GARCH error structure. The use of the SUR framework in testing the CAPM lets us examine the CAPM under both fully integrated and/or partially integrated assumptions. If markets are fully integrated, the error terms are orthogonal across the markets, and SUR estimation will produce exactly the same estimates as those by equation-by-equation ordinary least squares (OLS). On the other hand, if markets are partially integrated, the off-diagonal elements of the errors variance-covariance matrix are nonzero and SUR will give us more efficient estimates than those by OLS.

5.4. Estimation Strategy

Equations (5.1) and (5.11) can be restated as a SUR model. For simplicity, we will use system equation (5.11) as a sample to explain the estimation strategy. Let us define $\boldsymbol{ER}_i$ as a *T*-vector of excess return of asset-*i*, matrix $\boldsymbol{X}_i = [\boldsymbol{e}, \widehat{\boldsymbol{\beta}}_{\mathrm{i}}, \boldsymbol{\Xi}_{\mathrm{i}}]$ is a vector of independent variables, where its respective elements are a *T*-vector of ones, a *T*-vector of time varying betas for asset-*i*, and a *T*-vector of exchange rate changes for market-*i*, and $\boldsymbol{\Gamma}_{\mathrm{i}} = [\boldsymbol{\alpha}_{\mathbf{i}}\ , \ \boldsymbol{\theta}_{\mathbf{i}}\ , \ \boldsymbol{\xi}_{\mathrm{i}}]$ is a vector of coefficients for equation-*i*. Then, equation-*i* in the system equation (5.11) can be restated as follows:

$$\boldsymbol{ER}_{\mathrm{i}} = \boldsymbol{X}_{\mathrm{i}}\boldsymbol{\Gamma}_{\mathrm{i}} + \boldsymbol{\eta}_{\mathrm{i}}, \qquad \mathrm{i} = 1, \ldots, \mathrm{N} \tag{5.12}$$

where $\boldsymbol{\eta}_i$ is the *T*-vector of the disturbance errors for the equation. In the stacked model, the system equation (5.11) can be restated as follows:

$$\begin{bmatrix} \boldsymbol{ER}_1 \\ \boldsymbol{ER}_2 \\ \vdots \\ \boldsymbol{ER}_N \end{bmatrix} = \begin{bmatrix} \boldsymbol{X}_1 & 0 & \ldots & 0 \\ 0 & \boldsymbol{X}_2 & \ldots & 0 \\ \vdots & \vdots & & \vdots \\ 0 & 0 & \ldots & \boldsymbol{X}_N \end{bmatrix} \begin{bmatrix} \boldsymbol{\Gamma}_1 \\ \boldsymbol{\Gamma}_2 \\ \vdots \\ \boldsymbol{\Gamma}_{\mathrm{N}} \end{bmatrix} + \begin{bmatrix} \boldsymbol{\eta}_1 \\ \boldsymbol{\eta}_2 \\ \vdots \\ \boldsymbol{\eta}_{\mathrm{P}} \end{bmatrix},$$

In general, the corresponding matrices define the following system,

$$\boldsymbol{Y} = \boldsymbol{X}\boldsymbol{\Gamma} + \boldsymbol{\eta}. \tag{5.13}$$

VECM in system equation (5.1) also can be stated similarly to the above system equation by redefining the $\boldsymbol{X}$ and $\boldsymbol{\Gamma}$ accordingly. To reduce the number of parameters that need to be estimated in the VEC-GARCH, we first estimate the VECM (without GARCH), create a series with a cointegrating equation (we assume that there is only one cointegrating equation), and use it as a new variable in a VAR system. Thus, the $\boldsymbol{X}_i$ for system equation (5.1) is defined as $\boldsymbol{X}_i = [\boldsymbol{e}, \boldsymbol{CE}, \boldsymbol{R}^d_{i,t-1}]$, where $\boldsymbol{CE}$ is the *T*-vector of cointegrating series that applies for every *i*.

5.4.1. Feasible Generalized Least Square (FGLS) SUR Estimation

FGLS, also known as Zellner's estimator (Zellner, 1962), assumes that $E[\boldsymbol{\eta}_i|\boldsymbol{X}_1, \boldsymbol{X}_2, \dots, \boldsymbol{X}_N] = 0$ (strict exogeneity of $\boldsymbol{X}_i$), and $E[\boldsymbol{\eta}_\mathrm{i}\boldsymbol{\eta}_\mathrm{i}'|\boldsymbol{X}_1, \boldsymbol{X}_2, \dots, \boldsymbol{X}_N] = \sigma_{ii}\boldsymbol{I}_T$ (homoscedasticity). As stock markets are assumed to be partially integrated, the disturbances might be correlated across equations. Therefore, $E\left[\eta_{\mathrm{it}}\eta_{\mathrm{js}}'\middle|\boldsymbol{X}_1, \boldsymbol{X}_2, \dots, \boldsymbol{X}_N\right] = \sigma_{\mathrm{ij}}$ for $t = s$ and 0 for $t \neq s$. The σ_{ij} is the covariance between disturbances *i* and *j*: it is the *ij*th element of the variance-covariance matrix $\boldsymbol{\Sigma}$. Let us also define $\boldsymbol{\Omega} = \boldsymbol{\Sigma}\otimes\mathbf{I}$. The generalized least squares estimator under the covariance structures assumption is

$$\hat{\boldsymbol{\Gamma}} = [\boldsymbol{X}'\left(\hat{\boldsymbol{\Sigma}}\otimes\boldsymbol{I}\right)^{-1}\boldsymbol{X}]^{-1}[\boldsymbol{X}'\left(\hat{\boldsymbol{\Sigma}}\otimes\boldsymbol{I}\right)^{-1}\boldsymbol{Y}]. \tag{5.14}$$

Because σ_{ij} is generally unknown, it is estimated by $\hat{\sigma}_{\mathrm{ij}} = s_{ij} = \frac{\hat{\boldsymbol{\eta}}_\mathrm{i}'\hat{\boldsymbol{\eta}}_\mathrm{j}}{T}$ where $\hat{\boldsymbol{\eta}}_\mathrm{i}$ is the vector of residuals in equation *i*. By doing so, the estimated variance-covariance matrix $\hat{\boldsymbol{\Sigma}}$ can be computed. The FGLS estimator requires inversion of matrix $\hat{\boldsymbol{\Sigma}}$, so that the matrix must have a nonzero discriminant.

The standard errors of the parameters were estimated by taking the square root of elements in sampling variances:

$$\mathrm{Var}\left[\hat{\boldsymbol{\Gamma}}\middle|\boldsymbol{X}\right] = \hat{\sigma}^2(\boldsymbol{X}'\hat{\boldsymbol{\Omega}}^{-1}\boldsymbol{X})^{-1} \tag{5.15}$$

where $\hat{\sigma}^2 = \frac{\hat{\boldsymbol{\eta}}_\mathrm{i}'\hat{\boldsymbol{\eta}}_\mathrm{j}}{T-N} = \frac{(\boldsymbol{Y}-\boldsymbol{X}\hat{\boldsymbol{\Gamma}})'\hat{\boldsymbol{\Omega}}^{-1}(\boldsymbol{Y}-\boldsymbol{X}\hat{\boldsymbol{\Gamma}})}{T-N}$.

The join hypotheses of H_0^1 and H_0^2, were tested by the Wald coefficient test with *J* degrees of freedom, where *J* is *N* or *N-1*, respectively. The restriction is defined by $\boldsymbol{R}\hat{\boldsymbol{\Gamma}} = \boldsymbol{q}$, where $\boldsymbol{R}$ is the (*JxK*) matrix of restriction with *K* as the number of parameters in $\hat{\boldsymbol{\Gamma}}$, and $\boldsymbol{q}$ is the *J*-vector of the true values. The Wald statistic is $\chi^2[J]$ distributed and computed by

$$\mathrm{W[J]} = (\boldsymbol{R}\hat{\boldsymbol{\Gamma}} - \boldsymbol{q})'[\boldsymbol{R}\hat{\sigma}^2(\boldsymbol{X}'\hat{\boldsymbol{\Omega}}^{-1}\mathbf{X})^{-1}\boldsymbol{R}'](\boldsymbol{R}\hat{\boldsymbol{\Gamma}} - \mathbf{q}). \tag{5.16}$$

5.4.2. Modified Feasible Generalized Least Square (mFGLS) SUR-GARCH Estimation

Considering that system equations (5.1) and (5.11) are estimated in partially integrated markets and there were shocks and crises during the observation periods that spilled over among the samples, the multivariate GARCH error structure should be considered. To do so, the following steps include the error structure for estimating the parameters in the models:

[1] Estimate the mean equations by first ignoring the GARCH error structure and obtain the residuals.

[2] Use the residuals to estimate the conditional variance-covariance matrix by using the Diagonal BEKK model. At every observation *t*, we have $\widehat{\boldsymbol{H}}_t$ with elements of $\hat{h}_{ij,t}$.

[3] Use the variance-covariance matrix from step 2 to construct $\widehat{\boldsymbol{\Omega}}$. Note that $\widehat{\boldsymbol{\Omega}}$ in the SUR model as in (14) is defined as $\widehat{\boldsymbol{\Sigma}}\otimes\boldsymbol{I}$, where $\widehat{\boldsymbol{\Sigma}}$ is a constant variance-covariance matrix. The modified $\widehat{\boldsymbol{\Omega}}$ at this step is based on the heteroscedasticity and covariance across the equations. To illustrate it in a simple example, for $N = 3$, $\widehat{\boldsymbol{\Omega}}$ is:

$$\widehat{\boldsymbol{\Omega}} = \begin{bmatrix} \widehat{\boldsymbol{\Omega}}_{11} & \widehat{\boldsymbol{\Omega}}_{12} & \widehat{\boldsymbol{\Omega}}_{13} \\ \widehat{\boldsymbol{\Omega}}_{21} & \widehat{\boldsymbol{\Omega}}_{22} & \widehat{\boldsymbol{\Omega}}_{23} \\ \widehat{\boldsymbol{\Omega}}_{31} & \widehat{\boldsymbol{\Omega}}_{32} & \widehat{\boldsymbol{\Omega}}_{33} \end{bmatrix}$$

where $\widehat{\boldsymbol{\Omega}}_{\mathrm{ij}}$ is a TxT diagonal matrix where its main diagonal elements are elements of the T-vector of $h_{ij,t}$ and zeros on the off-diagonal elements, and $\widehat{\boldsymbol{\Omega}}_{\mathrm{ij}} = \widehat{\boldsymbol{\Omega}}_{\mathrm{ji}}$, i.e.,

$$\widehat{\boldsymbol{\Omega}}_{ij} = \begin{bmatrix} \hat{h}_{ij,1} & & & & \\ & \ddots & & 0 & \\ & & \hat{h}_{ij,t} & & \\ & 0 & & \ddots & \\ & & & & \hat{h}_{ij,T} \end{bmatrix}$$

Thus we have,

$$\widehat{\mathbf{\Omega}} = \left[\begin{array}{ccccc|ccccc|ccccc}
\hat{h}_{11,1} & & & & & \hat{h}_{12,1} & & & & & \hat{h}_{13,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & \hat{h}_{11,t} & & & & & \hat{h}_{12,t} & & & & & \hat{h}_{13,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & \hat{h}_{11,n} & & & & & \hat{h}_{12,n} & & & & & \hat{h}_{13,n} \\
\hline
\hat{h}_{21,1} & & & & & \hat{h}_{22,1} & & & & & \hat{h}_{23,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & \hat{h}_{21,t} & & & & & \hat{h}_{22,t} & & & & & \hat{h}_{23,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & \hat{h}_{21,n} & & & & & \hat{h}_{22,n} & & & & & \hat{h}_{23,n} \\
\hline
\hat{h}_{31,1} & & & & & \hat{h}_{32,1} & & & & & \hat{h}_{33,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & \hat{h}_{31,t} & & & & & \hat{h}_{32,t} & & & & & \hat{h}_{33,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & \hat{h}_{31,n} & & & & & \hat{h}_{32,n} & & & & & \hat{h}_{33,n}
\end{array}\right]$$

where $\hat{h}_{ij,t}$ follow the multivariate MGARCH(1,1) process.

[4] After obtaining an estimate $\widehat{\mathbf{\Omega}}$, we have the modified FGLS,

$$\widehat{\mathbf{\Gamma}} = [\boldsymbol{X}'\widehat{\mathbf{\Omega}}^{-1}\boldsymbol{X}]^{-1}\boldsymbol{X}'\widehat{\mathbf{\Omega}}^{-1}\boldsymbol{Y} \tag{5.17}$$

Note that inverting a large and sparse matrix $\widehat{\mathbf{\Omega}}$ often causes computational problems such as memory size, computer time, and inaccurate numerical results. To avoid those problems, we propose the following algorithm. After estimating the MGARCH process we construct a relatively small matrix $\widehat{\boldsymbol{H}}_{\mathrm{t}}$ and its inverse $\widehat{\boldsymbol{H}}_{\mathrm{t}}^{-1}$ at each time *t* such that,

$$\widehat{\boldsymbol{H}}_{\mathrm{t}} = \begin{bmatrix} \hat{h}_{11,t} & \hat{h}_{12,t} & \hat{h}_{13,t} \\ \hat{h}_{21,t} & \hat{h}_{22,t} & \hat{h}_{23,t} \\ \hat{h}_{31,t} & \hat{h}_{32,t} & \hat{h}_{33,t} \end{bmatrix}, \text{and } \widehat{\boldsymbol{H}}_{\mathrm{t}}^{-1} = \begin{bmatrix} \hat{h}_t^{11} & \hat{h}_t^{12} & \hat{h}_t^{13} \\ \hat{h}_t^{21} & \hat{h}_t^{22} & \hat{h}_t^{23} \\ \hat{h}_t^{31} & \hat{h}_t^{32} & \hat{h}_t^{33} \end{bmatrix}$$

where $\widehat{\boldsymbol{H}}_{\mathrm{t}}$ and $\hat{h}_{ij,t}$ are the estimated variance and covariance of MGARCH. Replacing $\hat{h}_{ij,t}$ with $\hat{h}_t^{ij}$ in $\widehat{\mathbf{\Omega}}$ we easily obtain $\widehat{\mathbf{\Omega}}^{-1}$ without inverting a large matrix $\widehat{\mathbf{\Omega}}$.

The modified $\widehat{\mathbf{\Omega}}$ and $\widehat{\mathbf{\Gamma}}$ hypotheses can be tested using the Wald Test as described previously. The performance of the modified FGLS estimator has been examined by carrying out Monte Carlo simulations. The modified FGLS estimator is still an unbiased estimator and it is more efficient and consistent than the standard FGLS estimator when a multivariate GARCH error structure does exist (Maekawa and Setiawan, 2012).

5.5. Data

Stock market indexes from 12 economies were collected with their respective currencies. The indexes represent six developed stock markets: United States S&P500 (US), Germany DAX (GE), Hong Kong Hang Seng (HK), Japan Nikkei225 (JP), Singapore Straits Times (SI) and FTSE100 (UK), and six emerging markets: Argentina MerVal (AR), Brazil BOVESPA (BR), China SSEC (CH), Indonesia IDX composite (ID), Malaysia KLSE composite (MA), and Mexico IPC (ME). The market indexes are exchange rate adjusted and in natural logarithmic form, with the US Dollar as the base currency.

The dataset runs from July 1997 to July 2012 and on a weekly basis for avoiding non-synchronous trading time effects. Data were collected from Yahoo Finance services through its website. Because weekly data are used, and it is assumed that portfolio rebalancing is done weekly, the returns do not include dividends. Most of the stock market indexes are value-weighted indexes and the remaining are equally weighted index (Nikkei225) and top performers' indexes (i.e. FTSE100). However, the indexes used in this paper are assumed to be sufficient for representing the market portfolio in the respective markets because the indexes used are regarded as the market references. As the US is regarded as the home country, US 3-month T-Bills are used as the risk-free rate.

5.6. Findings

5.6.1. Data Properties

Based on the Augmented Dickey-Fuller (ADF) Tests and Common Unit Root Tests performed for data in levels (log market index) and its first differences (return), the results indicate that all series in levels are non-stationary (except for Indonesia and Malaysia when intercept and trend are included), but that all series in their first differences are stationary.

Granger causality tests for returns of the US Dollar-adjusted market indexes were performed, and the results are shown in Table 5-1. It indicates that the US stock market Granger-caused the other markets (except for China, Malaysia, and Mexico). The result implies that the US stock market is still very dominant and has the greatest influence on other markets in the world.

Table 5-1: Granger Causality Test for Stock Markets Returns

	US	GE	HK	JP	SI	UK	AR	BR	CH	ID	MA	ME
US		**0.031**	**0.000**	**0.014**	**0.001**	**0.006**	**0.078**	**0.000**	0.072	**0.000**	0.091	0.139
GE	0.579		**0.010**	0.696	**0.024**	0.942	0.107	**0.008**	**0.007**	**0.001**	**0.014**	**0.744**
HK	0.293	0.638		0.432	**0.042**	0.338	0.067	**0.006**	0.091	**0.000**	**0.027**	0.355
JP	0.243	0.500	0.157		**0.049**	0.522	0.509	0.277	0.120	**0.004**	**0.016**	0.583
SI	0.548	0.892	0.753	0.807		0.501	0.110	0.055	0.082	**0.000**	0.092	0.133
UK	0.253	0.784	0.052	0.411	**0.018**		0.156	**0.003**	**0.017**	**0.012**	**0.039**	0.894
AR	0.279	0.178	0.088	0.462	0.071	0.644		0.194	**0.017**	0.076	0.349	0.614
BR	0.976	0.107	0.180	0.368	0.201	0.229	0.743		0.083	**0.001**	0.423	0.413
CH	0.126	0.495	0.085	0.703	0.286	0.246	0.663	0.589		0.389	0.954	0.923
ID	0.717	0.423	0.196	0.687	0.115	0.913	0.421	0.474	0.853		0.615	0.819
MA	0.925	0.995	0.879	0.897	**0.006**	0.339	0.561	0.098	**0.044**	0.106		0.672
ME	0.928	0.275	0.112	0.454	0.081	0.159	0.184	0.318	0.438	**0.000**	0.262	

The numbers represent p-values on Granger Causality F-Statistics with lag-1 of the stock markets returns. The table is read 'row' Granger-causes 'column'.

Table 5-2: Johansen's Cointegration Test

Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.110	464.063	374.908	0.000
At most 1 *	0.103	372.930	322.069	0.000
At most 2 *	0.087	288.022	273.189	0.010
At most 3	0.060	216.213	228.298	0.157
Maximum Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.1096	91.1335	80.8703	0.0048
At most 1 *	0.1025	84.9072	74.8375	0.0047
At most 2 *	0.0874	71.8092	68.8121	0.0256
At most 3	0.0596	48.2450	62.7521	0.5701

** denotes rejection of the hypothesis at the 0.05 level, **MacKinnon-Haug-Michelis (1999) p-values. The trace test and Max-eigenvalue test indicate three cointegrating equations at the 0.05 level.*

The cointegration test in Table 5-2 shows that there are three cointegrating equations. It shows that there is a long-term equilibrium relationship among the market indices. However, for simplicity and reducing the computational burden in VECM estimation, only one cointegrating equation was applied. The cointegrating equation in the VECM is shown in Table 5-3. Using the cointegration equation, VECM and VEC-GARCH model parameters are shown in Tables 5-4 and 5-5.

Table 5-3: Cointegrating Equation in Vector Error Correction Model (VECM)

	log(US)	log(GE)	log(HK)	log(JP)	log(SI)	log(UK)	log(AR)	log(BR)	log(CH)	log(ID)	log(MA)	log(ME)	Const.
Coeff.	1.000	0.094	0.526	-0.371	0.021	-0.528	-0.138	-0.008	-0.022	0.364	-0.996	-0.023	2.027
S.E.		-0.170	-0.182	-0.127	-0.234	-0.167	-0.061	-0.091	-0.055	-0.071	-0.140	-0.082	-1.002
t-stat.		0.554	**2.884**	**-2.916**	0.090	**-3.153**	**-2.282**	-0.083	-0.397	**5.117**	**-7.131**	-0.282	**2.024**

Numbers in bold face indicate the coefficient is significant at the 0.05 level.

Table 5-4: Vector Error Correction Model (VECM)

	$\breve{R}_{US,t}$	$\breve{R}_{GE,t}$	$\breve{R}_{HK,t}$	$\breve{R}_{JP,t}$	$\breve{R}_{SI,t}$	$\breve{R}_{UK,t}$	$\breve{R}_{AR,t}$	$\breve{R}_{BR,t}$	$\breve{R}_{CH,t}$	$\breve{R}_{ID,t}$	$\breve{R}_{MA,t}$	$\breve{R}_{ME,t}$
Coint.Eq.	**-0.027**	-0.022	0.011	**0.027**	0.021	-0.017	-0.002	-0.019	**-0.025**	**0.043**	**0.095**	-0.011
S.E.	**-0.009**	-0.014	-0.013	**-0.012**	-0.013	-0.010	-0.019	-0.021	**-0.012**	**-0.022**	**-0.014**	-0.015
$\breve{R}_{US,t-1}$	-0.034	0.159	**0.218**	**0.203**	**0.185**	**0.171**	0.071	**0.289**	-0.023	0.107	-0.049	0.182
S.E.	-0.062	-0.092	**-0.088**	**-0.078**	**-0.088**	**-0.069**	-0.128	**-0.138**	-0.083	-0.148	-0.093	-0.103
$\breve{R}_{GE,t-1}$	0.006	**-0.178**	0.043	-0.064	-0.004	-0.066	0.046	0.020	0.080	0.090	0.091	-0.002
S.E.	-0.045	**-0.067**	-0.065	-0.057	-0.064	-0.050	-0.094	-0.101	-0.060	-0.108	-0.068	-0.076
$\breve{R}_{HK,t-1}$	-0.004	0.021	-0.050	0.012	0.041	0.028	0.088	0.137	0.018	0.080	0.017	0.036
S.E.	-0.042	-0.063	-0.060	-0.053	-0.060	-0.047	-0.087	-0.094	-0.056	-0.101	-0.063	-0.070
$\breve{R}_{JP,t-1}$	-0.033	0.018	0.021	-0.064	0.029	0.002	-0.037	-0.052	0.005	0.022	0.064	-0.072
S.E.	-0.036	-0.053	-0.051	-0.045	-0.051	-0.040	-0.074	-0.080	-0.048	-0.086	-0.054	-0.060
$\breve{R}_{SI,t-1}$	0.007	-0.005	-0.002	-0.015	**-0.128**	-0.004	0.066	-0.040	-0.007	**0.199**	**0.012**	0.105
S.E.	-0.042	-0.062	-0.060	-0.053	**-0.059**	-0.046	-0.086	-0.093	-0.056	**-0.100**	**-0.063**	-0.070
$\breve{R}_{UK,t-1}$	-0.049	-0.062	-0.057	-0.007	0.025	**-0.177**	-0.039	0.038	0.021	-0.193	0.034	-0.110
S.E.	-0.062	-0.092	-0.088	-0.078	-0.088	**-0.069**	-0.128	-0.138	-0.082	-0.147	-0.093	-0.103
$\breve{R}_{AR,t-1}$	-0.027	0.024	0.033	0.011	0.028	-0.009	-0.001	0.027	0.051	-0.027	0.017	0.022
S.E.	-0.023	-0.034	-0.032	-0.029	-0.032	-0.025	-0.047	-0.050	-0.030	-0.054	-0.034	-0.038
$\breve{R}_{BR,t-1}$	0.012	0.034	-0.004	0.009	-0.017	0.012	-0.037	**-0.130**	0.022	0.042	-0.020	-0.050
S.E.	-0.024	-0.036	-0.034	-0.030	-0.034	-0.027	-0.050	**-0.054**	-0.032	-0.057	-0.036	-0.040
$\breve{R}_{CH,t-1}$	-0.044	-0.035	-0.059	-0.009	-0.050	-0.043	-0.045	-0.006	0.002	-0.105	0.006	-0.012
S.E.	-0.028	-0.042	-0.040	-0.035	-0.040	-0.031	-0.058	-0.062	-0.037	-0.067	-0.042	-0.046
$\breve{R}_{ID,t-1}$	0.009	-0.020	-0.033	-0.017	0.019	0.001	-0.052	0.007	-0.020	-0.047	**-0.060**	-0.013
S.E.	-0.018	-0.027	-0.026	-0.023	-0.026	-0.020	-0.037	-0.040	-0.024	-0.043	**-0.027**	-0.030
$\breve{R}_{MA,t-1}$	0.003	0.003	0.007	0.012	0.105	0.019	0.005	0.043	0.057	-0.010	0.025	-0.017
S.E.	-0.029	-0.043	-0.041	-0.037	-0.041	-0.032	-0.060	-0.065	-0.039	-0.069	-0.044	-0.048
$\breve{R}_{ME,t-1}$	0.023	-0.019	-0.025	-0.029	-0.021	0.008	0.033	-0.084	-0.085	0.058	-0.016	-0.027
S.E.	-0.036	-0.053	-0.051	-0.045	-0.051	-0.040	-0.074	-0.079	-0.048	-0.085	-0.054	-0.059

Numbers in bold face indicate the coefficient is significant at the 0.05 level.

Table 5-5: VEC-GARCH Model By Modified FGLS Estimator

	$\breve{R}_{US,t}$	$\breve{R}_{GE,t}$	$\breve{R}_{HK,t}$	$\breve{R}_{JP,t}$	$\breve{R}_{SI,t}$	$\breve{R}_{UK,t}$	$\breve{R}_{AR,t}$	$\breve{R}_{BR,t}$	$\breve{R}_{CH,t}$	$\breve{R}_{ID,t}$	$\breve{R}_{MA,t}$	$\breve{R}_{ME,t}$
Coint.Eq.	**-0.021**	**-0.025**	0.019	**0.030**	**0.025**	**-0.014**	0.001	**-0.041**	-0.017	**0.035**	**0.095**	-0.011
S.E.	**0.006**	**0.008**	0.010	**0.008**	**0.009**	**0.007**	0.010	**0.016**	0.011	**0.017**	**0.012**	0.011
$\breve{R}_{US,t-1}$	**-0.106**	0.044	**0.149**	0.131	**0.165**	0.083	0.005	-0.016	-0.056	**0.217**	-0.012	0.000
S.E.	**0.050**	0.071	**0.066**	0.068	**0.061**	0.053	0.100	0.111	0.078	**0.100**	0.060	0.082
$\breve{R}_{GE,t-1}$	0.032	**-0.117**	0.094	-0.043	0.034	-0.059	0.076	0.033	0.080	0.055	**0.094**	0.044
S.E.	0.037	**0.056**	0.048	0.050	0.045	0.040	0.074	0.081	0.057	0.070	**0.044**	0.058
$\breve{R}_{HK,t-1}$	0.018	0.076	-0.051	0.034	0.017	**0.102**	0.109	**0.279**	0.018	0.037	0.016	0.059
S.E.	0.031	0.044	0.046	0.043	0.041	**0.033**	0.060	**0.074**	0.051	0.073	0.045	0.053
$\breve{R}_{JP,t-1}$	-0.029	0.025	-0.031	-0.060	0.023	0.007	-0.010	-0.078	-0.013	0.018	0.004	-0.089
S.E.	0.028	0.040	0.038	0.042	0.035	0.029	0.058	0.065	0.044	0.060	0.036	0.047
$\breve{R}_{SI,t-1}$	-0.004	-0.042	-0.027	-0.009	**-0.107**	-0.049	0.009	-0.085	-0.019	0.064	0.016	0.039
S.E.	0.032	0.046	0.049	0.046	**0.046**	0.034	0.066	0.079	0.051	0.078	0.048	0.057
$\breve{R}_{UK,t-1}$	0.028	0.061	-0.018	0.051	-0.038	-0.048	0.017	0.199	0.057	-0.172	-0.054	0.042
S.E.	0.050	0.073	0.064	0.068	0.059	0.055	0.101	0.112	0.078	0.095	0.059	0.080
$\breve{R}_{AR,t-1}$	-0.015	**0.021**	0.029	0.016	**0.048**	-0.003	0.035	0.032	0.052	-0.027	0.025	0.048
S.E.	0.018	**0.028**	0.023	0.027	**0.022**	0.019	0.044	0.041	0.028	0.034	0.021	0.029
$\breve{R}_{BR,t-1}$	-0.002	0.012	-0.006	0.001	-0.013	-0.011	0.009	-0.096	0.005	**0.065**	0.010	-0.020
S.E.	0.019	0.028	0.025	0.027	0.023	0.020	0.040	0.045	0.030	**0.039**	0.024	0.031
$\breve{R}_{CH,t-1}$	**-0.068**	**-0.071**	**-0.074**	**-0.069**	**-0.073**	**-0.083**	**-0.145**	**-0.129**	0.005	**-0.118**	0.002	**-0.097**
S.E.	**0.020**	**0.029**	**0.027**	**0.029**	**0.025**	**0.022**	**0.041**	**0.046**	0.036	**0.043**	0.026	**0.034**
$\breve{R}_{ID,t-1}$	0.014	-0.008	-0.043	-0.009	0.027	0.002	0.003	0.043	-0.031	0.030	**-0.063**	0.013
S.E.	0.014	0.019	0.023	0.021	0.021	0.015	0.030	0.037	0.022	0.041	**0.024**	0.026
$\breve{R}_{MA,t-1}$	0.028	0.051	**0.085**	0.015	**0.132**	**0.056**	0.044	0.071	0.069	0.069	**0.089**	0.028
S.E.	0.023	0.031	**0.035**	0.030	**0.032**	**0.023**	0.044	0.056	0.036	0.058	**0.040**	0.040
$\breve{R}_{ME,t-1}$	0.031	-0.024	-0.002	-0.025	0.014	0.014	-0.035	-0.099	-0.056	-0.002	0.010	-0.048
S.E.	0.028	0.040	0.038	0.040	0.035	0.029	0.058	0.066	0.045	0.061	0.035	0.049

Numbers in bold face indicate the coefficient is significant at the 0.05 level.

5.6.2. Expected Return of Risky Assets

The estimated parameters and their standard errors in the VECM and VEC-GARCH model are different. Because the MGARCH error structure is assumed, the estimated expected returns are based on the VEC-GARCH model.

The statistics of the estimated expected return and realized return are presented in Table 5-6. In general, emerging stock markets such as Brazil, China, and Mexico had higher expected returns, yet they were also more volatile than those in the developed markets. Several economic crises and recessions took place during the observation period, such that the averages of expected returns in most countries were negative. The long period of recession in Japan caused both its realized and expected returns to be negative. In emerging markets, only the stock market in Argentina consistently had negative expected and realized returns.

Table 5-6: Annualized Weekly Statistics

Realized Return	US	GE	HK	JP	SI	UK	AR	BR	CH	ID	MA	ME
Mean	0.024	0.034	0.015	-0.030	0.033	0.004	-0.029	0.044	0.056	0.020	0.014	0.096
Std.Dev.	0.178	0.265	0.255	0.225	0.255	0.199	0.367	0.397	0.238	0.430	0.275	0.295
Expected Return*	US	GE	HK	JP	SI	UK	AR	BR	CH	ID	MA	ME
Mean	0.008	-0.001	-0.005	-0.014	-0.010	0.002	-0.006	0.000	0.002	-0.005	-0.031	-0.001
Std.Dev.	0.026	0.033	0.048	0.035	0.061	0.031	0.057	0.081	0.037	0.081	0.076	0.039

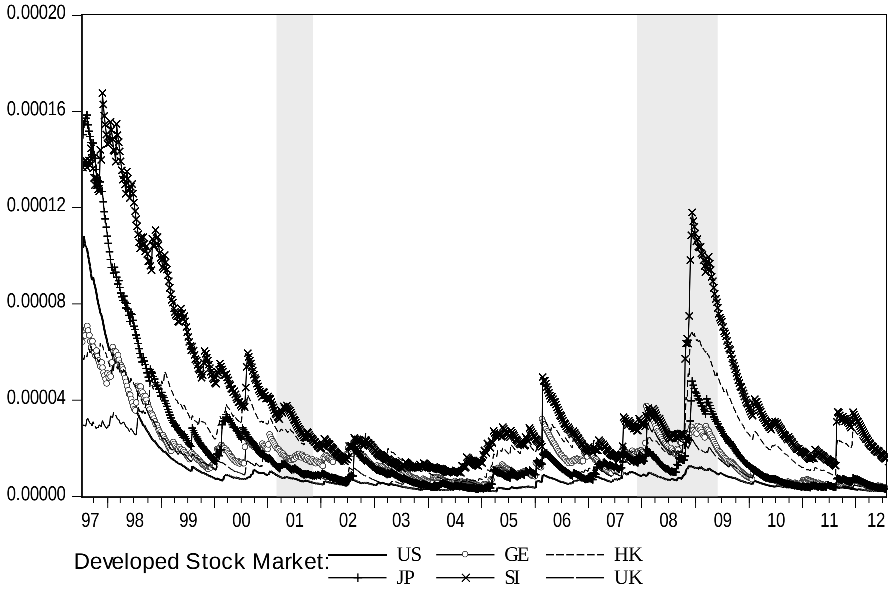
**The estimated expected return was estimated by VEC-GARCH using modified FGLS estimator*

5.6.3. Conditional Variance of Risky Assets

Conditional variances for each market expected return were estimated using the Diagonal BEKK model of Engle and Kroner (1995) as specified in equation (5.2), and the results are shown in Figures 5-1 and 5-2 for developed and emerging markets, respectively.

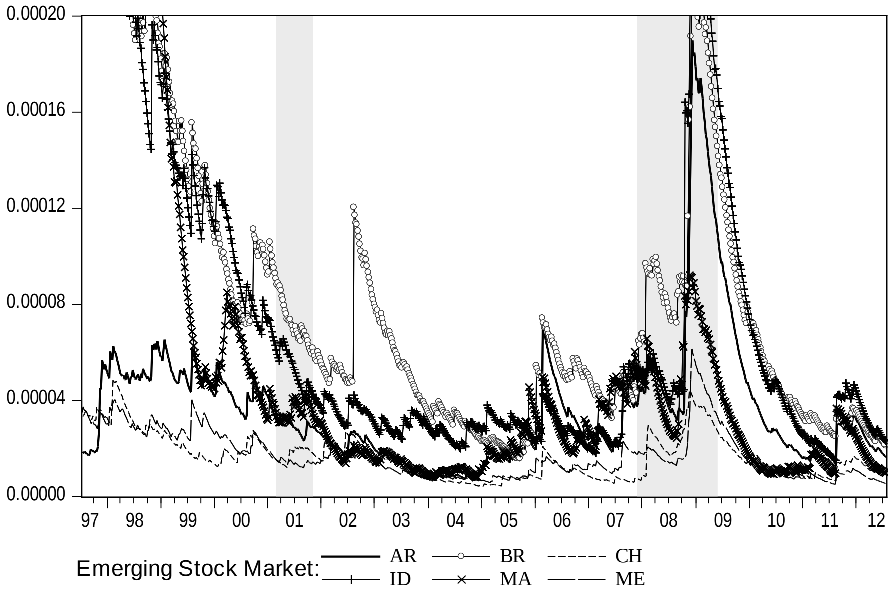
The figures show that the conditional variances were increasing during periods of crises, yet the magnitudes varied across the samples. For example, non-Asian developed and emerging stock markets were less affected by the Asian financial crisis in 1997–1998. However, the US financial crisis in 2008–2009 seems to have spilled over to other markets and Asian markets were becoming more volatile in that period. Emerging markets apparently show higher volatility than that in developed markets. The different magnitudes of volatility indicate that there is opportunity to obtain lower diversifiable risk by investing in those markets. This could be the driving factor of stronger price comovements and stock market integration.

Figure 5-1: Conditional Variance of Estimated Expected Return in Developed Markets



Note: The shaded area is the US recession period (based on NBER Business Cycle Dating Committee report, the last update was on September 20, 2010).

Figure 5-2: Conditional Variance of Estimated Expected Return in Emerging Markets



Note: The scale was trimmed to conform to that in Figure 5-1. The shaded area is the US recession period (based on NBER Business Cycle Dating Committee report, last update was on September 20, 2010).

5.6.4. Test of International CAPM

The *ex-ante* and *ex-post* tests for the CAPM were carried out under both SUR (without GARCH) and SUR-GARCH. The results are shown in Tables 5-7 and 5-8, respectively. In the *ex-ante* test (Table 5-7), the null hypotheses H_0^1 and H_0^2 are all rejected; they indicate that CAPM does not work well for international assets, and the market risk premiums are heterogeneous across the markets. However, individual tests of the hypothesis that $\hat{\alpha}_i = 0$ (*t*-test) show that CAPM can be applied for pricing of all market indexes (except for the Malaysian market). Even under the SUR-GARCH test, all alphas are not statistically different from zero. It is probable that the rejections of H_0^1 were caused by large differences in the standard errors[2]. This is an indication that the market risk premium adjustments across the markets were quite variable during the observation period. The results suggest that removing some markets from the sample might alter the verdict that the CAPM does not fit well for international asset pricing.

Table 5-7: *Ex-Ante* International Dynamic Beta CAPM Test

	SUR				SUR-GARCH			
	Coef.	S.E.	t-Stat.	Prob.	Coef.	S.E.	t-Stat.	Prob.
$\hat{\alpha}_{US}$	0.000	0.000	1.885	0.059	0.000	0.000	0.279	0.781
$\hat{\theta}_{US}$	**0.021**	**0.000**	**51.835**	**0.000**	**0.021**	**0.000**	**74.689**	**0.000**
$\hat{\alpha}_{GE}$	0.000	0.000	1.144	0.253	0.000	0.000	-1.152	0.252
$\hat{\theta}_{GE}$	**0.022**	**0.000**	**65.176**	**0.000**	**0.022**	**0.000**	**95.359**	**0.000**
$\hat{\xi}_{GE}$	-0.002	0.003	-0.596	0.552	-0.001	0.002	-0.564	0.574
$\hat{\alpha}_{HK}$	0.000	0.000	0.180	0.857	0.000	0.000	1.747	0.084
$\hat{\theta}_{HK}$	**0.022**	**0.000**	**70.061**	**0.000**	**0.022**	**0.000**	**104.130**	**0.000**
$\hat{\xi}_{HK}$	0.066	0.056	1.175	0.240	**0.063**	**0.031**	**2.032**	**0.045**
$\hat{\alpha}_{JP}$	**0.000**	**0.000**	**-2.233**	**0.026**	0.000	0.000	0.165	0.869
$\hat{\theta}_{JP}$	**0.022**	**0.000**	**71.136**	**0.000**	**0.021**	**0.000**	**105.469**	**0.000**
$\hat{\xi}_{JP}$	0.002	0.003	0.829	0.407	0.002	0.002	0.951	0.344
$\hat{\alpha}_{SI}$	0.000	0.000	-0.349	0.727	0.000	0.000	0.293	0.770
$\hat{\theta}_{SI}$	**0.024**	**0.000**	**67.676**	**0.000**	**0.023**	**0.000**	**101.945**	**0.000**
$\hat{\xi}_{SI}$	0.018	0.010	1.765	0.078	**0.012**	**0.006**	**2.037**	**0.044**
$\hat{\alpha}_{UK}$	0.000	0.000	1.751	0.080	0.000	0.000	0.043	0.966
$\hat{\theta}_{UK}$	**0.022**	**0.000**	**71.038**	**0.000**	**0.022**	**0.000**	**103.266**	**0.000**
$\hat{\xi}_{UK}$	0.001	0.003	0.465	0.642	0.002	0.002	0.822	0.413
$\hat{\alpha}_{AR}$	0.000	0.000	-0.122	0.903	0.000	0.000	0.053	0.958
$\hat{\theta}_{AR}$	**0.023**	**0.000**	**81.410**	**0.000**	**0.022**	**0.000**	**121.855**	**0.000**
$\hat{\xi}_{AR}$	0.000	0.003	-0.098	0.922	0.000	0.002	-0.143	0.886
$\hat{\alpha}_{BR}$	0.000	0.000	0.820	0.412	0.000	0.000	-1.226	0.223
$\hat{\theta}_{BR}$	**0.023**	**0.000**	**62.376**	**0.000**	**0.022**	**0.000**	**92.981**	**0.000**
$\hat{\xi}_{BR}$	0.000	0.005	-0.007	0.994	0.001	0.003	0.253	0.801
$\hat{\alpha}_{CH}$	0.000	0.000	-0.298	0.766	0.000	0.000	-1.898	0.061
$\hat{\theta}_{CH}$	**0.022**	**0.000**	**75.680**	**0.000**	**0.021**	**0.000**	**102.483**	**0.000**
$\hat{\xi}_{CH}$	-0.040	0.023	-1.710	0.087	-0.011	0.015	-0.749	0.455
$\hat{\alpha}_{ID}$	0.000	0.000	-0.721	0.471	0.000	0.000	0.426	0.671
$\hat{\theta}_{ID}$	**0.024**	**0.000**	**67.258**	**0.000**	**0.023**	**0.000**	**103.701**	**0.000**
$\hat{\xi}_{ID}$	0.003	0.002	1.471	0.141	0.003	0.001	1.943	0.055
$\hat{\alpha}_{MA}$	**-0.001**	**0.000**	**-2.937**	**0.003**	0.000	0.000	0.765	0.446
$\hat{\theta}_{MA}$	**0.024**	**0.000**	**53.605**	**0.000**	**0.023**	**0.000**	**91.641**	**0.000**
$\hat{\xi}_{MA}$	0.008	0.008	0.929	0.353	0.004	0.005	0.774	0.441
$\hat{\alpha}_{ME}$	0.000	0.000	-0.348	0.728	0.000	0.000	-1.380	0.171
$\hat{\theta}_{ME}$	**0.022**	**0.000**	**69.672**	**0.000**	**0.022**	**0.000**	**99.530**	**0.000**
$\hat{\xi}_{ME}$	0.000	0.003	-0.126	0.900	0.000	0.002	-0.177	0.860
Coefficients Wald Test								
Null Hypothesis		d.f.	Chi-sq	Prob.		d.f.	Chi-sq	Prob.
$\hat{\alpha}_i = 0, \forall i$		12	**30.843**	**0.002**		12	**26.463**	**0.009**
$\lvert\hat{\gamma}_1\rvert = \lvert\hat{\gamma}_2\rvert = \cdots = \lvert\hat{\gamma}_N\rvert$		11	**69.525**	**0.000**		11	**174.795**	**0.000**

Numbers in bold face indicate the coefficient is significant at the 0.05 level.

[2] The differences in the standard errors cannot be seen in the tables because the numbers were rounded to only three decimals.

Table 5-8: *Ex-Post* International Dynamic Beta CAPM Test

	SUR				SUR-GARCH			
	Coef.	S.E.	t-Stat.	Prob.	Coef.	S.E.	t-Stat.	Prob.
$\hat{\alpha}_{US}$	0.000	0.001	0.199	0.842	0.000	0.000	0.670	0.504
$\hat{\theta}_{US}$	-0.019	0.003	-6.893	**0.000**	-0.015	0.002	-8.040	**0.000**
$\hat{\alpha}_{GE}$	0.000	0.001	0.219	0.827	0.000	0.001	0.472	0.638
$\hat{\theta}_{GE}$	-0.017	0.003	-6.124	**0.000**	-0.011	0.002	-5.722	**0.000**
$\hat{\xi}_{GE}$	0.644	0.051	12.604	**0.000**	0.652	0.036	18.327	**0.000**
$\hat{\alpha}_{HK}$	0.000	0.001	-0.346	0.729	0.000	0.001	-0.222	0.825
$\hat{\theta}_{HK}$	-0.006	0.003	-1.792	0.073	-0.002	0.002	-0.793	0.430
$\hat{\xi}_{HK}$	1.300	0.830	1.566	0.117	1.782	0.485	3.672	**0.000**
$\hat{\alpha}_{JP}$	-0.001	0.001	-1.316	0.188	-0.002	0.001	-2.260	**0.026**
$\hat{\theta}_{JP}$	-0.011	0.003	-3.260	**0.001**	-0.007	0.002	-3.027	**0.003**
$\hat{\xi}_{JP}$	0.658	0.062	10.635	**0.000**	0.623	0.045	13.819	**0.000**
$\hat{\alpha}_{SI}$	-0.001	0.001	-0.737	0.461	0.000	0.001	-0.007	0.994
$\hat{\theta}_{SI}$	-0.003	0.003	-0.977	0.329	0.000	0.002	0.023	0.981
$\hat{\xi}_{SI}$	1.227	0.102	11.996	**0.000**	1.112	0.061	18.143	**0.000**
$\hat{\alpha}_{UK}$	0.000	0.001	0.236	0.813	0.000	0.000	0.150	0.881
$\hat{\theta}_{UK}$	-0.018	0.002	-7.196	**0.000**	-0.012	0.002	-7.459	**0.000**
$\hat{\xi}_{UK}$	0.653	0.040	16.178	**0.000**	0.661	0.027	24.050	**0.000**
$\hat{\alpha}_{AR}$	-0.002	0.002	-0.928	0.353	-0.002	0.001	-1.898	0.061
$\hat{\theta}_{AR}$	0.008	0.004	2.189	**0.029**	0.008	0.003	3.051	**0.003**
$\hat{\xi}_{AR}$	0.345	0.072	4.759	**0.000**	0.462	0.077	6.027	**0.000**
$\hat{\alpha}_{BR}$	-0.001	0.002	-0.408	0.683	0.001	0.001	0.591	0.556
$\hat{\theta}_{BR}$	-0.005	0.003	-1.717	0.086	-0.005	0.002	-2.877	**0.005**
$\hat{\xi}_{BR}$	1.037	0.054	19.222	**0.000**	1.050	0.035	30.399	**0.000**
$\hat{\alpha}_{CH}$	0.000	0.001	-0.350	0.726	-0.001	0.001	-0.647	0.519
$\hat{\theta}_{CH}$	0.002	0.004	0.568	0.570	0.005	0.003	1.558	0.122
$\hat{\xi}_{CH}$	0.853	0.736	1.159	0.247	1.389	0.524	2.652	**0.009**
$\hat{\alpha}_{ID}$	0.000	0.002	-0.078	0.938	0.003	0.001	2.919	**0.004**
$\hat{\theta}_{ID}$	-0.001	0.003	-0.424	0.671	0.001	0.002	0.476	0.635
$\hat{\xi}_{ID}$	0.978	0.035	28.243	**0.000**	1.064	0.032	33.572	**0.000**
$\hat{\alpha}_{MA}$	0.000	0.001	-0.276	0.783	0.001	0.001	1.404	0.163
$\hat{\theta}_{MA}$	-0.004	0.004	-1.014	0.310	0.002	0.002	0.674	0.502
$\hat{\xi}_{MA}$	1.093	0.081	13.481	**0.000**	1.090	0.061	17.976	**0.000**
$\hat{\alpha}_{ME}$	0.002	0.001	1.391	0.164	0.003	0.001	3.718	**0.000**
$\hat{\theta}_{ME}$	-0.007	0.003	-2.307	**0.021**	-0.007	0.002	-3.845	**0.000**
$\hat{\xi}_{ME}$	1.128	0.071	15.891	**0.000**	1.067	0.042	25.520	**0.000**
Coefficients Wald Test								
Null Hypothesis		d.f.	Chi-sq	Prob.		d.f.	Chi-sq	Prob.
$\hat{\alpha}_i = 0, \forall i$		12	9.442	0.665		12	**45.876**	**0.000**
$\lvert\hat{\gamma}_1\rvert = \lvert\hat{\gamma}_2\rvert = \cdots = \lvert\hat{\gamma}_N\rvert$		11	**36.816**	**0.000**		11	**148.947**	**0.000**

Numbers in bold face indicate the coefficient is significant at the 0.05 level.

Both the homogeneity tests of the market risk premiums are rejected. It suggests that world stock markets are not yet fully integrated. Market risk is priced higher in Asian stock markets such as in Singapore, Indonesia, and Malaysia, than that in other markets. Meanwhile, in the US and Japan, the market risk premium is lower than that in the other markets.

Note that all market risk premiums are nonnegative. This is the expected result. It indicates that the constructed world market portfolio is always in the efficient frontier and is at the tangency of capital market line.

The effects of changes in currency exchange rates seem to be absorbed by the market risk factor. Under the SUR-GARCH test, the additional required rate of return to compensate for the exchange rate risk is only applied for assets from Hong Kong and the Singapore stock market. This result indicates that the market risk (beta) is still the only relevant risk factor in the International CAPM (provided that unintegrated stock markets were removed from the sample such that H_0^1 could not be rejected).

The *ex-post* test presented in Table 5-8 examined whether CAPM was applied in the market for pricing the international assets. The test was using realized or actual returns. From the table, CAPM fits well in pricing the assets when the multivariate GARCH error structure was ignored (the test under SUR). Testing the alphas individually should support the finding. However, from the data properties of the sample, the multivariate GARCH error structure does exist. Ignoring the error structure proved that the latter conclusion was inaccurate: when GARCH error structure was considered, the CAPM does not fit well! This result is consistent with previous findings, for example in Lewellen and Nagel (2006) and Wu and Chiou (2007). The latter paper used the Kalman filter method in testing the CAPM. Thus, this paper shows the applicability of the SUR-GARCH model using the modified FGLS estimator is simpler than that of other methods such as the Kalman filter.

As in the previous analysis in the *ex-ante* test, removing some stock market indexes might make CAPM work. Under the SUR-GARCH test, CAPM only failed to work for pricing the Japanese and Indonesian stock market returns. This research shows that constructing a world market portfolio from the twelve indexes leads to an inapplicable CAPM. Finding the stock market indexes that make CAPM work is a subject of future research.

The realized market risk premiums are also heterogeneous. Some of the market risk premiums are negative. They indicate that those index returns have negative covariance with the world market portfolio. This is as a result of allowing the short selling. Moreover, this result also suggests that the stock markets were not fully integrated yet. The price of the market risk for the assets varies. In addition, the exchange rate risk is also priced differently for the market indexes. It indicates that beta risk is not the only risk factor considered by investors. Multi-factor CAPM may be applied in the markets.

The use of the SUR framework in testing CAPM is justified by the fact that residuals of the model are cross-sectionally correlated. Table 5-9 below shows that the residuals in some markets are correlated with those in the other markets. The table indicates that idiosyncratic risks of the markets are neither perfectly correlated nor uncorrelated: the markets are indeed just partially integrated. The benefit of this situation is that an internationally diversified portfolio may still be useful in reducing or even removing the diversifiable risk.

Table 5-9: Residuals Cross-Correlations of SUR-GARCH Models

	US	GE	HK	JP	SI	UK	AR	BR	CH	ID	MA	ME
US		0.779	0.572	0.506	0.478	0.779	0.478	0.555	0.071	0.193	0.217	0.610
		0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.047*	*0.000*	*0.000*	*0.000*
GE	0.443		0.566	0.544	0.511	0.815	0.468	0.524	0.080	0.274	0.252	0.579
	0.000		*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.025*	*0.000*	*0.000*	*0.000*
HK	0.013	0.180		0.547	0.714	0.632	0.409	0.482	0.208	0.351	0.386	0.510
	0.706	*0.000*		*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
JP	-0.167	0.214	0.669		0.506	0.522	0.342	0.403	0.060	0.338	0.287	0.449
	0.000	*0.000*	*0.000*		*0.000*	*0.000*	*0.000*	*0.000*	*0.095*	*0.000*	*0.000*	*0.000*
SI	0.034	0.321	0.720	0.616		0.529	0.373	0.399	0.155	0.433	0.495	0.437
	0.348	*0.000*	*0.000*	*0.000*		*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
UK	0.478	0.835	0.278	0.344	0.477		0.506	0.530	0.098	0.270	0.229	0.557
	0.000	*0.000*	*0.000*	*0.000*	*0.000*		*0.000*	*0.000*	*0.006*	*0.000*	*0.000*	*0.000*
AR	0.368	0.477	0.611	0.530	0.758	0.540		0.563	0.100	0.266	0.210	0.557
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		*0.000*	*0.005*	*0.000*	*0.000*	*0.000*
BR	0.530	0.562	0.147	0.218	0.342	0.526	0.653		0.091	0.277	0.188	0.613
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*		*0.011*	*0.000*	*0.000*	*0.000*
CH	0.233	0.341	0.422	-0.022	0.338	0.074	0.527	0.513		0.090	0.062	0.030
	0.000	*0.000*	*0.000*	*0.541*	*0.000*	*0.037*	*0.000*	*0.000*		*0.012*	*0.081*	*0.397*
ID	0.011	0.168	0.571	0.559	0.822	0.420	0.768	0.200	0.121		0.492	0.282
	0.762	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.001*		*0.000*	*0.000*
MA	-0.420	-0.236	0.532	0.617	0.561	-0.036	0.378	-0.152	0.068	0.603		0.238
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.318*	*0.000*	*0.000*	*0.057*	*0.000*		*0.000*
ME	0.542	0.450	0.431	0.436	0.478	0.439	0.791	0.794	0.544	0.404	0.051	
	0.000	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*	*0.150*	

Note: The lower triangular elements are residual cross-correlations of the ex-ante *model, while the upper triangular elements are those of the* ex-post *model. The italic numbers represent p-values.*

5.7. Conclusions

A conditional International CAPM was tested under assumptions of unrestricted short selling and borrowing at riskless rates such that the constructed world market portfolio is a mean-variance efficient portfolio at the tangency of the capital market line. Previous studies that attempt to test the CAPM for international assets were using a readily available index that was subject to the critique that the market portfolio was not mean-variance efficient. By constructing the world market portfolio that meets the assumptions, we could find estimates for both the expected return and the conditional variance of that portfolio, but also the conditional covariance between the world market portfolio and its composing portfolios (national stock market indices), such that time varying betas for each international asset can be estimated. Thus, all the assumptions used in building the CAPM were met so that the test of the model can be emphasized on the estimated parameters of the model.

The test of the international asset-pricing model was carried out under the SUR framework, such that CAPM is testable under both fully integrated and partially integrated markets. Furthermore, because crises, recessions, and other market shocks happened during the observation period from 1997:7 until 2012:7, heteroscedasticity of the errors is expected, and the sample data properties confirm this. To consider the covariance and the heteroscedasticity, the time varying beta CAPM was tested under the SUR-GARCH model. In the *ex-ante* test, CAPM is rejected, but the individual analysis of the assets showed that CAPM may be applied for all the assets. It indicates that the risk premium adjustments were carried out during the period of analysis, and the levels of adjustments varied across the assets. The market risk is also priced differently for each asset, and that indicates markets are not yet fully integrated. However, the exchange rate risk is not significantly affecting the expected excess returns. This shows that theoretically CAPM is correct, and that the only risk factor worth considering is the market risk (beta). However, in the real world, the *ex-post* tests show that CAPM failed in pricing the international assets and suggest that other risk factors might exist.

The findings are subject to the stock market index selection for constructing the world market portfolio. In addition, CAPM might also work under sub-sample periods, for example in non-recession periods. Finding the structural break point under SUR-GARCH is also a challenge on the econometric side. These issues should be addressed in future research.

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Chapter 6

ESTIMATION OF VECTOR ERROR CORRECTION MODEL WITH GARCH ERRORS

ESTIMATION OF VECTOR ERROR CORRECTION MODEL WITH GARCH ERRORS[*]

ABSTRACT

The standard vector error correction (VEC) model assumes the iid normal distribution of disturbance term in the model. This paper extends this assumption to include GARCH process. We call this model as VEC-GARCH model. However as the number of parameters in a VEC-GARCH model is large, the maximum likelihood (ML) method is computationally demanding. To overcome these computational difficulties, this paper searches for alternative estimation methods and compares them by Monte Carlo simulation. As a result a feasible generalized least square (FGLS) estimator shows comparable performance to ML estimator. Furthermore an empirical study is presented to see the applicability of the FGLS.

6.1. Introduction

Vector Error correction (VEC) model is often used in econometric analysis and estimated by maximum likelihood (ML) method under the normality assumption. ML estimator is known as the most efficient estimator under the *iid* normality assumption. However there are disadvantages such that the normality assumption is often violated in real date, especially in financial time series, and that ML estimation is computationally demanding for a large model. Furthermore in our experience of empirical study error terns in VEC model often show a GARCH phenomenon, which violates *iid* assumption. To overcome these disadvantages and to reduce computational burden of ML estimator it may be worthwhile to reconsider the feasible generalized least square (FGLS) estimator instead of ML estimator (MLE) because FGLS method is relatively free from the distributional assumptions and ease computational burden.

The purpose of this paper is to examine the finite sample properties of FGLS estimator in VEC-GARCH model by Monte Carlo simulation and by real data analysis of the international financial time series. The paper is organized as follows:

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Section 6.2 briefly surveys the multivariate GARCH (MGARCH hereafter) model; Section 6.3 describes VEC representation of the vector autoregressive (VAR) model; Section 6.4 presents a VEC-GARCH model and shows that this model can be estimated by FGLS within the framework of the seemingly unrelated regression (SUR) model; Section 6.5 examines the performance of FGLS by Monte Carlo simulation; Section 6.6 presents an empirical application of VEC-GARCH model and shows the applicability of FGLS; finally Section 6.7 gives some concluding remarks.

6.2. Multivariate GARCH

Multivariate GARCH model has been developed and applied in financial econometrics and numerous literature were published. The recent development in this area were surveyed by Bauwens, L., S. Laurent and J. V. K. Rombouts (2006) and T. Teräsvirta (2009) . Before investigating MGARCH model in this paper we briefly introduce MGARCH model focusing on relevant MGARCH models in our study.

6.2.1. vech-GARCH Model

The univariate GARCH model has been generalized to *N*-variable multivariate GARCH models in many ways. The most straightforward generalization is the following *vech*-GARCH model by Bollerslev, Engle, and Woodridge (1988):

$$r_t = H_t^{1/2}\eta_t \ \ with\, E(r_t) = 0,\ \ E(\eta_t\eta_t') = I \tag{6.1}$$

where $r_t = (r_{1t}, \cdots, r_{it}, \cdots, r_{Nt})'$, and r_t is assumed to follows a multivariate normal distribution $N(0, H_t)$. An element of the variance covariance matrix H_t is denoted by h_{ijt} :$H_t = \left[h_{ijt}\right]$. In the most general *vech*-GARCH model $vech(H_t)$ is given by

$$vech(H_t) = c + \sum_{j=1}^{q} A_j\, vech\left(r_{t-j}r_{t-j}'\right) + \sum_{j=1}^{p} B_j\, vech\left(H_{t-j}\right) \tag{6.2}$$

where $vech(\cdot)$ is an operator that vectorizes a symmetric matrix. We briefly illustrate the 2-variable case (*N*=2) for simplicity. For *N*=2 and *p*=*q*=1 $vech(H_t)$ is written as follows:

$$vech\begin{pmatrix} h_{11,t} & h_{12,t} \\ h_{21,t} & h_{22,t} \end{pmatrix} = \left(h_{11,t}, h_{21,t}, h_{22,t}\right)',$$

and c is an $(N(N+1)/2)\times1=3\times1$ vector, and A_j and B_j are $N(N+1)/2\times N(N+1)/2=3\times3$ parameter matrices. Then $vech(H_t) := h_t$ is written as

$$h_t = \begin{bmatrix} h_{11,t} \\ h_{21,t} \\ h_{22,t} \end{bmatrix}$$

$$= \begin{bmatrix} c_{01} \\ c_{02} \\ c_{03} \end{bmatrix} + \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} r_{1,t-1}^2 \\ r_{1,t-1}r_{2,t-1} \\ r_{2,t-1}^2 \end{bmatrix} + \begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{bmatrix} \begin{bmatrix} h_{11,t-1} \\ h_{12,t-1} \\ h_{22,t-1} \end{bmatrix} \quad (6.3)$$

or

$$\begin{aligned} h_{11,t} &= c_{01} + a_{11}r_{1,t-1}^2 + a_{12}r_{1,t-1}r_{2,t-1} + a_{13}r_{2,t-1}^2 \\ &\quad + b_{11}h_{11,t-1} + b_{12}h_{12,t-1} + b_{13}h_{22,t-1} \\ h_{21,t} &= c_{02} + a_{21}r_{1,t-1}^2 + a_{22}r_{1,t-1}r_{2,t-1} + a_{23}r_{2,t-1}^2 \\ &\quad + b_{21}h_{11,t-1} + b_{22}h_{12,t-1} + b_{23}h_{22,t-1} \\ h_{22,t} &= c_{03} + a_{31}r_{1,t-1}^2 + a_{32}r_{1,t-1}r_{2,t-1} + a_{33}r_{2,t-1}^2 \\ &\quad + b_{31}h_{11,t-1} + b_{32}h_{21,t-1} + b_{33}h_{22,t-1} \end{aligned}$$

This representation is very general and flexible but there is a disadvantage that only a sufficient condition for the positive definiteness of the matrix H_t is known. Furthermore the number of parameters is $(p+q)(N(N+1)/2)^2 + N(N+1)/2$ which is large unless N is small. For example, if $p = q = 1$ and $N = 2$, the number of parameters is 21, if N=3 it is 78. This may cause computational difficulties.

6.2.2. Diagonal vech Model

To reduce such disadvantages mentioned above Bollerslev, Engle, and Wooldridge (1988) proposed diagonal *vech* model in which the coefficient matrices A_j and B_j are assumed diagonal. In this case the number of parameters is reduced to $(p+q+1)N(N+1)/2)$. For example, if $p = q = 1$ and $N = 2$ then the number is 9, and if N=3 it is 8. Furthermore, in this case the necessary and sufficient conditions for the positive definiteness of H_t are obtained by Bollerslev, Engle, and Nelson (1994). The variance equation (6.3) is simplified as follows:

$$h_t = \begin{bmatrix} h_{11,t} \\ h_{21,t} \\ h_{22,t} \end{bmatrix} = \begin{bmatrix} c_{01} \\ c_{02} \\ c_{03} \end{bmatrix} + \begin{bmatrix} a_{11} & 0 & 0 \\ 0 & a_{22} & 0 \\ 0 & 0 & a_{33} \end{bmatrix} \begin{bmatrix} r_{1,t-1}^2 \\ r_{1,t-1}r_{2,t-1} \\ r_{2,t-1}^2 \end{bmatrix} + \begin{bmatrix} b_{11} & 0 & 0 \\ 0 & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix} \begin{bmatrix} h_{11,t-1} \\ h_{21t-1} \\ h_{22,t-1} \end{bmatrix}$$

or

$$h_{11,t} = c_{01} + a_{11}r_{1,t-1}^2 + b_{11}h_{11,t-1}$$
$$h_{21,t} = c_{02} + a_{22}r_{1,t-1}r_{2,t-1} + b_{22}h_{21,t-1}$$
$$h_{22,t} = c_{02} + a_{22}r_{2,t-1}^2 + b_{33}h_{22,t-1}$$

6.2.3. BEKK Model

To ensure the positive definiteness of H_t Engle and Kroner (1995) proposed a following model called as Baba-Engle-Kraft-Kroner (BEKK) model.

$$\mathrm{H_t} = \mathrm{CC'} + \sum_{j=1}^{q}\sum_{k=1}^{K} \mathrm{A'_{kj}}\, \mathrm{r_{t-j}r'_{t-j}A_{kj}} + \sum_{j=1}^{q}\sum_{k=1}^{K} \mathrm{B'_{kj}H_{t-j}B_{kj}} \qquad (6.4)$$

where A_{kj}, B_{kj}, C are $N \times N$ coefficient matrices, C is a lower triangular matrix. Although this decomposition of the constant term can ensure the positive definiteness of H_t, which is the advantage of this model, the number of parameters is quite large. Because of this, estimation of this model is often infeasible for a large model. When *K*=1 this model is written as

$$H_t = CC' + A'r_{t-1}r'_{t-1}A + B'H_{t-1}B \qquad (6.5)$$

In this case the number of parameters is *np*= $(\mathrm{p}+\mathrm{q})\mathrm{N}^2 + \mathrm{N}(\mathrm{N}+1)/2$. If $p = q = 1$ and *N*=2, then $np = 11$, and $np = 24$ for *N*=3. If $N \geq 4$ it may not be feasible to estimate this model. To reduce number of parameters it is common and popular to assume that the coefficient matrices *A*, *B* are diagonal. This model is called Diagonal BEKK model (Engle and Kroner (1995)). In this model *np*=$(p+q)N + N(N+1)/2$. If $p = q = 1$ and *N*=2, then $n\mathrm{p} = 7$, and $np = 12$ for *N*=3. For small size Diagonal BEKK model the calculation is feasible. However, even in Diagonal BEKK model, *np* will be large when *N* is not small. For example, *np*=35 when $p = q = 1$ and *N*=5.

We illustrate several versions of (6.5) for a simple case *N*=2 and *K*=1:

Unrestricted BEKK. In this case the variance covariance matrix $\mathrm{H_t} = \begin{bmatrix} \mathrm{h_{11,t}} & \mathrm{h_{12,t}} \\ \mathrm{h_{21,t}} & \mathrm{h_{22,t}} \end{bmatrix}$ is expressed as

$$\mathrm{H_t} = \begin{bmatrix} \mathrm{c_{11}} & 0 \\ \mathrm{c_{21}} & \mathrm{c_{22}} \end{bmatrix}\begin{bmatrix} \mathrm{c_{11}} & \mathrm{c_{21}} \\ 0 & \mathrm{c_{22}} \end{bmatrix} + \begin{bmatrix} \mathrm{a_{11}} & \mathrm{a_{12}} \\ \mathrm{a_{21}} & \mathrm{a_{22}} \end{bmatrix}' \begin{bmatrix} \mathrm{r_{1,t-1}^2} & \mathrm{r_{1,t-1}r_{2,t-1}} \\ \mathrm{r_{2,t-1}r_{1,t-1}} & \mathrm{r_{2,t-1}^2} \end{bmatrix}\begin{bmatrix} \mathrm{a_{11}} & \mathrm{a_{12}} \\ \mathrm{a_{21}} & \mathrm{a_{22}} \end{bmatrix}$$
$$+ \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}' H_{t-1} \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$$

or

$$h_{11,t} = c_{11}^2 + a_{11}^2 r_{1,t-1}^2 + 2a_{11}a_{21}r_{1,t-1}r_{2,t-1} + a_{21}^2 r_{2,t-1}^2 + b_{11}^2 h_{11,t-1}$$
$$+2b_{11}b_{21}h_{12,t-1} + b_{21}^2 h_{22,t-1}$$
$$h_{12,t} = c_{11}c_{21} + a_{11}a_{12}r_1^2 + \left(a_{21}a_{12} + a_{11}a_{22}\right)r_1 r_2 + a_{21}a_{12}r_2^2 + b_{11}b_{12}h_{11,t-1}$$
$$+\left(b_{21}b_{12} + b_{11}b_{22}\right)h_{12,t-1} + b_{21}b_{12}h_{22,t-1}$$
$$h_{22,t} = c_{12}^2 + c_{22}^2 + a_{12}^2 r_1^2 + 2a_{12}a_{22}r_1 r_2 + a_{22}^2 r_2^2 + b_{12}^2 h_{11,t-1}$$
$$+2b_{12}b_{22}h_{12,t-1} + b_{22}^2 r_2^2$$

where H_t is positive definite by construction.

Diagonal BEKK is expressed as

$$\mathrm{H_t} = \begin{bmatrix} \mathrm{c}_{11} & 0 \\ 0 & \mathrm{c}_{22} \end{bmatrix} \begin{bmatrix} \mathrm{c}_{11} & 0 \\ 0 & \mathrm{c}_{22} \end{bmatrix} + \begin{bmatrix} \mathrm{a}_{11} & 0 \\ 0 & \mathrm{a}_{22} \end{bmatrix}' \begin{bmatrix} \mathrm{r}_{1,\mathrm{t}-1}^2 & \mathrm{r}_{1,\mathrm{t}-1}\mathrm{r}_{2,\mathrm{t}-1} \\ \mathrm{r}_{2,\mathrm{t}-1}\mathrm{r}_{1,\mathrm{t}-1} & \mathrm{r}_{2,\mathrm{t}-1}^2 \end{bmatrix} \begin{bmatrix} \mathrm{a}_{11} & 0 \\ 0 & \mathrm{a}_{22} \end{bmatrix}$$
$$+ \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix}' H_{t-1} \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix}$$

or

$$h_{11,t} = c_{11}^2 + a_{11}^2 r_{1,t-1}^2 + b_{11}^2 h_{11,t-1}$$
$$h_{12,t} = a_{11}a_{22}r_{1,t-1}r_{2,t-1} + b_{11}b_{22}h_{12,t-1}$$
$$h_{22,t} = c_{22}^2 + a_{22}^2 r_{2,t-1}^2 + b_{22}^2 h_{2,t-1}$$

where $h_{ij,t}$ in these variance covariance equations only depend on their own lagged values $h_{ij,t-1}$.

Engle and Kroner (1995) shows that the diagonal *vech* and the diagonal BEKK are equivalent as follows: By stacking the diagonal elements of A and B of the diagonal vech model, i.e.,

$$\alpha = (a_{11}, a_{22}, a_{33})', \qquad \beta = (b_{11}, b_{22}, b_{33})'$$

and write

$$\Sigma_\mathrm{t} = \mathrm{M} + \alpha\alpha' \odot \mathrm{r}_{\mathrm{t}-1}\mathrm{r}_{\mathrm{t}-1}' + \beta\beta' \odot \Sigma_{\mathrm{t}-1}$$

then it is easy to see that $vech(\Sigma_\mathrm{t})$ is identical to the diagonal *vech*.

There are many other types of multivariate GARCH model. They are surveyed, for example, in Bauwens, et al. (2006) and Silvennoinen and Terasvirta (2009).

Bollerslev, et al. (1988) introduced a restricted version of the general multivariate *vec* model of GARCH with following representation:

$$\mathrm{H_t} = \Omega + \mathrm{A} \odot \mathrm{r_{t-1}r'_{t-1}} + \mathrm{B} \otimes \mathrm{H_{t-1}}$$

where the operator $\odot$ is the Hadamard product and $\otimes$ is Kronecker Product. To ensure the positive semi-definiteness (PSD) there are several ways for specifying coefficient matrices. One example is to specify Ω, A, and B as products of Cholesky factorized triangular matrices. Such parameterization will be used in the latter section in this paper.

6.2.4. Log-Likelihood Function of vech-GARCH

If the distribution of errors η_t is a multivariate normal, then the log-likelihood function of (6.1) is given by

$$\sum_{t=1}^{T} l_t(\theta) = c - \frac{1}{2}\sum_{t=1}^{T} ln|H_t| - \frac{1}{2}\sum_{t=1}^{T} r_t' H_t^{-1} r_t \tag{6.6}$$

In calculating MLE we have to invert H_t at every time *t*. This is computationally tedious when *T* and *N* are not small. Furthermore H_t is often noninvertible.

6.3. VEC Representation of VAR Model

We consider *M*-variate and *k*-th order vector autoregressive time series Y_t $=[y_{1,t} \dots y_{i,t} \dots y_{M,t}]'$

$$\mathrm{Y_t} = \Pi_1 \mathrm{Y_{t-1}} + \cdots + \Pi_k \mathrm{Y_{t-k}} + \mathrm{r_t} \tag{6.7}$$

This model is called Vector Autoregressive (VAR) Model. The subscript *t* denotes time: $t = 1,2,\cdots,n$. The errors r_t are assumed to follows *iid* *M*-dimensional multivariate normal distribution $N(0, \Sigma)$. Note that Σ does not depend on time *t*. Later in this paper we consider the time dependent case, i.e., Σ_t. Now by introducing a $M \times M$ matrix Π defined by

$$\Pi = I_p - \Pi_1 - \cdots - \Pi_k$$

We can rewrite (6.7) as

$$\Delta Y_t = C^0 + \Pi Y_{t-1} + \Phi \Delta Y_{t-1} + r_t \tag{6.8}$$

where,

Y_{t-1} $= [y_{1,t-1} \dots y_{i,t-1} \dots y_{M,t-1}]'$: a vector of first order lagged of Y_t.

ΔY_t $= [\Delta y_{1,t}\ \Delta y_{2,t}\ ...\ \Delta y_{i,t}\ ...\ \Delta y_{M,t}]'$: a vector of first difference of Y_t at time *t*.

C^0 $= [c_1^0\ c_2^0\ ...\ c_i^0\ ...\ c_M^0]'$: a vector of constant terms.

r_t $= [r_1\ r_2\ ...\ r_M]'$: a vector of disturbance errors which is assumed *iid M*-dimensional multivariate normal distribution $N(0, \Sigma)$.

In what follows we consider a case in which all elements in Y_t are I(1). In this case as the left hand side variables $\Delta \mathrm{Y_t}$ are sationary I(0) the right hand side of (6.8) should be also stationary. To ensure the stationarity of the right hand side of (6.8), the rank of the coefficient matrix Π is less than M or rank(Π)<M. The reason is as follows: if rank(Π)=M then there exists Π^{-1} and the equation (6.8) can be solved for I(1) variable Y_{t-1} as a linear combination of stationary variables $\Delta \mathrm{Y_t}$ and $\Delta \mathrm{Y_{t-1}}$. This is a contradiction. This is because why rank(Π)<M. Under this rank condition Π can be decomposed as follows:

$$\Pi = AB,$$

where

A $= [a_1\ a_2\ ...\ a_i\ ...\ a_M]'$: vector of coefficients in cointegrating equation (loading matrix that contains adjustment parameters) and,

B $= [b_1\ b_2\ ...\ b_i\ ...\ b_M]$: a vector of cointegrating coefficient,

Φ $= \begin{bmatrix} \varphi_{11} & \cdots & \varphi_{1M} \\ \vdots & \ddots & \vdots \\ \varphi_{M1} & \cdots & \varphi_{MM} \end{bmatrix}$: a M by M matrix,

where BY_{t-1} is assured to be stationary (Granger's representation theorem). The stationarity of BY_{t-1} means that a linear combination of elements in Y_{t-1} is stationary, in such elements are called as co-integrated and B is called as co-integration vector. The coefficient matrix A is called as loading vector because A conveys cointegrated variables to the system.

6.4. Vector Error Correction with GARCH Errors (VEC-GARCH Model)

6.4.1. VECM with BEKK Errors

So far we have considered the standard Vector Error Correction Model (VECM), where a set of time series is nonstationary at level, but stationary at their first differences and $r_t \sim iid\ N(0, \Sigma)$. Matrix Π represents the long run relationship between the variables in Equation (6.8) and Johansen (1988) proposed a maximum likelihood estimation of (6.8) for the case of the rank of matrix $\Pi = k$, where $0 < k < M$.

In what follows, we relaxed the assumption of homoscedasticity of the errors. Instead, we assume that r_t has zero mean and time dependent variance-covariance matrix of H_t that has the BEKK GARCH structure as given by (6.6):

$$H_t = CC' + A'r_{t-1}r'_{t-1}A + BH_{t-1}B'.$$

6.4.2. SUR Representation

VEC model with GARCH errors can be represented by Seemingly Unrelated Regression (SUR) model as follows. SUR representation of VEC model seems to be worthwhile to consider. For simplicity we consider three-equation VEC model such as:

$$\Delta Y_t = \Pi Y_{t-1} + \Phi \Delta Y_{t-1} + r_t$$

or

$$\begin{bmatrix} \Delta Y_{1,t} \\ \Delta Y_{2,t} \\ \Delta Y_{3,t} \end{bmatrix} = \begin{bmatrix} \pi_{11} & \pi_{12} & \pi_{13} \\ \pi_{21} & \pi_{22} & \pi_{23} \\ \pi_{31} & \pi_{32} & \pi_{33} \end{bmatrix} \begin{bmatrix} Y_{1,t-1} \\ Y_{2,t-1} \\ Y_{3,t-1} \end{bmatrix} + \begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33} \end{bmatrix} \begin{bmatrix} \Delta Y_{1,t-1} \\ \Delta Y_{2,t-1} \\ \Delta Y_{3,t-1} \end{bmatrix} + \begin{bmatrix} r_{1,t-1} \\ r_{2,t-1} \\ r_{3,t-1} \end{bmatrix},$$

for t=1, 2, …, n.

Alternatively this system can be written as

$$\begin{aligned} \Delta Y_{1,\cdot} &= Y_{-1}\Pi'_1 + \Delta Y_{-1}\Phi'_1 + r_1 \\ \Delta Y_{2,\cdot} &= Y_{-1}\Pi'_2 + \Delta Y_{-1}\Phi'_2 + r_2 \\ \Delta Y_{3,\cdot} &= Y_{-1}\Pi'_3 + \Delta Y_{-1}\Phi'_3 + r_3 \end{aligned} \tag{6.9}$$

where Π_i and Φ_i are the ith row of Π and Φ respectively, i.e.,

$$\Pi = \begin{bmatrix} \pi_{11} & \pi_{12} & \pi_{13} \\ \pi_{21} & \pi_{22} & \pi_{23} \\ \pi_{31} & \pi_{32} & \pi_{33} \end{bmatrix} = \begin{bmatrix} \Pi_1 \\ \Pi_2 \\ \Pi_3 \end{bmatrix},\ \Phi = \begin{bmatrix} \phi_{11} & \phi_{12} & \phi_{13} \\ \phi_{21} & \phi_{22} & \phi_{23} \\ \phi_{31} & \phi_{32} & \phi_{33} \end{bmatrix} = \begin{bmatrix} \Phi_1 \\ \Phi_2 \\ \Phi_3 \end{bmatrix},$$

$$Y_{-1} = \begin{pmatrix} y_{11} & y_{21} & y_{31} \\ \vdots & \vdots & \vdots \\ y_{1,n-1} & y_{2,n-1} & y_{3,n-1} \end{pmatrix}, \qquad \Delta Y_{-1} = \begin{pmatrix} \Delta y_{11} & \Delta y_{21} & \Delta y_{31} \\ \vdots & \vdots & \vdots \\ \Delta y_{1,n-1} & \Delta y_{2,n-1} & \Delta y_{3,n-1} \end{pmatrix},$$

$\Delta Y_{i,\cdot} = [\Delta Y_{i,2}, \Delta Y_{i,3}, \dots, \Delta Y_{i,t}, \dots, \Delta Y_{i,n}]'$ and,

$r_i = [r_{i,2}, r_{i,3}, \dots, r_{i,t}, \dots, r_{i,n}]'$.

Defining new matrices X and β by

$$X = [Y_{-1}, \Delta Y_{-1}] \text{ and } \beta' = [\beta_1', \beta_2', \beta_3'],$$

the 3-equation VEC model (6.8) can be written as SUR model as follows:

$$\begin{bmatrix} \Delta Y_1 \\ \Delta Y_2 \\ \Delta Y_3 \end{bmatrix} = \begin{bmatrix} X & 0 & 0 \\ 0 & X & 0 \\ 0 & 0 & X \end{bmatrix} \beta + \begin{bmatrix} r_1 \\ r_2 \\ r_3 \end{bmatrix}.$$

We assume that $E(r) = 0$, $E(r_{is}, r_{it}) = 0$ for $s \neq t$, and the variance and covariance $E(r_{it}^2) = h_{iit}$ and $E\big(r_{it}, r_{jt}\big) = h_{ijt}$ follow MGARCH(1,1). Let us define $\Omega = E(rr')$, or in the complete form:

$$\Omega = \begin{bmatrix} \Omega_{11} & \Omega_{12} & \Omega_{13} \\ \Omega_{21} & \Omega_{22} & \Omega_{23} \\ \Omega_{31} & \Omega_{32} & \Omega_{33} \end{bmatrix}$$

where, Ω_{ij} is a n×n diagonal matrix where its main diagonal elements are elements of *n*-vector of $h_{ij,t}$ and zeros on the off diagonal elements and, $\Omega_{ij} = \Omega_{ji}$, i.e.,

$$\Omega_{ij} = \begin{bmatrix} h_{ij,1} & & & & \\ & \ddots & & 0 & \\ & & h_{ij,t} & & \\ & 0 & & \ddots & \\ & & & & h_{ij,n} \end{bmatrix}$$

Thus we have

$$\Omega = \left[\begin{array}{ccccc|ccccc|ccccc}
h_{11,1} & & & & & h_{12,1} & & & & & h_{13,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & h_{11,t} & & & & & h_{12,t} & & & & & h_{13,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & h_{11,n} & & & & & h_{12,n} & & & & & h_{13,n} \\ \hline
h_{21,1} & & & & & h_{22,1} & & & & & h_{23,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & h_{21,t} & & & & & h_{22,t} & & & & & h_{23,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & h_{21,n} & & & & & h_{22,n} & & & & & h_{23,n} \\ \hline
h_{31,1} & & & & & h_{32,1} & & & & & h_{33,1} & & & & \\
& \ddots & & 0 & & & \ddots & & 0 & & & \ddots & & 0 & \\
& & h_{31,t} & & & & & h_{32,t} & & & & & h_{33,t} & & \\
& 0 & & \ddots & & & 0 & & \ddots & & & 0 & & \ddots & \\
& & & & h_{31,n} & & & & & h_{32,n} & & & & & h_{33,n}
\end{array}\right]$$

where $h_{ij,t}$ follow multivariate MGARCH(1,1) process.

After obtaining an estimate $\widehat{\Omega}$, we have FGLS,

$$\widehat{\beta} = [X'\widehat{\Omega}^{-1}X]^{-1}X'\widehat{\Omega}^{-1}\Delta Y.$$

Note that inverting a large and sparse matrix Ω often causes computational problems such as memory size, computer time, and inaccurate numerical results. To avoid those problems we propose the following algorithm: After estimating MGARCH process we construct a relatively small matrix $\widehat{H}_t$ and its inverse $\widehat{H}_t^{-1}$ at each time *t* such that,

$$\widehat{H}_t = \begin{bmatrix} \hat{h}_{11,t} & \hat{h}_{12,t} & \hat{h}_{13,t} \\ \hat{h}_{21,t} & \hat{h}_{22,t} & \hat{h}_{23,t} \\ \hat{h}_{31,t} & \hat{h}_{32,t} & \hat{h}_{33,t} \end{bmatrix}, \text{and } \widehat{H}_t^{-1} = \begin{bmatrix} \hat{h}_t^{11} & \hat{h}_t^{12} & \hat{h}_t^{13} \\ \hat{h}_t^{21} & \hat{h}_t^{22} & \hat{h}_t^{23} \\ \hat{h}_t^{31} & \hat{h}_t^{32} & \hat{h}_t^{33} \end{bmatrix} \tag{6.10}$$

where $\widehat{H}_t$ and $\hat{h}_{ij,t}$ are estimated variance covariance of MGARCH.

Replacing $\hat{h}_{ij,t}$ with $\hat{h}_t^{ij}$ in $\hat{\Omega}$ we have easily obtain $\hat{\Omega}^{-1}$ without inverting a large matrix Ω.

6.5. Monte Carlo Simulation

6.5.1. Data generating Process (DGP)

Monte Carlo simulation is carried out by generating artificial data of three series. The data generating process (DGP) is repeated for 1000 times. We run the simulation for the number of observations *n*: 100, 300 and 500. For removing the initial value effect, we generate 2*n* observations for each series and remove the first half of the generated data in each simulation run. The true model for generating the data is specified as follows:

$$Y_t = PY_{t-1} + QY_{t-2} + r_t \tag{6.11}$$

or in stacked model it can be restated as,

$$\begin{bmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{bmatrix} = \begin{bmatrix} p_{11} & p_{12} & p_{13} \\ p_{21} & p_{22} & p_{23} \\ p_{31} & p_{32} & p_{33} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \\ y_{3t-1} \end{bmatrix} + \begin{bmatrix} q_{11} & q_{12} & q_{13} \\ q_{21} & q_{22} & q_{23} \\ q_{31} & q_{32} & q_{33} \end{bmatrix} \begin{bmatrix} y_{1t-2} \\ y_{2t-2} \\ y_{3t-2} \end{bmatrix} + \begin{bmatrix} r_{1t} \\ r_{2t} \\ r_{3t} \end{bmatrix}$$

where r_t follow GARCH process, $r_t \sim N(0, H_t)$ and H_t follows the diagonal BEKK:

$$H_t = M^* + \alpha^* \odot r_{t-1}' r_{t-1} + \beta^* \odot H_{t-1}$$

with

$$\alpha^* = \begin{bmatrix} \alpha_{11}^2 & \alpha_{11}\alpha_{22} & \alpha_{11}\alpha_{33} \\ \alpha_{11}\alpha_{22} & \alpha_{22}^2 & \alpha_{22}\alpha_{33} \\ \alpha_{11}\alpha_{33} & \alpha_{22}\alpha_{33} & \alpha_{33}^2 \end{bmatrix} = \begin{bmatrix} 0.090 & 0.180 & 0.060 \\ 0.180 & 0.360 & 0.120 \\ 0.060 & 0.120 & 0.040 \end{bmatrix}$$

$$\beta^* = \begin{bmatrix} \beta_{11}^2 & \beta_{11}\beta_{22} & \beta_{11}\beta_{33} \\ \beta_{11}\beta_{22} & \beta_{22}^2 & \beta_{22}\beta_{33} \\ \beta_{11}\beta_{33} & \beta_{22}\beta_{33} & \beta_{33}^2 \end{bmatrix} = \begin{bmatrix} 0.090 & 0.150 & 0.120 \\ 0.150 & 0.250 & 0.200 \\ 0.120 & 0.200 & 0.160 \end{bmatrix}$$

$$\mathrm{M}^* = \begin{bmatrix} m_{11}^2 & 0 & 0 \\ 0 & m_{22}^2 & 0 \\ 0 & 0 & m_{33}^2 \end{bmatrix} = \begin{bmatrix} 0.025 & 0 & 0 \\ 0 & 0.090 & 0 \\ 0 & 0 & 0.049 \end{bmatrix}$$

α^*, β^* are transformed matrices of $\alpha'\alpha$ and $\beta'\beta$ where where α and β are [0.3,0.6,0.2], [0.3,0.5,0.4] respectively. M* is a transformed matrix of M'M where M is a diagonal matrix with its diagonal elements are [0.5,0.3,0.7]. Equivalently, the variance-covariance equations are as follow:

$$\begin{aligned}
h_{11\mathrm{t}} &= 0.025 + 0.09r_{1t}^2 + 0.09h_{11,t-1} \\
h_{21\mathrm{t}} &= 0.18r_{1t}r_{2t} + 0.15h_{21,t-1} \\
h_{31\mathrm{t}} &= 0.06r_{3t}r_{1t} + 0.12h_{31,t-1} \\
h_{22\mathrm{t}} &= 0.09 + 0.36r_{2t}^2 + 0.25h_{22,t-1} \\
h_{32\mathrm{t}} &= 0.12u_{3t}r_{2t} + 0.2h_{32,t-1} \\
h_{33\mathrm{t}} &= 0.049 + 0.04r_{3t}^2 + 0.16h_{33,t-1}
\end{aligned}$$

Equation (6.11) can be rewritten as Vector Error Correction Model (VECM):

$$\Delta Y_t = \Pi Y_{t-1} + \phi \Delta Y_{t-1} + r_t \tag{6.12}$$

where $\Pi = P + Q - I$ and $\phi = -Q$. The true values of P and Q are set as follow:

$$P = \begin{bmatrix} 0.7 & 0 & 0 \\ 0 & 0.3 & 0 \\ 0.5 & 0 & 0.4 \end{bmatrix} \text{ and } Q = \begin{bmatrix} 0.3 & 0 & 0 \\ 0 & 0.7 & 0 \\ 0.5 & 1 & 0.1 \end{bmatrix}$$

thus $\Pi = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 1 & -0.5 \end{bmatrix}$ which can be decomposed into loading vector $[0 \quad 0 \quad 1]'$ and cointegrating vector $[1 \quad 1 \quad -0.5]$.

Before we generate Y_t, we have to generate r_t ~N(0, H_t) as follows.

Step 1. Generate $\varepsilon_t = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \sim N(0, I)$

Step 2. Generate H_t using Diagonal BEKK model from ε_t

Step 3. Transform ε_t to r_t by applying Cholesky Decomposition: $r_t = L_t\varepsilon_t$, where L_t is lower triangular matrix obtained from decomposing $H_t = L_t {L_t}'$.

By construction, the positive definiteness (PD) of H_t is assured.

6.5.2. Estimation Strategy

Under the above DGP we carried out Monte Carlo simulation for the following five cases:

Case 1 (OLS): We estimate parameters equation by equation in equation (6.9) by OLS without considering GARCH error structure and obtain the followings:

$$\Delta Y_{1,\cdot} = Y_{-1}\widehat{\Pi}_1' + \Delta Y_{-1}\widehat{\Phi}_1' + \hat{r}_1$$
$$\Delta Y_{2,\cdot} = Y_{-1}\widehat{\Pi}_2' + \Delta Y_{-1}\widehat{\Phi}_2' + \hat{r}_2$$
$$\Delta Y_{3,\cdot} = Y_{-1}\widehat{\Pi}_3' + \Delta Y_{-1}\widehat{\Phi}_3' + \hat{r}_3$$

Case 2 (VECM): We estimate parameters in equation (6.12) by VECM system equation without considering GARCH error structure and obtain the followings:

$$\Delta Y_t = \widehat{\Pi} Y_{t-1} + \widehat{\Phi}\Delta Y_{t-1} + \hat{r}_t$$

Case 3 (FGLS-OLS-GARCH/FOLSH): First we calculate OLS residuals $\hat{r}_i$ for each equations without considering GARCH error structure as in Case 1. Next, we use $\hat{r}_i$ for obtaining variance covariance matrix $\widehat{H}_t$ and $\widehat{H}_t^{-1}$ in the diagonal BEKK model. Having $\widehat{H}_t$ and $\widehat{H}_t^{-1}$ in hand we can construct $\widehat{\Omega}$ and $\widehat{\Omega}^{-1}$ to have feasible generalized least square (FGLS) estimator.

Case 4 (FGLS-VECM-GARCH/FVECH): We use VECM system equations as in Case 2 for estimating $\widehat{\Omega}$. First we obtain each residual $\hat{r}_i$ from VECM in Case 2. Next, we use $\hat{r}_i$ for obtaining variance covariance matrix $\widehat{H}_t$ and $\widehat{H}_t^{-1}$ in the diagonal BEKK model. Having $\widehat{H}_t$ and $\widehat{H}_t^{-1}$ in hand we can construct $\widehat{\Omega}$ and $\widehat{\Omega}^{-1}$ to have feasible generalized least squre (FGLS) estimator.

Case 5 (MLE): We estimate all parameters in the mean equation (6.12) and the diagonal BEKK variance equation (6.5) by MLE and obtain the estimated system as follows:

Mean equation: $\Delta \mathrm{Y_t} = \widehat{\Pi}\mathrm{Y_{t-1}} + \widehat{\Phi}\Delta \mathrm{Y_{t-1}} + \hat{r}_\mathrm{t}$

Variance equation: $\widehat{H}_t = \hat{C}\hat{C}' + \hat{A}'\hat{r}_{t-1}\hat{r}'_{t-1}\hat{A} + \hat{B}'\widehat{H}_{t-1}\hat{B}$

or equivalently the variance-covariance equations are as follow:

$$
\begin{aligned}
\hat{h}_{11\mathrm{t}} &= \widehat{\mathrm{m}}_{11}^2 + \hat{a}_{11}^2\hat{r}_{1\mathrm{t}-1}^2 + \hat{b}_{11}^2\hat{h}_{11,t-1} \\
\hat{h}_{21\mathrm{t}} &= \hat{a}_{22}\hat{a}_{11}\hat{r}_{2t}\hat{r}_{1t-1} + \hat{b}_{22}\hat{b}_{11}\hat{h}_{21,t-1} \\
\hat{h}_{31\mathrm{t}} &= \hat{a}_{33}\hat{a}_{11}\hat{r}_{3t}\hat{r}_{1t-1} + \hat{b}_{33}\hat{b}_{11}\hat{h}_{31,t-1} \\
\hat{h}_{22\mathrm{t}} &= \widehat{\mathrm{m}}_{22}^2 + \hat{a}_{22}^2\hat{r}_{2\mathrm{t}-1}^2 + \hat{b}_{22}^2\hat{h}_{22,t-1} \\
\hat{h}_{32\mathrm{t}} &= \hat{a}_{33}\hat{a}_{22}\hat{r}_{3t}\hat{r}_{2t-1} + \hat{b}_{33}\hat{b}_{22}\hat{h}_{32,t-1} \\
\hat{h}_{33\mathrm{t}} &= \widehat{\mathrm{m}}_{33}^2 + \hat{a}_{33}^2\hat{r}_{3\mathrm{t}-1}^2 + \hat{b}_{33}^2\hat{h}_{33,t-1}
\end{aligned}
$$

In estimating the parameters we maximize log likelihood function as specified in Equation (6.6). We run the simulation in Eviews program (version 7.2). For Case 5, in order to starting the iteration, the initial values of VECM parameters (the mean equation) were set based on single OLS equations as in Case 1. Meanwhile, the initial values for MGARCH parameters in the variance equations were set based on univariate GARCH.

6.5.3. Simulation Results

The main estimation methods under investigation in this paper are FGLS-based estimator (FOLSH and FVECH) and Maximum Likelihood Estimator (MLE). These strategies are taking into account the presence of MGARCH error structure. Presumably, the strategies are expected to outperform the other strategies that neglect the MGARCH error structure (OLS and VECM). Summary of simulation results is presented in Table 6-1. From the table, we observed that estimation methods FOLSH, FVECH, and MLE seem to outperform the other methods (OLS and VECM); the mean of the estimated parameter from 1000 times simulation run tends to be closer to its true value in most cases.

Table 6-1: Parameter Estimates from Monte Carlo Simulation

		OLS		VECM		FOLSH		FVECH		MLE	
Parameters	True Value	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
n=100											
$\hat{\pi}_{11}$	0.000	-0.048	0.082	-0.011	0.074	-0.043	0.082	-0.042	0.081	-0.038	0.078
$\hat{\pi}_{12}$	0.000	-0.010	0.083	-0.011	0.074	-0.008	0.083	-0.008	0.084	-0.007	0.079
$\hat{\pi}_{13}$	0.000	0.005	0.040	0.005	0.037	0.003	0.040	0.003	0.040	0.003	0.037
$\hat{\varphi}_{11}$	-0.300	-0.272	0.127	-0.279	0.127	-0.275	0.129	-0.275	0.131	-0.282	0.122
$\hat{\varphi}_{12}$	0.000	-0.001	0.082	0.018	0.132	-0.002	0.085	-0.001	0.084	-0.002	0.079
$\hat{\varphi}_{13}$	0.000	0.001	0.049	-0.520	0.149	0.001	0.052	0.001	0.050	0.001	0.048
$\hat{\pi}_{21}$	0.000	-0.017	0.099	-0.019	0.090	-0.009	0.092	-0.009	0.094	-0.010	0.076
$\hat{\pi}_{22}$	0.000	-0.072	0.109	-0.020	0.091	-0.051	0.098	-0.047	0.102	-0.040	0.084
$\hat{\pi}_{23}$	0.000	0.009	0.047	0.010	0.045	0.004	0.043	0.004	0.049	0.005	0.036
$\hat{\varphi}_{21}$	0.000	0.016	0.133	0.000	0.080	0.010	0.127	0.010	0.132	0.009	0.103
$\hat{\varphi}_{22}$	-0.700	-0.647	0.101	-0.668	0.100	-0.656	0.095	-0.660	0.095	-0.670	0.087
$\hat{\varphi}_{23}$	0.000	-0.003	0.057	-1.018	0.105	-0.004	0.052	-0.003	0.053	-0.001	0.045
$\hat{\pi}_{31}$	1.000	1.026	0.101	1.025	0.102	1.027	0.109	1.026	0.109	1.026	0.109
$\hat{\pi}_{32}$	1.000	1.025	0.101	1.026	0.103	1.027	0.110	1.026	0.112	1.025	0.114
$\hat{\pi}_{33}$	-0.500	-0.512	0.048	-0.512	0.049	-0.513	0.052	-0.513	0.053	-0.513	0.052
$\hat{\varphi}_{31}$	-0.500	-0.520	0.149	0.000	0.049	-0.521	0.158	-0.523	0.157	-0.522	0.161
$\hat{\varphi}_{32}$	-1.000	-1.017	0.106	-0.003	0.056	-1.018	0.114	-1.016	0.115	-1.018	0.117
$\hat{\varphi}_{33}$	-0.100	-0.094	0.094	-0.093	0.066	-0.095	0.069	-0.093	0.071	-0.095	0.070
n=300											
$\hat{\pi}_{11}$	0.000	-0.021	0.042	-0.007	0.039	-0.019	0.043	-0.019	0.043	-0.016	0.037
$\hat{\pi}_{12}$	0.000	-0.006	0.042	-0.007	0.039	-0.005	0.042	-0.005	0.042	-0.004	0.038
$\hat{\pi}_{13}$	0.000	0.004	0.020	0.003	0.020	0.003	0.021	0.003	0.020	0.002	0.019
$\hat{\varphi}_{11}$	-0.300	-0.281	0.073	-0.285	0.074	-0.284	0.074	-0.285	0.073	-0.287	0.073
$\hat{\varphi}_{12}$	0.000	0.004	0.043	0.005	0.078	0.003	0.043	0.003	0.044	0.001	0.041
$\hat{\varphi}_{13}$	0.000	0.000	0.028	-0.502	0.088	0.000	0.028	0.000	0.028	0.001	0.025
$\hat{\pi}_{21}$	0.000	-0.004	0.054	-0.004	0.052	0.000	0.045	-0.001	0.045	-0.001	0.035
$\hat{\pi}_{22}$	0.000	-0.021	0.055	-0.004	0.052	-0.011	0.046	-0.011	0.046	-0.008	0.035
$\hat{\pi}_{23}$	0.000	0.002	0.026	0.002	0.026	0.000	0.022	0.000	0.022	0.000	0.017
$\hat{\varphi}_{21}$	0.000	0.005	0.078	0.004	0.043	0.001	0.070	0.002	0.069	0.002	0.054
$\hat{\varphi}_{22}$	-0.700	-0.683	0.057	-0.690	0.057	-0.688	0.052	-0.689	0.051	-0.692	0.040
$\hat{\varphi}_{23}$	0.000	-0.001	0.033	-1.002	0.059	-0.001	0.028	0.000	0.028	0.000	0.021
$\hat{\pi}_{31}$	1.000	1.003	0.056	1.003	0.056	1.002	0.055	1.002	0.056	1.002	0.057
$\hat{\pi}_{32}$	1.000	1.003	0.056	1.004	0.056	1.003	0.056	1.003	0.056	1.002	0.057
$\hat{\pi}_{33}$	-0.500	-0.502	0.027	-0.502	0.027	-0.502	0.027	-0.502	0.027	-0.501	0.028
$\hat{\varphi}_{31}$	-0.500	-0.502	0.088	0.000	0.028	-0.501	0.089	-0.501	0.089	-0.501	0.088
$\hat{\varphi}_{32}$	-1.000	-1.002	0.059	-0.001	0.032	-1.001	0.060	-1.002	0.059	-1.000	0.060
$\hat{\varphi}_{33}$	-0.100	-0.096	0.037	-0.096	0.037	-0.096	0.038	-0.096	0.038	-0.096	0.038
n=500											
$\hat{\pi}_{11}$	0.000	-0.010	0.033	-0.002	0.032	-0.010	0.033	-0.009	0.033	-0.007	0.029
$\hat{\pi}_{12}$	0.000	-0.001	0.033	-0.002	0.031	-0.001	0.034	-0.001	0.034	0.000	0.029
$\hat{\pi}_{13}$	0.000	0.001	0.016	0.001	0.016	0.001	0.016	0.000	0.016	0.000	0.014
$\hat{\varphi}_{11}$	-0.300	-0.297	0.056	-0.299	0.056	-0.296	0.059	-0.297	0.057	-0.297	0.050
$\hat{\varphi}_{12}$	0.000	0.000	0.032	0.003	0.060	0.000	0.032	0.000	0.032	0.000	0.029
$\hat{\varphi}_{13}$	0.000	-0.001	0.022	-0.506	0.066	-0.001	0.022	-0.001	0.022	0.000	0.019
$\hat{\pi}_{21}$	0.000	-0.004	0.040	-0.004	0.040	-0.002	0.035	-0.002	0.035	-0.001	0.026
$\hat{\pi}_{22}$	0.000	-0.015	0.041	-0.004	0.040	-0.009	0.036	-0.009	0.036	-0.005	0.027
$\hat{\pi}_{23}$	0.000	0.002	0.020	0.002	0.020	0.001	0.017	0.001	0.017	0.000	0.013
$\hat{\varphi}_{21}$	0.000	0.003	0.060	0.001	0.031	0.001	0.053	0.001	0.052	0.002	0.043
$\hat{\varphi}_{22}$	-0.700	-0.691	0.044	-0.695	0.044	-0.694	0.038	-0.695	0.037	-0.696	0.029
$\hat{\varphi}_{23}$	0.000	0.001	0.025	-1.002	0.042	0.001	0.022	0.000	0.021	0.000	0.016
$\hat{\pi}_{31}$	1.000	1.004	0.039	1.004	0.039	1.004	0.040	1.003	0.040	1.005	0.044
$\hat{\pi}_{32}$	1.000	1.003	0.040	1.003	0.040	1.003	0.041	1.002	0.041	1.004	0.043
$\hat{\pi}_{33}$	-0.500	-0.502	0.020	-0.502	0.020	-0.502	0.020	-0.501	0.020	-0.502	0.022
$\hat{\varphi}_{31}$	-0.500	-0.506	0.066	-0.001	0.022	-0.504	0.066	-0.504	0.066	-0.506	0.072
$\hat{\varphi}_{32}$	-1.000	-1.002	0.042	0.001	0.025	-1.001	0.043	-1.001	0.043	-1.001	0.045
$\hat{\varphi}_{33}$	-0.100	-0.099	0.028	-0.099	0.028	-0.099	0.028	-0.099	0.028	-0.099	0.031

OLS and VECM under the heteroscedasticity condition still provide us an unbiased estimator, but their standard deviations are larger than the methods that assume MGARCH error structure. Table 6-2 shows that MLE, FOLSH, and FVECH are more efficient than OLS and VECM. It shows that methods ignoring the MGARCH error structure would result in less efficient estimator. All methods are consistent estimator and the efficiency measured by the Mean Squared Error (MSE) are improving when larger sample size is used.

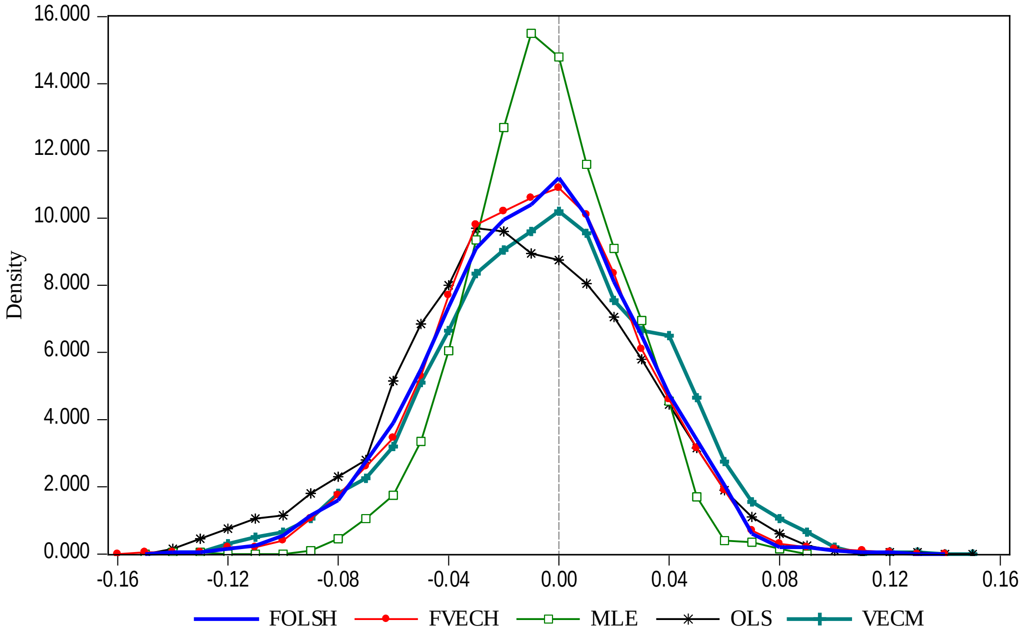
MLE is still the most efficient estimator as shown by the least average MSE in every sample size. However, MLE become computationally demanding when number of parameter is large. Table 6-2 shows that FGLS-based estimator (FOLSH and FVECH) perform better than OLS and VECM and only slightly inferior to MLE. It suggests that FGLS-based estimator could be useful in overcoming computation burden of the MLE. FGLS-based estimator needs to compute inverse of $\widehat{\Omega}$ which is a very large and sparse matrix, but the inversion of that matrix may cause computational problems as mentioned above in Section 6.4. Such problems can be solved by the suggested method in that section. The algorithm for matrix inversion in most statistical software is still limited only for matrix in small dimension. We already tried to compute $\widehat{\Omega}^{-1}$ using standard command in EViews and MATLAB in our simulation, while n<100 FGLS-based estimators perform fairly good that comparable to MLE. However, when n becomes larger (i.e. n=300 and n=500), the FGLS-based estimator become poorly inefficient since it produces extreme values for the estimated parameters. All estimated parameters from FGLS-based estimators presented in this paper are based on our matrix inversion procedure. The results based on standard matrix inversion in statistical software are not presented to save space.

Table 6-2: Average of Mean Squared Error

	OLS	VECM	FOLSH	FVECH	MLE
n=100	0.00970	0.15012	0.00936**	0.00958*	0.00834***
n=300	0.00280	0.14180	0.00255*	0.00253**	0.00218***
n=500	0.00154	0.14104	0.00144*	0.00141**	0.00127***

*Note: *** The best estimator, ** 2nd best estimator, * 3rd best estimator*

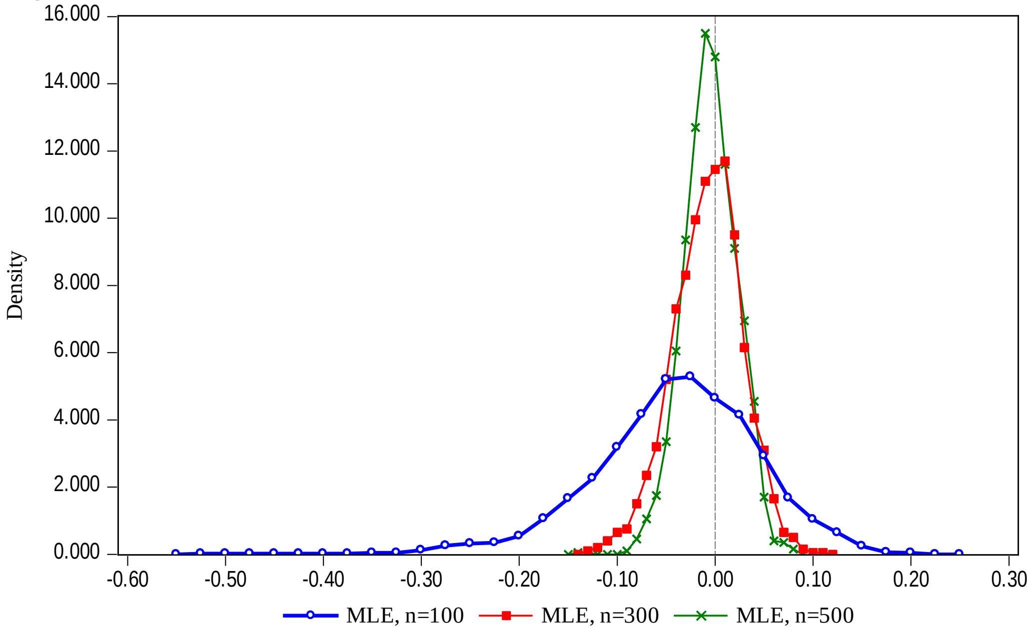
Figure 6-1: Empirical Distribution Histogram of $\hat{\pi}_{22}$ when n=500



Note: The true value for $\hat{\pi}_{22}$ is 0 as shown by the vertical dashed line

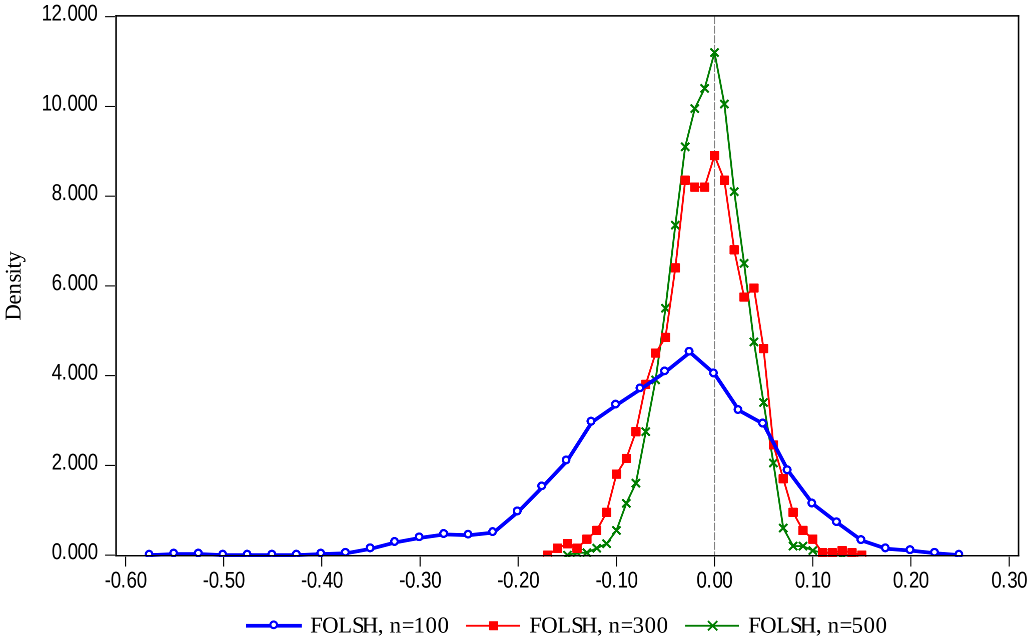
Figures 6-1 compares the distribution of $\hat{\pi}_{22}$ with *n*=500. The figures show that MLE is the most efficient estimator. FOLSH and FVECH have very similar efficiency as shown by the empirical distribution histogram and relatively are more efficient than OLS and VECM. The figure also shows that OLS estimator is biased to the left although the sample size is large (*n*=500).

Figure 6-2: Empirical Distribution Histogram of $\hat{\pi}_{22}$ by MLE



Note: The vertical dashed line indicates the true value of the parameter

Figure 6-3: Empirical Distribution Histogram of $\hat{\pi}_{22}$ by FOLSH

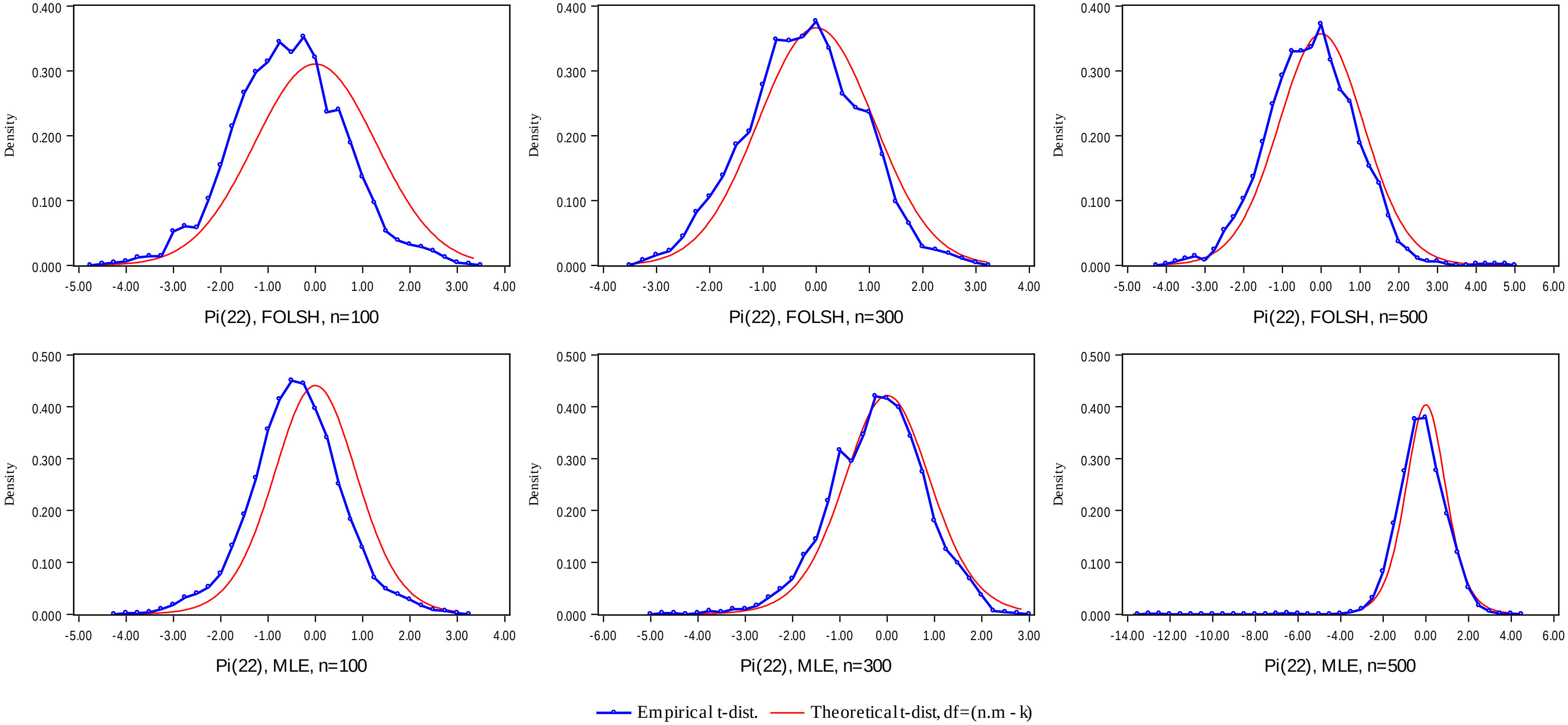


Note: The vertical dashed line indicates the true value of the parameter.

Figure 6-2 and 6-3 show example of empirical distribution of the estimated parameter $\hat{\pi}_{22}$ by MLE and FOLSH respectively, for n=100, 300, and 500. Those figures suggest that both ML estimator and FOLSH are consistent estimators as the estimated parameter more converge to the true value when the sample size is larger. Both MLE and FOLSH tend to be unbiased when sample size is large.

Figure 6-4 shows example of empirical *t*-statistic distribution for $\hat{\pi}_{22}$. From the figures, both FOLSH and MLE tend to conform to student-*t* distribution when larger sample size is used. The empirical distribution for $\hat{\pi}_{22}$ estimated by FVECH is very similar to that by FOLSH. Table 6-3 shows that rejection rate of null hypothesis that each parameter is equal to its true value is also close to the significance level (0.05) for parameter estimated by FOLSH, FVECH, and MLE. From the table it is also apparent that estimators that do not consider multivariate GARCH error structure (OLS and VECM) has higher rejection rate compares to those of estimators that consider the error structure (FOLSH, FVECH, and MLE). These findings show us that neglecting the presence of multivariate GARCH error structure will increase the rejection rate or the type I error.

Figure 6-4: Empirical and Theoretical *t*-Distribution Histogram of $\hat{\pi}_{22}$ by FOLSH and MLE



Note: degree of freedom = nm-k, where n=number observation, m=number of equation (6.3), and k=number of parameter (18)

Table 6-3: Average of Rejection Rate of Null Hypothesis* Test at 5 Percent Significance Level

n=100	$\hat{\pi}_{11}$	$\hat{\pi}_{12}$	$\hat{\pi}_{13}$	$\hat{\varphi}_{11}$	$\hat{\varphi}_{12}$	$\hat{\varphi}_{13}$	$\hat{\pi}_{21}$	$\hat{\pi}_{22}$	$\hat{\pi}_{23}$	$\hat{\varphi}_{21}$	$\hat{\varphi}_{22}$	$\hat{\varphi}_{23}$	$\hat{\pi}_{31}$	$\hat{\pi}_{32}$	$\hat{\pi}_{33}$	$\hat{\varphi}_{31}$	$\hat{\varphi}_{32}$	$\hat{\varphi}_{33}$	Average
OLS	0.151	0.127	0.127	0.142	0.119	0.099	0.135	0.203	0.128	0.118	0.171	0.102	0.107	0.100	0.105	0.095	0.113	0.104	0.125
VECM	0.111	0.107	0.111	0.142	0.110	0.969	0.136	0.131	0.134	0.117	0.155	1.000	0.139	0.086	0.100	1.000	1.000	0.113	0.315
FOLSH	0.024	0.071	0.072	0.097	0.080	0.071	0.061	0.032	0.086	0.088	0.138	0.059	0.080	0.077	0.028	0.035	0.035	0.060	0.066
FVECH	0.021	0.070	0.079	0.099	0.081	0.062	0.052	0.027	0.073	0.092	0.126	0.062	0.085	0.082	0.028	0.040	0.035	0.063	0.065
MLE	0.008	0.031	0.033	0.037	0.028	0.026	0.033	0.022	0.043	0.043	0.070	0.037	0.049	0.043	0.015	0.018	0.012	0.023	0.032
n=300	$\hat{\pi}_{11}$	$\hat{\pi}_{12}$	$\hat{\pi}_{13}$	$\hat{\varphi}_{11}$	$\hat{\varphi}_{12}$	$\hat{\varphi}_{13}$	$\hat{\pi}_{21}$	$\hat{\pi}_{22}$	$\hat{\pi}_{23}$	$\hat{\varphi}_{21}$	$\hat{\varphi}_{22}$	$\hat{\varphi}_{23}$	$\hat{\pi}_{31}$	$\hat{\pi}_{32}$	$\hat{\pi}_{33}$	$\hat{\varphi}_{31}$	$\hat{\varphi}_{32}$	$\hat{\varphi}_{33}$	Average
OLS	0.143	0.111	0.097	0.154	0.093	0.098	0.146	0.165	0.140	0.110	0.151	0.100	0.103	0.113	0.111	0.122	0.112	0.108	0.121
VECM	0.099	0.099	0.099	0.157	0.111	1.000	0.138	0.137	0.138	0.090	0.147	1.000	0.119	0.105	0.104	1.000	1.000	0.115	0.314
FOLSH	0.030	0.054	0.072	0.105	0.068	0.055	0.061	0.030	0.064	0.069	0.085	0.054	0.049	0.056	0.053	0.056	0.057	0.060	0.060
FVECH	0.026	0.048	0.075	0.102	0.070	0.062	0.063	0.031	0.062	0.075	0.087	0.053	0.049	0.055	0.051	0.057	0.054	0.062	0.060
MLE	0.015	0.030	0.041	0.075	0.043	0.038	0.045	0.026	0.053	0.071	0.077	0.042	0.038	0.042	0.048	0.049	0.053	0.046	0.046
n=500	$\hat{\pi}_{11}$	$\hat{\pi}_{12}$	$\hat{\pi}_{13}$	$\hat{\varphi}_{11}$	$\hat{\varphi}_{12}$	$\hat{\varphi}_{13}$	$\hat{\pi}_{21}$	$\hat{\pi}_{22}$	$\hat{\pi}_{23}$	$\hat{\varphi}_{21}$	$\hat{\varphi}_{22}$	$\hat{\varphi}_{23}$	$\hat{\pi}_{31}$	$\hat{\pi}_{32}$	$\hat{\pi}_{33}$	$\hat{\varphi}_{31}$	$\hat{\varphi}_{32}$	$\hat{\varphi}_{33}$	Average
OLS	0.122	0.122	0.110	0.142	0.083	0.101	0.135	0.153	0.134	0.111	0.148	0.109	0.096	0.095	0.094	0.108	0.096	0.104	0.115
VECM	0.110	0.110	0.110	0.147	0.114	1.000	0.137	0.137	0.137	0.089	0.156	1.000	0.106	0.087	0.091	1.000	1.000	0.106	0.313
FOLSH	0.031	0.073	0.072	0.074	0.045	0.055	0.061	0.037	0.076	0.075	0.072	0.069	0.052	0.050	0.036	0.044	0.041	0.040	0.056
FVECH	0.038	0.077	0.067	0.073	0.042	0.053	0.065	0.040	0.070	0.071	0.065	0.063	0.052	0.049	0.036	0.045	0.044	0.041	0.055
MLE	0.023	0.047	0.051	0.062	0.046	0.048	0.061	0.040	0.059	0.086	0.054	0.055	0.047	0.044	0.038	0.039	0.039	0.043	0.049

**The null hypothesis: the estimated parameter = its true value, the alternative hypothesis: the estimated parameter ≠ its true value*

6.6. Empirical Application

Weekly data from July 1997 until July 2011 of US S&P500, Japan Nikkei225 and Malaysia KLSE composite index are collected as a dataset for our model (n=732). The indexes are stated in logarithmic and are measured in US Dollar. Since they are in log index, their first order differences can be regarded as stock market return of the respective markets.

Unit root test indicates that the three time series are non-stationary at level, but they are stationary at their first difference. The Augmented Dickey Fuller (ADF) statistic (τ-*stat.*) for data in level indicates the null hypothesis that the series has unit root cannot be rejected at 10 percent significance level or less. Meanwhile, the τ-stat. for the respective series in the first order difference significantly rejects the null hypothesis of unit root at one percent significance level.

Table 6-4: Unit Root Test

	Level		1st Differences	
Unit Root Test	ADF τ-*stat.*	P-Value	ADF τ-*stat.*	P-Value
S&P500	-2.4618	0.1254	-29.7881	0.0000
Nikkei225	-2.4258	0.1349	-27.8684	0.0000
KLSE	-0.8080	0.8158	-28.1092	0.0000

Null Hypothesis: Series has unit root

Johansen's cointegration test was performed for the dataset, the results, as presented in Table 5, show that one cointegrating equation is found from tests based on both Trace and Maximum Eigenvalue method.

Estimation of VECM with one cointegrating equation is shown in Table 6-6, where Y_1, Y_2, and Y_3 correspond to log of S&P500, Nikkei225, and KLSE index respectively. From the table, it shows that coefficients of error correction for cointegrating equation are all significant to show that the stock markets have long run price relationship. In the VAR part, lagged S&P500 return has significant effect to itself and to both Japanese and Malaysian stock market returns. The results indicate that US stock market is still a very dominant market that shares its greater influence to other markets.

In addition, the significant VECM coefficients also indicate that past information (lagged variables of both price and return) can explain the present stock market returns. It implies that the stock markets are neither informationally efficient nor perfectly integrated. The importance of past information may be used for setting arbitrage strategies in the markets to exploit the market inefficiency.

Table 6-5: Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.0436	38.0006	29.7971	0.0046
At most 1	0.0058	5.4141	15.4947	0.7634
At most 2	0.0016	1.1569	3.8415	0.2821
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.0436	32.5865	21.1316	0.0008
At most 1	0.0058	4.2572	14.2646	0.8313
At most 2	0.0016	1.1569	3.8415	0.2821

Trace and Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis (1999) p-values*

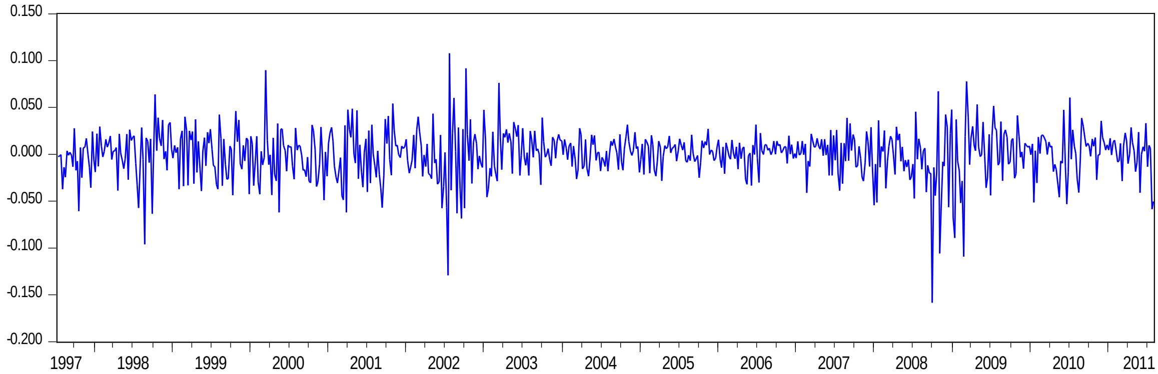
Table 6-6: Vector Error Correction Model (VECM)

Coint.Eq.	Coef.		
Y_{1t-1}	1.000		
Y_{2t-1}	-0.682		
	(0.090)		
Y_{3t-1}	-0.024		
	(0.054)		
C	-3.700		
E.C. Eq.	ΔY_{1t}	ΔY_{2t}	ΔY_{3t}
Coint.Eq.	-0.024	0.027	0.040
	(0.009)	(0.012)	(0.015)
ΔY_{1t-1}	-0.095	0.214	0.174
	(0.041)	(0.053)	(0.069)
ΔY_{2t-1}	-0.007	-0.076	0.032
	(0.032)	(0.042)	(0.055)
ΔY_{3t-1}	0.012	-0.047	-0.076
	(0.024)	(0.031)	(0.040)
C	0.000	-0.001	0.000
	(0.001)	(0.001)	(0.002)

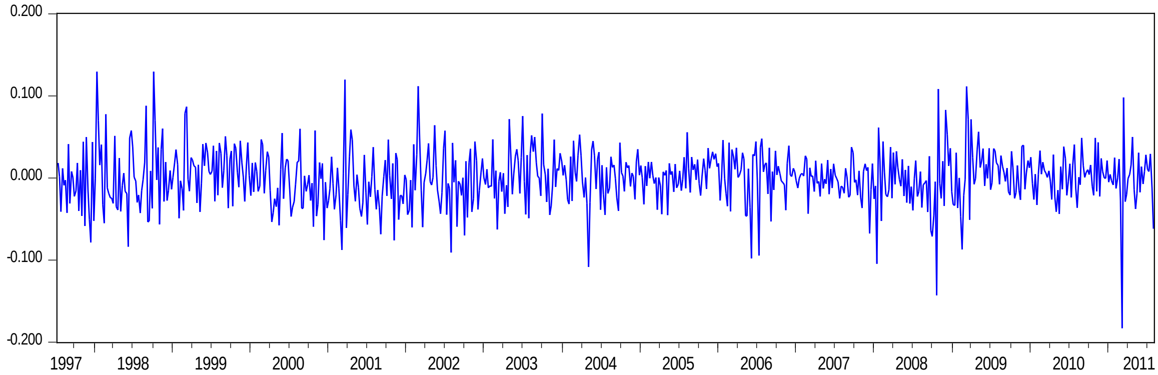
Standard Error in Parenthesis

The residuals of estimated VECM show a non-homoscedastic structure as it is shown in Figure 6-5. The residual of VECM can be regarded as a market shock or the unexpected return, and from the figure we can observed that during period of 1999-2002 and 2008-2009 the volatility of the US residuals were higher compared to that in the other periods. The two sub-periods are known as the burst of dot-com bubble and the collapse of financial institutions in the US market. The pattern of the Japan residuals is less clear to be connected with some events; however, it is clear that the residuals are also not homoscedastic. Meanwhile, the residuals plot of Malaysian stock market returns show that higher volatility is detected during the Asian financial crisis in 1997-1998 and also during the US financial turmoil in late 2008 until 2009.

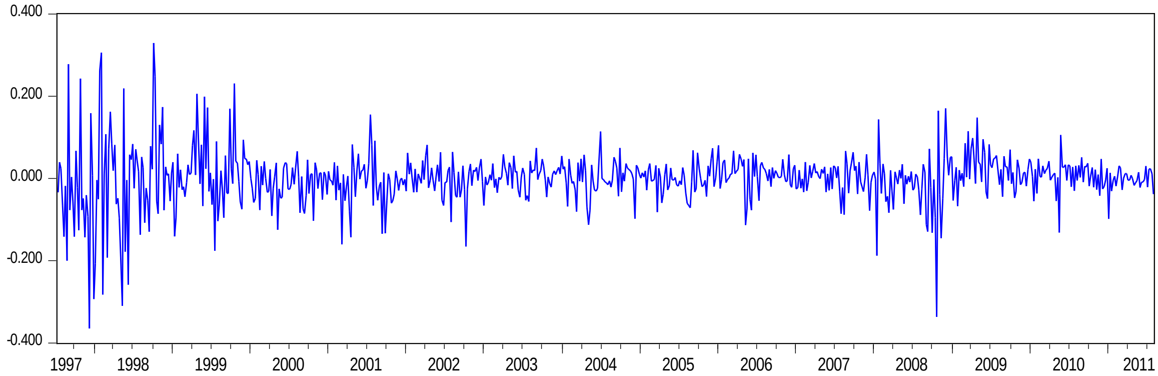
Figure 6-5: Residuals of VECM



Residuals of D(Ln(S&P500))



Residuals of D(Ln(Nikkei225))

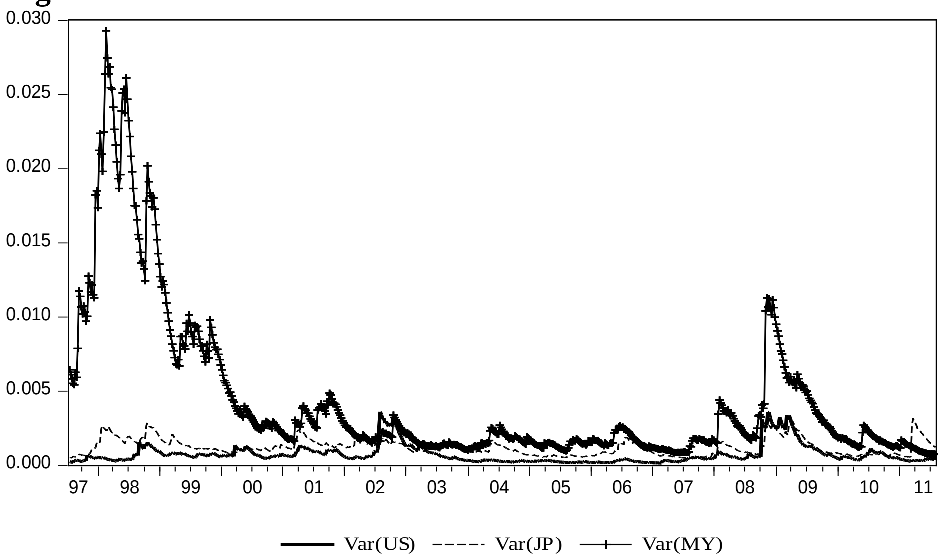


Residuals of D(Ln(KLSE))

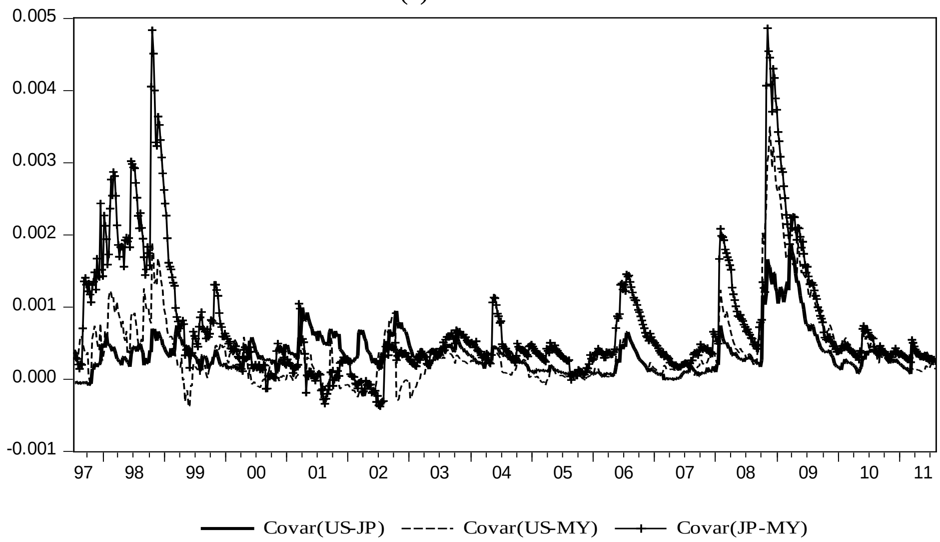
The similar pattern of residuals during a crisis period, i.e. during the collapse of Lehman Brothers in US, indicates the presence of volatility spillover from US to other markets, and thus it become evidence of the correlated structure of the residuals. This phenomenon is often seen in financial market. The latter property of the residuals becomes a motivation to apply SUR type model.

Residuals from each single OLS model are also computed, the results are similar to those of VECM's residuals that they indicate that the residuals are heteroscedastic. The residuals are then used in estimating $\widehat{H_t}$ by Diagonal BEKK. Having the variance-covariance series, we proceed to the next step for constructing matrix $\widehat{\Omega}$ and used it to obtain FGLS estimators.

Figure 6-6: Estimated Conditional Variance-Covariance



(a) Conditional Variance



(b) Conditional Covariance

The FGLS estimators, the restated VECM (without GARCH), OLS, and MLE estimated parameters are shown in Table 6-7. As shown in the table, although the sign and value of the estimated parameters are very similar among the various estimation methods, but the probability of significance are sometime different. Based on the data properties shown in Figure 6-5 and 6-6, the GARCH error structure does exists. And based on the simulation results, estimation methods that take into account the GARCH structure are more efficient than those that ignore the structure. Therefore, in the empirical example, the use of such methods (OLS and VECM) might produce wrong conclusion regarding the significance of the estimated parameters. For example, $\hat{\pi}_{32}$ estimated by OLS (and VECM) is significantly different from zero, but it is not significant when it is estimated by FOLSH, FVECH, and MLE. It means that when we estimate the parameter using method that neglecting the MGARCH error structure we would conclude that lagged of Nikkei225 Index (Japanese stock prices) affects Malaysia KLSE returns (Malaysian stock returns), while we should not.

Table 6-7: Estimated Parameters of OLS, VECM, FOLSH, FVECH, and MLE

Estimated	OLS		VECM		FOLSH		FVECH		MLE	
Parameter	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$\hat{C}_1^0$	0.139	0.047**	0.089	#	0.138	0.045**	0.195	0.045**	0.139	0.038**
$\hat{\pi}_{11}$	-0.028	0.009**	-0.024	#	-0.029	0.010**	-0.040	0.010**	-0.024	0.007**
$\hat{\pi}_{12}$	0.014	0.007*	0.016	#	0.014	0.004**	0.019	0.004**	0.008	0.004
$\hat{\pi}_{13}$	-0.001	0.003	0.001	#	0.000	0.000**	0.000	0.000**	-0.001	0.002
$\hat{\varphi}_{11}$	-0.093	0.041*	-0.095	0.041*	-0.091	0.159	-0.090	0.061	-0.106	0.040**
$\hat{\varphi}_{12}$	-0.006	0.032	-0.007	0.032	0.007	0.010	0.008	0.005	-0.004	0.024
$\hat{\varphi}_{13}$	0.013	0.024	0.012	0.024	0.038	0.028	0.038	0.017*	0.035	0.015*
$\hat{C}_2^0$	-0.023	0.061	-0.102	#	-0.017	0.025	0.028	0.016*	-0.006	0.048
$\hat{\pi}_{21}$	0.020	0.012	0.027	#	0.015	0.016	0.005	0.003*	0.019	0.009*
$\hat{\pi}_{22}$	-0.024	0.009**	-0.019	#	-0.020	0.031	-0.015	0.009*	-0.023	0.006**
$\hat{\pi}_{23}$	-0.001	0.003	-0.001	#	0.001	0.002	0.001	0.000*	-0.003	0.003
$\hat{\varphi}_{21}$	0.218	0.053**	0.214	0.053**	0.259	0.086**	0.261	0.066**	0.200	0.042**
$\hat{\varphi}_{22}$	-0.075	0.042	-0.076	0.042	-0.094	0.045*	-0.095	0.031**	-0.050	0.038
$\hat{\varphi}_{23}$	-0.046	0.031	-0.047	0.031	-0.056	0.037	-0.057	0.023**	-0.026	0.022
$\hat{C}_3^0$	-0.129	0.079	-0.147	#	-0.109	0.272	-0.052	0.035	-0.017	0.050
$\hat{\pi}_{31}$	0.040	0.016*	0.040	#	0.026	0.041	0.011	0.007*	0.007	0.011
$\hat{\pi}_{32}$	-0.026	0.011*	-0.027	#	-0.014	0.029	-0.004	0.003	-0.003	0.008
$\hat{\pi}_{33}$	-0.005	0.004	-0.001	#	-0.001	0.001	-0.001	0.001	-0.003	0.004
$\hat{\varphi}_{31}$	0.173	0.069*	0.174	0.069*	0.246	0.119*	0.251	0.082**	0.223	0.036**
$\hat{\varphi}_{32}$	0.031	0.055	0.032	0.055	0.006	0.003*	0.002	0.001**	0.011	0.030
$\hat{\varphi}_{33}$	-0.073	0.040	-0.076	0.040	-0.067	0.041	-0.061	0.023**	-0.026	0.037

*** significant at 0.01*
** significant at 0.05*
The Standard error marked by # indicates that the coefficient is computed from loading vector and adjustment vector in the error correction equations, the respective standard error for these parameters are shown in Table 5.

6.7. Concluding Remarks

The standard Vector Error correction model (VECM), which is based on normality assumption of error term, is often applied to analyze the real financial time series. However, as shown in the section 5 it is often seen that residuals of this model seem to follow GARCH errors process. From this experience we extend the standard VECM to include GARCH error process. We call such model as VEC-GARCH model. Although the maximum likelihood (ML) estimator is known as the most efficient estimator under the normality assumption, ML estimation is computationally demanding when a model to be estimated is not small. To overcome these disadvantages and to reduce computational burden of ML estimator we consider the generalized least square estimator (GLS) instead of ML estimator. GLS is relatively free from the distributional assumptions.

In this paper we mainly concerns with the GLS representation, the algorithm of it, and the properties of it, we have examined the performance of GLS and MLE in VEC-GARCH model by Monte Carlo simulation and the applicability of it by real data analysis of the financial time series. The Monte Carlo simulation naturally has shown that MLE is still better than the FGLS. However FGLS-based estimators that also consider GARCH error structure are also more efficient than estimators that neglect the error structure. The performance of MLE and FGLS-based estimator in our simulation are only slightly different, yet both are better estimators compare to the OLS and VECM. Thus, the suggested FGLS-based estimator may overcome the disadvantages of MLE, especially in reducing the computational burden.

Our suggested method for the large matrix inversion successfully overcomes the computational problem such as memory size, computer time, and inaccurate numerical results. The estimated parameters from the FGLS-based estimator performed in the simulation is as good as the MLE.

There, however, remain several problems in estimating VECM with GARCH errors for the future research as follows: (1) to use realized volatility (RV) instead of multivariate GARCH model, (2) to compare the GLS and MLE under non-normality by Monte Carlo simulation, (3) to carry out theoretical comparisons of asymptotic properties of the GLS and MLE, under normality and non-normality, (4) to examine the performance of VEC model with GARCH errors when it is applied to empirical analysis of financial time series. We have a plan to attack these problems in future.

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Chapter 7

HOUSEHOLD CONSUMPTION SMOOTHING THROUGH EQUITY INVESTMENT IN THE UNITED STATES AND JAPAN: AN EMPIRICAL EXAMINATION OF THE CONSUMPTION-CAPITAL ASSET PRICING MODEL (C-CAPM)

HOUSEHOLD CONSUMPTION SMOOTHING THROUGH EQUITY INVESTMENT IN THE UNITED STATES AND JAPAN: AN EMPIRICAL EXAMINATION OF THE CONSUMPTION-CAPITAL ASSET PRICING MODEL (C-CAPM)[*]

ABSTRACT

The C-CAPM is examined based on a constant relative risk aversion utility function. The subjective discount rate (beta) and coefficient of risk aversion (gamma) are estimated by recursive generalized method of moments estimation over the 1987:12–2010:7 period for the US and Japan. In contrast with previous empirical research, the findings show that the C-CAPM fits well for both countries yet for different time periods (1987:12-1996:11 and 1987:12-2001:1 for the US and Japan respectively). However, during the sample period, the gamma coefficient estimated for the US was high (above eight) compared with that for Japan (around one). I also find that there is no relationship between US stock market returns and Japanese household consumption. Parameter stability tests are also performed for the model estimated using the full sample and breakpoints were found in the models.

7.1. Introduction

The world capital markets have grown continuously in terms of both market capitalization and diversification of financial products, even amidst crises and recessions in the last two decades. The growth of market size and product variation coupled with rapid development in information technology lead to lower information and transaction costs. Moreover, as a result of deregulation of banking industries, segmentation in banking business areas has been eroded such that there are no clear definitions to distinguish the products of retail (ordinary) banks and other financial services firms (investment banks and insurance). The deregulation has transformed the function of the banking industry from merely a financial intermediary into a more complex financial services industry in which banks introduce and advise customers on financial assets traded in capital markets. If the financial assets become popular and

[*] This chapter is originally a paper by the author that has been accepted for forthcoming publication in International Journal of Economics and Business Research in 2013.

important as alternative investments for individuals, then we may expect to find a strong relationship between stock market performance and household consumption.

The consumption-capital asset pricing model (C-CAPM) is one of the asset pricing models frequently used in previous empirical research to study the relationship. The C-CAPM was first developed by Merton (1973) and Lucas (1978), and was an extension of the traditional CAPM that can be traced back to the work of Treynor (1962), Sharpe (1964), Lintner (1965), and Mossin (1966). The C-CAPM has been a less popular model than the traditional CAPM in estimating the expected return of an asset, at least up to 1982 according to Mankiw and Shapiro (1986).

Although the C-CAPM is a theoretically sound and sophisticated model because it takes into account individual’s consumption utility and multiperiod decisions traditionally presumed by economists, it is difficult to find empirical research that supports its existence and applicability. Mehra and Prescott (1985) used the C-CAPM to investigate the presence of an equity premium in the US during the 1889–1978 period and found that the equity premium could not be explained by a standard consumption model, a phenomenon that was later known as the equity premium puzzle. Mankiw (1986) reinvestigated the equity premium puzzle by taking into account the effect of aggregation of consumer consumption data, and concluded that the puzzle may be aroused by unequal distribution of income shocks. Mankiw and Zeldes (1991) reexamined the relationship between stock returns and personal consumption of stockholders and nonstockholders. In their finding, consumption of stockholders is more volatile and more highly correlated with excess returns on the stock market than consumption of nonstockholders. This finding supports the previous result of Mankiw (1986) that there is a concentration of income shocks so that aggregate consumption data may not be appropriate for representing the effect of shocks that were previously assumed to be equally distributed across the population.

In contrast to empirical findings in the US, the C-CAPM was examined by Hamori (1992a,b) using Japanese household consumption and Japanese securities (riskless and risky financial assets) returns data from 1980 to 1988 and showed that the estimated parameters of the model are stable and were consistent with standard consumption models (except for stock returns). In another paper, Hamori (1993) presented evidence that US and German stock returns are able to explain Japanese household consumption. The findings indicate that the C-CAPM may work better in Japan than in the US and also that it may be used to detect the use of foreign financial assets for domestic household consumption smoothing.

By observing the comovements of stock returns and consumption growth, the coefficient of risk aversion and subjective time preference can be estimated. In this paper, the parameters are estimated by applying generalized method of moment (GMM) recursively. Comparing the estimated parameters using recent data and parameters found in earlier studies provide new evidence of the effect of recent developments in stock markets and the applicability of the C-CAPM. This is the main motivation for writing this paper.

This paper attempts to attain three objectives. First, we examine the applicability of the C-CAPM (the stock return and household consumption relationship) in the US and Japan and compare the estimated parameters between the two countries. The US differs from Japan mainly in terms of financial depth (ratio between stock market capitalization and GDP), savings ratio, equity holding, and consumption expenditure. The differences may reflect households' consumption behavior in each country so that different levels of subjective discount rate and risk aversion in both countries are expected. Recursive GMM estimation provides us with the dynamics of households' preferences over the sample period so that the effect of economic conditions that include the development in stock markets can be observed in both countries. For instance, in the 2000s, US households' equity holding increased by about 8–10 percent compared with its level in 1988, which indicates increasing familiarity of households with equity markets. From this point, we may expect that shocks in the stock market may be transmitted to the households more quickly and equally as income shocks, such that the risk aversion coefficient should be better estimated, not overestimated as found by Mankiw (1986) in this period. On the other hand, although equity holdings by Japanese households were very low compared with those in the US, as a result of deregulation in the banking industry in the last two decades, bank business areas were expanding. As such, banks now offer not only traditional products such as savings and time deposits, but also a mixture of insurance, capital markets, and traditional products. The latter suggests that the banking industry could act as an alternative agent that links household savings to capital markets (including stock markets), and thus it suggests a potential indirect relationship between household consumption and stock market returns through the banks.[1] Therefore, the investigation of the C-CAPM in Japan using stock market returns as a proxy of risky asset returns remains relevant despite the low equity holdings. As expected, the findings differ from previous results (i.e. Hamori (1992a) tested C-CAPM using 1980–1988 data of Japanese stock market returns and household consumption. He found that the coefficient of relative risk aversion was negative, which indicates the inapplicability of the model).

Second, we examine the relationship between Japanese household consumption and US stock market returns. This tests whether Japanese households use US stocks for consumption smoothing. The Japanese stock market has long been known as the most integrated market in Asia, especially with the US, which gives Japanese investors greater access to foreign stocks in forming more internationally diversified portfolios. It is also known that companies in Japan are more bank-oriented in their financing strategies, while US companies are more capital market-oriented (preferring to raise new capital from capital markets by issuing bonds or equities rather than obtaining loans from banks). This suggests that Japanese households, directly or indirectly (through the banking industry), might be viewed as potential sources of capital for US companies. However, after the 1997 Asian crises, bank finance has continued to decline relative to capital market finance in Japan (Park and Wyplosz, 2010), which indicates that the stock market has become more important to Japanese companies and it may have an effect on the Japanese household consumption (and saving) and US stock market returns relationship.

Third, we test the stability of the estimated parameters over the full sample period. GMM estimates may be sensitive to volatility and sample size that may affect the robustness of the C-CAPM test results. Therefore, some important events that may affect the volatility of the time series during the period of analysis, such as recessions

[1] For example, in Japan, the percentage of household holding stock as a saving instrument is relatively low, yet had increased from 15.3% in 1979 to 20.5% in 1990, and even the increase is more significant for unit and open-end trust instrument (from 2.7% to 8.3%). However, it seems that securities holding among the households follows the market performance as well as the economic condition, so that at the end of 1997 (Asian financial crisis) the percentage fell to 17.5% and 3.2% for the respective securities types.
(Source: http://www.stat.go.jp/data/chouki/zuhyou/20-12.xls)

in the US and Japan, the bursting of economic bubbles, the collapse of financial institutions recently, and other shocks in the stock market, were investigated to detect whether such events affect parameter stability.

7.2. Theoretical Background

7.2.1. Consumption-based Asset Pricing Model

An investor is assumed to maximize the utility of his/her consumption decisions over time. The utility of the consumption decisions is the present value of the utility from current consumption and all future consumptions. It is assumed that the investor uses the discount rate ρ as his/her subjective time preference, and defines the discount factor β as *1/(1+ρ)*. The C-CAPM assumes that the investor has endowment, e_t, at time *t* that can be used to purchase assets, let us say stocks, of quantity Q at price p_t, and the remaining endowment is for consumption, C_t. In the next period, the investor receives a new endowment e_{t+1} and dividend per share d_{t+1}, and the stock price at period *t+1* is p_{t+1}. The new endowment and total value of assets in the next period can be used for consumption where the value of consumption depends on the consumption decision and the investment decision (purchasing stock of quantity Q) made in the previous period. The objective function can be defined as a two-period model as follows:

$$\max_{Q} U(C_t) + \beta E_t\left(U(C_{t+1})\right) \tag{7.1}$$

with budget constraints:

$$C_t + p_t Q = e_t \tag{7.2}$$

$$C_{t+1} = e_{t+1} + (p_{t+1} + d_{t+1})Q \tag{7.3}$$

The utility function is assumed to follow a constant relative risk aversion model[2]:

$$U(C) = \frac{C^{1-\gamma}}{1-\gamma}, 0 < \gamma < \infty \tag{7.4}$$

where γ is the coefficient of risk aversion that determines the curvature of the utility function. The solution of the maximization problem is found by obtaining the first

[2] When $\gamma = 1$, the utility function is defined as a logarithmic function, which is the limit of the utility function as γ approaches one (Pennacchi, 2008 pp. 16).

order condition of the objective function after substituting the constraints and utility function into it. The result can be stated as a Euler equation as follows:

$$\mathrm{E_t}\left(\beta\left(\frac{\mathrm{C_{t+1}}}{\mathrm{C_t}}\right)^{-\gamma}\mathrm{R_t}\right) - 1 = 0 \tag{7.5}$$

where $R_t = (p_{t+1} + d_{t+1})/p_t$, the gross rate of return of the risky asset.

For the C-CAPM defined in Equation (7.5) to be valid, the parameters must satisfy the following sign conditions:

subjective discount factor: $0 < \beta < 1$,

measure of relative risk aversion: $\gamma > 0$.

The basic C-CAPM above can be extended to estimate the risk premium (difference between the real rate of return on a risky asset and on a risk-free asset) as in Mehra and Prescott (1985) and is defined as follows:

$$\mathrm{E_t}\left(\mathrm{r_{i,t+1}}\right) - \mathrm{r_{f,t+1}} = -\frac{1}{\mathrm{E_t}\left(\mathrm{U}'(\frac{\mathrm{C_{t+1}}}{\mathrm{C_t}})\right)}\mathrm{cov_t}(\mathrm{U}'(\frac{\mathrm{C_{t+1}}}{\mathrm{C_t}}), 1 + \mathrm{r_{i,t+1}}) \tag{7.6}$$

where $r_{i,t}$ is the real rate of return on risky asset *i* at time *t* ($r_{i,t} = R_{i,t} - 1$) and $r_{f,t}$ is the real risk-free rate at time *t*.

From Equation (7.6), the expected risk premium on a risky asset (expected extra return relative to the riskless asset return) is not only dependent on the level of risk (variance) of the risky asset and expected future consumption, but also on the correlation between the marginal utility of consumption and the rate of return of the risky asset. Moreover, the shape of the utility function is also important, because it reflects the risk preferences of investors. Thus, an investor can undertake consumption smoothing by investing in a risky asset that has lower or negative covariance with his/her marginal utility of consumption (consumption growth) as if he/she buys insurance to maintain his/her future consumption at the current level.

7.2.2. Previous Empirical Results

The empirical results show that using a standard consumption model requires an extraordinary high coefficient of risk aversion (proxied by γ) in order for Equation (7.6) to hold. Mehra and Prescott documented that by simulating β, which varies between 0 and 1, and γ, which ranges between 0 and 10, the maximum equity premium is 0.35 percent, yet they found that the observed equity premium during the 1889–1978 period is about six percent. Acceptable values of γ from previous studies cited by Mehra and Prescott vary from around 0 to 2. Hansen and Jagannathan (1991) reestimated the coefficient of relative risk aversion γ using 1891–1985 time series data with the annual subjective discount factor set to 0.95, and found that γ ranges from 0 to 30 and they were still unable to explain the equity premium puzzle.

Although the coefficient of relative risk aversion created a puzzle that up to recently remained unresolved, some explanations have already been proposed. Quoted from Romer (2005), the proposed explanations were incomplete markets and transaction costs (Mankiw, 1986; Mankiw and Zeldes, 1991; Heaton and Lucas, 1996; Luttmer, 1999), habit formation (Constantinides, 1990; Campbell and Cochrane, 1999), nonexpected utility (Weil, 1989; Epstein and Zin, 1991; Bekaert, Hodrick, and Marshal, 1997), concern about equity returns for reasons other than just their implications for consumption (Benartzi and Thaler, 1995; Barberis, Huang, and Santos, 2001), and gradual adjustment of consumption (Gabaix and Laibson, 2001; Parker, 2001).

A higher coefficient of relative risk aversion was found in recent papers such as Klock and Phillips (1999) who estimated the coefficient of RRA using an ARCH model and Azar (2006) who simulated seven economies with different income levels; they found that the coefficient is around 2.5 and 4.5, respectively, with high degrees of uncertainty.

Similar to these findings, reestimation of the coefficient of RRA using US stock market data and the bootstrap procedure found that the coefficient of RRA is uncertain (Tödter, 2008). Lin (2009) also found that relative risk aversion for individual households depends on individuals' income risk: the higher the income risk that an individual faces, the higher their risk aversion. Further, Bliss and

Panigirtzoglou (2004) provided a caveat that there is some evidence of volatility dependence in risk aversion estimates, in which the estimated coefficient of risk aversion declines with the forecast horizon and is higher during periods of low volatility.

Studies of the C-CAPM for Japan are rare compared with those for the US. However, Hamori (1992a,b) found the C-CAPM was useful for explaining Japanese consumption smoothing (but not the relationship between equity and consumption) and the estimated parameters were stable, and Hamori (1993), who studied the use of US and German stocks for Japanese consumption smoothing, found that the Japanese consumption stream is consistent with both US and German stocks. Other C-CAPM tests in Japan were performed by Bakshi and Naka (1997) who tested C-CAPM in the form of time-separable and time-non-separable model, followed by Nakano and Saito (1998) who tested C-CAPM for land and asset in money market using Japanese post-war data, and found that the model was unable to explain the assets prices. Hamori (1998) empirically analyzes the relationship between consumption and asset returns using the Kreps-Porteus model for Japan and the United States. His empirical results indicate that the preference parameters of consumers in the United States are different from those of consumers in Japan, and taking that fact into consideration significantly improves the goodness-of-fit of the model. A more recent study was carried out by Tsuji (2009), which compared the CAPM and C-CAPM by incorporating a time-varying price of risk, and concluded that the CAPM is more powerful than the C-CAPM in Japan. Moreover, the original C-CAPM has been extended to the world C-CAPM (Stulz, 1981a,b), which has several variations such as the heterogeneous world C-CAPM (Constantinides and Duffie, 1996), world surplus C-CAPM, or habit C-CAPM (Campbell and Cochrane, 1999). Li (2010) tested the world C-CAPM including its variations mentioned above, and found that the later models of the world C-CAPM were able to produce lower coefficients of risk aversion that are more plausible in explaining the risk premium puzzle than the classic (Stulz) model.

7.3. Methods

7.3.1. GMM Estimation

Equation (7.5) will serve as a base model to estimate parameters β and γ and is restated in Equations (7.7) and (7.8) below. The parameters can be estimated directly using GMM and this method can attain efficient estimators without requiring the assumption of normality in the probability distribution of the disturbances:

$$\left(\beta\left(\frac{C_t}{C_{t-1}}\right)^{-\gamma} R_t\right) - 1 = 0 \quad (7.7)$$

To test whether household consumption in one country, say country *j*, is affected by asset returns in another country, say country *u*, Equation (7.7) is modified as follows:

$$\left(\beta\left(\frac{C_{j,t}}{C_{j,t-1}}\right)^{-\gamma} R_{u,t}\right) - 1 = 0 \quad (7.8)$$

where $R_{u,t} = \frac{(p_{u,t}+d_{u,t})}{p_{u,t-1}} \frac{e_{j,t}}{e_{j,t-1}} \frac{CPI_{j,t-1}}{CPI_{j,t}}$ and *p*, *d*, *e*, and *CPI* are the stock market index, dividend index, exchange rate of currency *j* per currency *u*, and consumer price index, respectively.

The subjective discount factor, β, is theoretically between 0 to 1, and previous empirical tests show that β is very close to 1 so that statistically the null hypothesis that β=1 will be hardly rejected. Bakshi *et al*. (1997) simplify the model by assuming that households have homogenous subjective time preference and set the β=0.99. Model based on Equation (7.7) or (7.8) is named Model 1 and the other one that only estimates γ (β is assumed to be constant at 0.99) is named Model 2.

In Model 1, there are two parameters ($K = 2$) to be estimated as represented in vector θ, where $\theta = (\beta, \gamma)'$. In order to obtain the solution, GMM requires that a set $Z \geq K$ of moment conditions are satisfied, and instrument variables that satisfy the orthogonality condition are needed to do so. Two set of instrumental variables used in this paper are stated as vector Z_1 and Z_2 defined as follow:

inst1: $Z_1 = \left[1, \left(\frac{C_{t-1}}{C_{t-2}}\right), R_{t-1})\right]'$

inst2: $Z_2 = \left[1, \left(\frac{C_{t-1}}{C_{t-2}}\right), \left(\frac{C_{t-2}}{C_{t-3}}\right), R_{t-1}, R_{t-2})\right]'$

The two sets of instrument variables were used in estimating both Model 1 and Model 2 in order to test the robustness of the results. The use of those instrumental variables creates an overidentified system that may not produce a unique solution with the estimated parameters. To reconcile the solutions, a weighting matrix developed by Newey and West (1987b) known as the heteroskedasticity and autocorrelation consistent (HAC) estimator, $\widehat{W}_T$, is used to estimate the parameters. If $\widehat{W}_T$ is an optimal weighting matrix then GMM would minimize to zero the objective function as specified in the following equation:

$$J(\theta, \widehat{W}_T) = Tm_T(\theta)'\widehat{W}_T^{-1}m_T(\theta) = \frac{1}{T}u(\theta)'Z\widehat{W}_T^{-1}Z'u(\theta) \qquad (7.9)$$

where $u(\theta)$ is the residual of the specified model. Equation (7.9) is known as the *J-statistic*, which can be used to test the null hypothesis that the overidentifying restrictions are satisfied (the *J-statistic* is not different from zero). This test also shows the goodness of fit of the model. The *J-statistic* will follow a χ^2 probability distribution (Hansen, 1982; Hansen and Singleton, 1982). The HAC-weighting matrix is updated using an iterated convergence method, and the lag specification for the prewhitening is based on the Akaike information criterion (AIC).

7.3.2. Structural Break Test

The stability of the parameters before and after a breakpoint can be identified using the *Andrews–Fair (AF) Wald Statistic* and *AF LR-type D-Statistic* (AFLR; Andrews, 1988). The structural break tests are calculated based on the variance–covariance matrix of the error terms that are allowed to vary between subsamples, instead of restricting them to be constant throughout the entire sample as in the *Chow Statistic*. The sample size used in this paper is 272 observations, which is large enough to justify the use of the *Wald Statistic*[3]. The *AF Wald Statistic* tests the null hypothesis

[3] The *Wald Statistic* in the AF test is valid whether or not the disturbance variances are the same, but only if the sample size is reasonably large. However, although the test is appropriate for testing a nonlinear model, the true size of the required sample size is uncertain. Hamori *et al.* (1996) analyze the small sample properties of structural change test in the framework of GMM and find that the power of the structural change test decreases drastically as the number of the out-sample data decreases. See Estrella, Rodrigues and Schich (2003) and Kobayashi (1986) for further discussion on sample size issues in this test.

that there are no differences in the estimated coefficients between two subsamples (before and after the breakpoint) and formulated as:

$$\mathrm{AF} = (\theta_1 - \theta_2)' \left(\frac{1}{T_1} V_1^{-1} + \frac{1}{T_2} V_2^{-1}\right)^{-1} (\theta_1 - \theta_2) \quad (7.10)$$

where θ_i refers to the coefficient estimates from subsample *i*, T_i refers to the number of observations in subsample *i*, and V_i is the estimate of the variance–covariance matrix for subsample *i*.

The AFLR tests the null hypothesis that the *J-statistic* from each subsample is not different, and is calculated as:

$$\mathrm{AFLR} = J_R - (J_1 + J_2) \quad (7.11)$$

where J_R is the *J-statistic* calculated with the original equation's residuals, and J_1 and J_2 are *J-statistics* from subsamples 1 and 2, respectively. Both the AF Wald and AFLR statistics have an asymptotic χ^2 distribution with $(m-1)k$ degrees of freedom, where *m* is the number of subsamples and *k* is the number of coefficients in the original equation.

In addition, the stability test on the overidentified restrictions before and after a breakpoint is tested using the *Hall and Sen O-Statistic*, calculated as:

$$O_T = J_1 + J_2 \quad (7.12)$$

where O_T is distributed as a χ^2 distribution.

The parameter stability tests were performed by moving the breakpoint within the time window of the first and the last 36 observations of the full sample. A breakpoint is found when the probability of accepting the null hypothesis of the AF Wald Statistic is below 5 percent (the null hypothesis is rejected).

7.4. Data and Sample

The observation period in this study is from 1987:12 to 2010:7, which includes recession periods for both the US and Japan. Identification of recession periods is based on a report from the *National Bureau of Economic Research (NBER)'s Business Cycle Dating Committee*. The monthly time series data used in this study are:

1. Household real consumption of nondurable goods and services (*C*). US data of household nondurable and services consumption are obtained from the *US Department of Commerce, Bureau of Economic Analysis*; Japanese data are obtained from the *Annual Survey Report, Bureau of Statistics of Japan*. Both series are seasonally adjusted and real consumption is computed by adjusting the nominal value by the consumer price index obtained from *IMF Statistics*.
2. Stock market real gross rate of return (R), which consists of capital gains and dividend yields (both adjusted for inflation using the consumer price index). The US dataset is based on the Standard and Poor, S&P 500 Index, and the dividend index of Standard and Poor was obtained from Robert Shiller's website at Yale University (http://www.econ.yale.edu/~shiller/data.htm). The comparable stock market index in Japan is the Composite Index of Tokyo Stock Exchange Section I (market capitalization weighted index, which is similar to the US S&P 500 Index) of stocks listed on the first section of the Tokyo Stock Exchange.

For additional analysis, other time series data were collected (but they are not reported to save space) such as the rate on *US Treasury Bills* and the discount rate of Japan (the rate at which the BOJ discounts eligible commercial bills and loans secured by government bonds, specially designed securities, and eligible commercial bills, obtained from *IMF Statistics*).

7.5. Data Analysis

The US and Japan share common characteristics in that both countries have similar recession periods that affected their stock markets performance, similar growth in stock market size, and similar levels of consumption expenditure (as a percentage of GDP). On the other hand, the US and Japan are different with regard to their net saving ratio, financial depth, equity holdings, and volatility in stock market returns and consumption growth.

Table 7-1: Summary Statistics for the United States and Japan 1987:12–2010:7

Variable	Mean	S.D.	Max	Min
USA RCG	1.0022	0.0035	1.0143	0.9866
JAPAN RCG	1.0002	0.0182	1.0512	0.9269
USA RRM	1.0263	0.0442	1.1433	0.8639
USA RRM (JPY)	1.0282	0.0546	1.2706	0.8441
JAPAN RRM	0.9995	0.0571	1.1698	0.7906

RCG: real consumption growth of non-durables and services, the consumption data are seasonally adjusted and measured in respective national currency. RRM: real return of stock market including dividend payment, based on S&P 500 index for US and Tokyo Stock Exchange Section I composite index. US RRM (JPY): real return of US stock market adjusted in Japanese Yen.

Table 7-1 above shows that the average real consumption growth in Japan is lower than that in US during the observation sample. This statistic is in line with previous empirical analysis on Japanese household consumption studies.

The net saving rate in Japan has long been known as the highest in the world. The Japanese net saving rate is approximately 2–3 times that in the US, whereas Japanese consumption expenditure as a percentage of GDP is slightly lower than that in the US (this data is provided in the appendix). This statistics is important because, both in US and Japan, the household saving comprises of financial assets including stocks, bonds, and other types of securities. Although the net saving rate cannot be directly linked to the estimated number of individual investor in the stock market, it may reflect the willingness to save or to postpone consumption that relevant to the subjective time preference estimation.

The growth rate of household real consumption in Japan is lower (and even negative for some periods) than that in the US. Nakagawa (1999) explained that the high rate of Japanese household savings (and relatively low consumption expenditure), even during the 1990s recession, was a precautionary action by households in anticipation of more uncertainty regarding the Japanese economy in the future. Moreover, he found that households in all income brackets have increasing motivation to save because of perceptions of an increasing future income risk rather than real interest rate changes. He also found that households in the low income and elderly categories were more sensitive to perceptions of income risk (retirement consumption puzzle). Wakabayashi (2008) explained the retirement consumption puzzle in Japan and later Hori and Shimizutani (2009) also studied Japanese household expenditure using more recent data. Both studies showed that the household consumption level remained low in Japan during the observation period.

Nakagawa's findings contradicted those of Mankiw (1986) for the US as well as the more recent study by Wachter and Yogo (2010), who found that US household consumption was very heterogeneous with respect to their responses to income shocks.

Japanese prefer to invest their money in nonequity financial assets. In contrast, the typical US household holds about half of its financial assets in the form of equity. However, lower ratios of Japanese equity holding may not indicate lower degree of familiarity of the households to the stock market instruments. This is because financial assets (including stocks) are part of saving, and the Japanese saving rate is much higher than that in US (see footnote 2). Thus, the more important measures that differentiate the characteristics of consumption behavior and saving behavior between the US and Japan are the net saving ratio and the growth in real consumption.

In addition, the volatility of the growth of real consumption in Japan is higher than that in the US. Following the argument of Hansen and Jagannathan (1991) and findings in Bliss and Panigirtzoglou (2004), one can expect to obtain a lower coefficient of risk aversion in Japan than that in the US because of the volatility differences. A more homogeneous impact of income shocks on Japanese consumption expenditure may also lead to more accurate estimation of the coefficient using the aggregate data as shown in Mankiw (1986) and confirmed by Hamori (1998).

Within the full sample period, the NBER has identified three recessions in the US (1990:7–1991:3, 2001:3–2001:11, and 2007:12–2009:6) and four recessions in Japan (1991:2–1993:10, 1997:5–1999:1, 2000:11–2002:1, and 2007:10–2009:3). The NBER analysis disregarded the impact of the 1997 Asian crisis on the US economy, whereas the effect of the crisis was observable in Japan. Table 7-1 shows that the average real gross return of Tokyo Stock Exchange (Section I) composite index during the observation period is less than 1, it indicates that on average the net real return of investing in the stock market is negative, while in US it is positive. Standard deviation of the real gross return is also found higher in Japan than that in US to indicate that Japanese stock market is more volatile (riskier).

7.6. Findings

This section is divided into two main parts and is organized as follows. In the first part, we will discuss the estimation results for the US and Japan and compare the estimated parameters to detect the usefulness of the C-CAPM in both countries. Because the C-CAPM in this paper is modeled by assuming that the utility function of consumption follows constant relative risk aversion as defined in Equation (7.4), then the identification procedure for which the C-CAPM does work depends on whether the sign conditions for β and γ in both economies are satisfied. However, when the C-CAPM in both economies holds, the estimated parameters can be compared for further analysis. The second part will discuss whether US stock market returns can explain Japanese household consumption. In other words, it tests whether Japanese households were including US stocks in their international investment portfolios as a means of consumption smoothing for anticipating future uncertainty. In that case, the test may be regarded as a type of international C-CAPM that also measures US–Japan capital market integration. In addition, the tests of parameter stability were performed on each part.

7.6.1. Recursive GMM Estimation

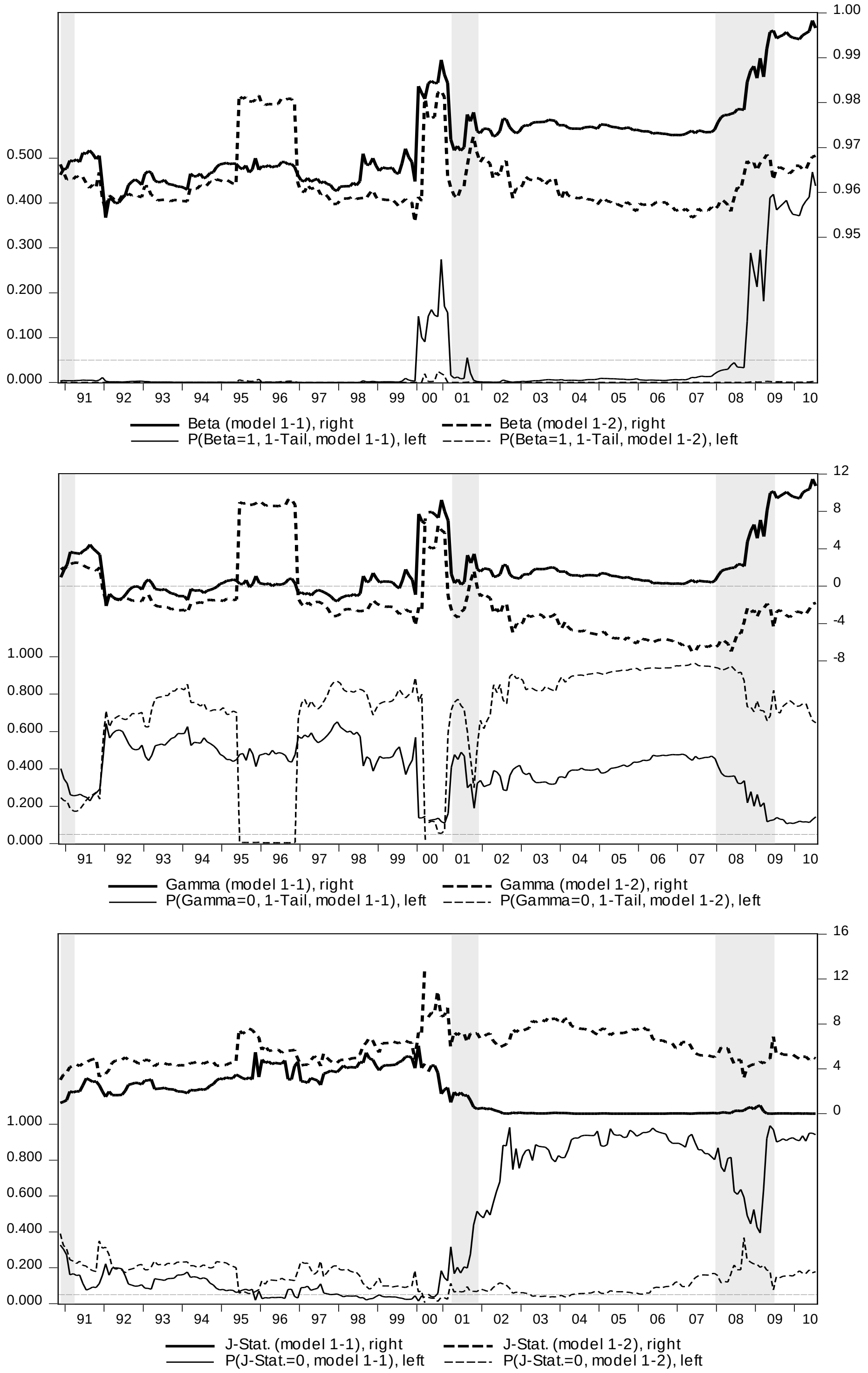
The estimated parameters for the US and Japan were obtained from recursive GMM estimation. In recursive estimation, the equation is estimated repeatedly, using ever larger subsets of the sample data. The beginning of sample period is 1987:12 and then the number of observations in each window increases where the first window contains the smallest sample size (36 observations) and the last window is the full sample (272 observations)[4]. The recursive estimations were performed in order to see the potential parameter stability issues in response to the economic dynamics and shocks in the stock markets.

[4] In order to check the robustness of the GMM estimations with regard to sample size effect, rolling window estimations were performed but they are not reported to save space. They are available on request. In general, the rolling window estimations produced more unstable estimates when smaller sample sizes were used.

GMM estimates for the US. The GMM estimation for the US is reported in Figure 7-1 and 7-2 for Model 1 and Model 2 respectively. In Figure 7-1, using Z_1 as vector of instrument variables (model 1-1), the estimated βs satisfy the sign condition when the model is estimated using sample in 1987:12-1999:12, 1987:12-(2001:3-7), and 1987:12-(2001:9-2008:9). Meanwhile, estimated βs in model 1 using instrument variables vector Z_2 (model 1-2) satisfy the sign condition in all recursive samples. From those figures, they show that the subjective discount rate increase before entering and during the recession. However, the standard error is also increasing at that period that lead to acceptance of the null hypothesis that $\beta = 1$. All γs are not significantly different from zero for model 1-1. Before entering 2000:3, the goodness-of-fit measure (*J-stat.*) of model 1-2 always has the p-value > 0.05 and greater than that of model 1-1, to say that model 1-2 is more robust than model 1-1. From model 1-2, it is found that $\gamma > 0$ for estimation using sample in 1987:12-(1995:6-1996:11) and 1987:12-2000:3 (but p-value of *J-stat.* < 0.05).

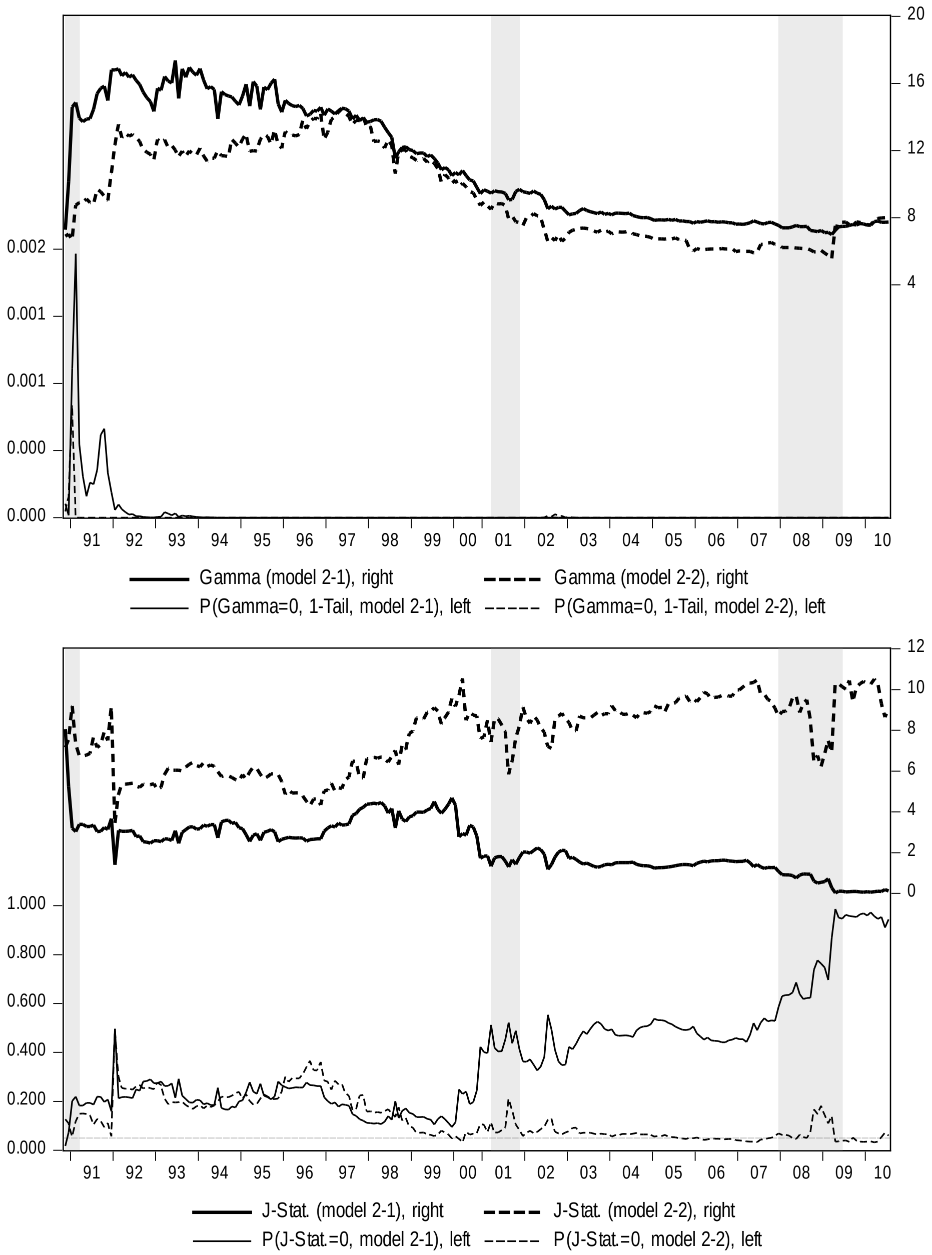
From Figure 7-1, the estimated βs are found very close to 1 that when the standard error of βs are increasing, the null hypothesis that $\beta = 1$ cannot be rejected. When β is set equal to 0.99 and assumed to be constant overtime, the estimated γs are all greater than zero as shown in Figure 7-2. However, the overidentifying restriction cannot be satisfied when sample in 2000:2 and thereafter are included. The estimated γs are also increasing during the recession period, yet the standard errors are also increasing that the γs statistically are not different from zero.

Figure 7-1: C-CAPM (Model 1) Recursive GMM Estimation for US



Model 1-1 and model 1-2 indicate that model 1 with instrument variable set 1 and 2 respectively. Shaded area represents US recession period. Upper horizontal dashed line in the middle graph (γ) indicates zero value, and the lower horizontal dashed line in all graphs indicates 0.05 significance level.

Figure 7-2: C-CAPM (Model 2) Recursive GMM Estimation for US

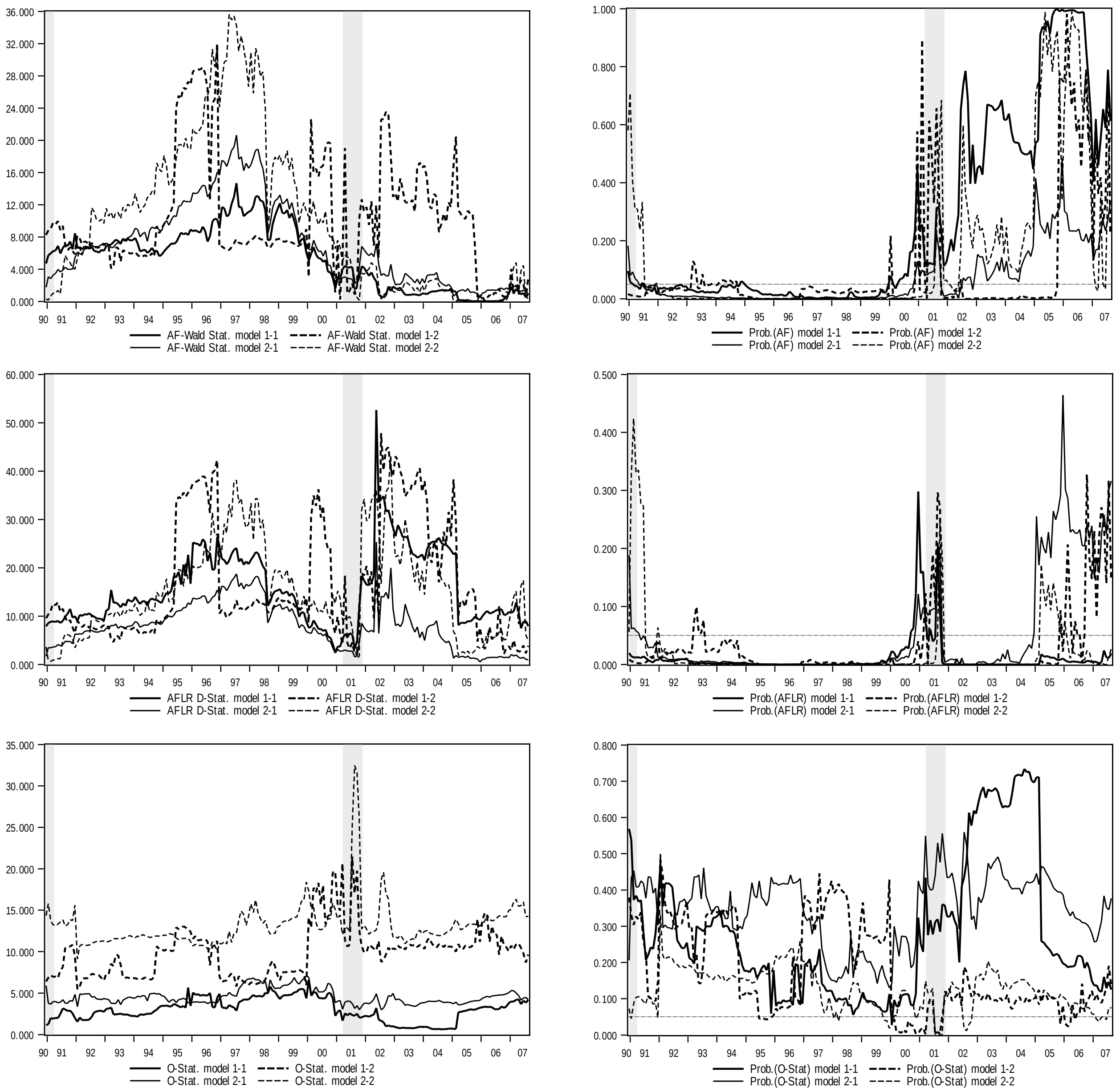


Model 2-1 and model 2-2 indicate that model 2 with instrument variable set 1 and 2 respectively. Shaded area represents US recession period. Horizontal dashed line indicates 0.05 significance level.

The structural break tests were performed for both Model 1 and Model 2 and presented in Figure 7-3. The estimated parameters are not stable during the test started from breakpoint at 1991 until 2007 for almost all models. Taking the results from Figure 7-1 and 7-2 into consideration, C-CAPM fits well in US according to model 1-2, model 2-1, and model 2-2 when estimated until 1996:11. To see the differences in the estimated parameters after 1996:11, a breakpoint was set to

1996:12, and then GMM estimation was run for each sample before and after the breakpoint. Table 7-2 shows the results.

Figure 7-3: Structural Break Test for US using Moving Breakpoint from 1990:12-2007:8



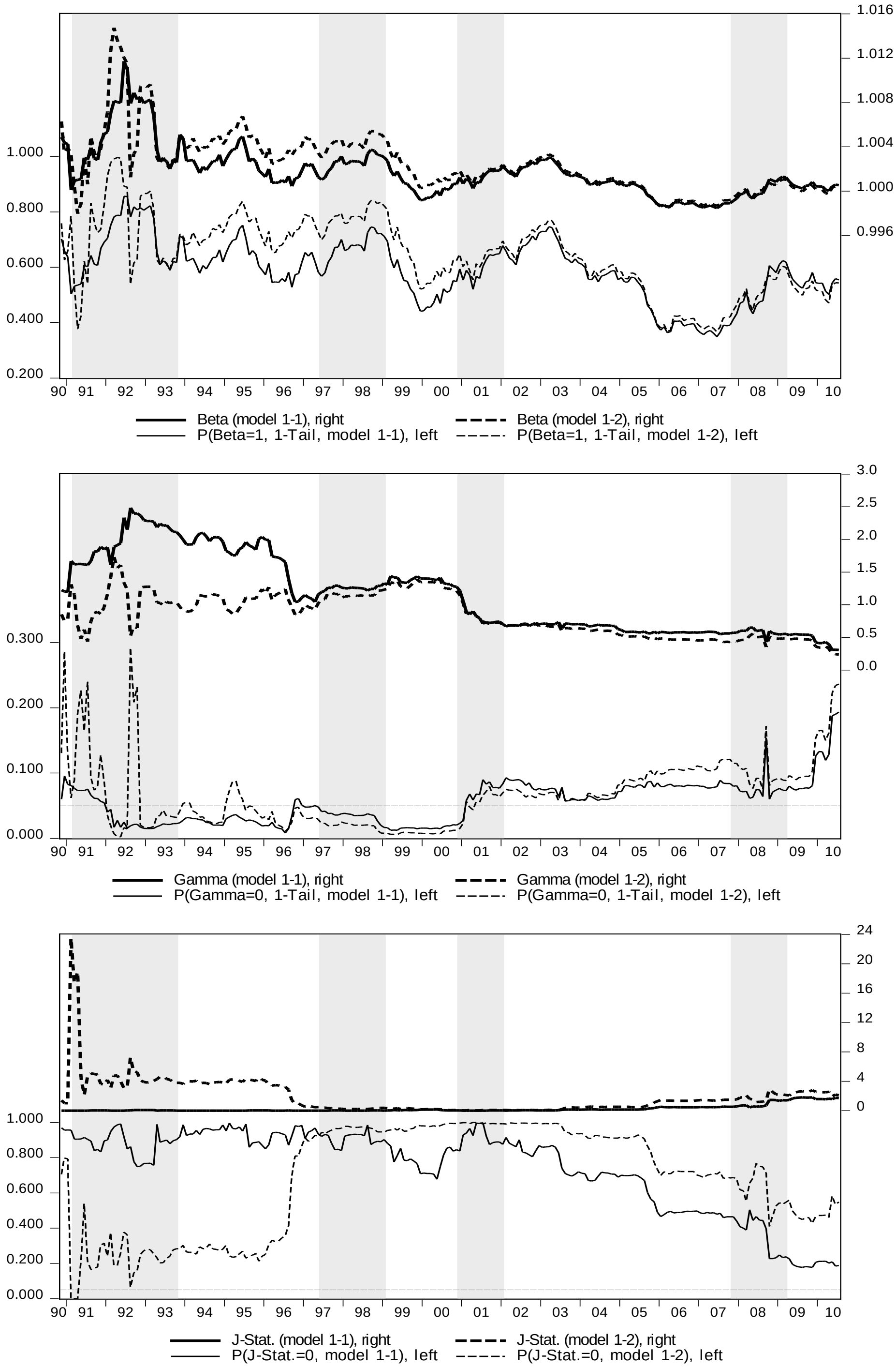
Shaded area represents US recession period. Horizontal dashed lines on graphs on the left (P-Value) indicate 0.05 significance level.

Table 7-2: Structural Break Estimation Result for US

Breakpoint Test: 1996:12				
Sample: 1987:12 - 2010:07				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
Andrews-Fair Wald Stat.	10.1710	32.0298	16.0633	31.4479
p(χ^2-AF)	0.0062	0.0000	0.0001	0.0000
Andrews-Fair LR-type D Stat.	26.3724	42.2757	15.4252	15.4252
p(χ^2-AFLR)	0.0000	0.0000	0.0001	0.0001
Hall and Sen O Stat.	4.4610	11.3147	3.8113	3.8113
p(χ^2-O-Stat.)	0.1075	0.0791	0.4321	0.4321
Sample: 1987:12 - 1996:11 (before the breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9656	0.9796	-	-
S.E. (β)	0.0095	0.0066	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.0002	0.0013	-	-
γ	0.2783	8.6890	14.5787	14.2429
S.E. (γ)	4.8408	3.3902	2.1062	1.5191
p(γ=0), 1-tail	0.4771	0.0059	0.0000	0.0000
J-Stat.	4.2531	5.6801	2.6742	4.3489
p(J-Stat=0)	0.0392	0.1283	0.2626	0.3608
Sample: 1997:1 - 2010:7 (after ther breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	1.0107	0.9280	-	-
S.E. (β)	0.0315	0.0256	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.6329	0.0029	-	-
γ	13.4193	-22.4713	4.6541	3.4900
S.E. (γ)	13.9685	10.5322	1.3557	1.2161
p(γ=0), 1-tail	0.1695	0.9823	0.0004	0.0025
J-Stat.	0.2904	2.1171	1.3327	5.9552
p(J-Stat=0)	0.5900	0.5485	0.5136	0.2025
Sample: 1987m12 - 2010:7 (all sample)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9967	0.9682	-	-
S.E. (β)	0.0214	0.0108	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.4380	0.0020	-	-
γ	10.7340	-1.7915	7.7403	8.1475
S.E. (γ)	10.0534	4.7669	1.0375	1.0370
p(γ=0), 1-tail	0.1441	0.6461	0.0000	0.0000
J-Stat.	0.0055	4.9207	0.1148	9.0358
p(J-Stat=0)	0.9408	0.1777	0.9442	0.0602

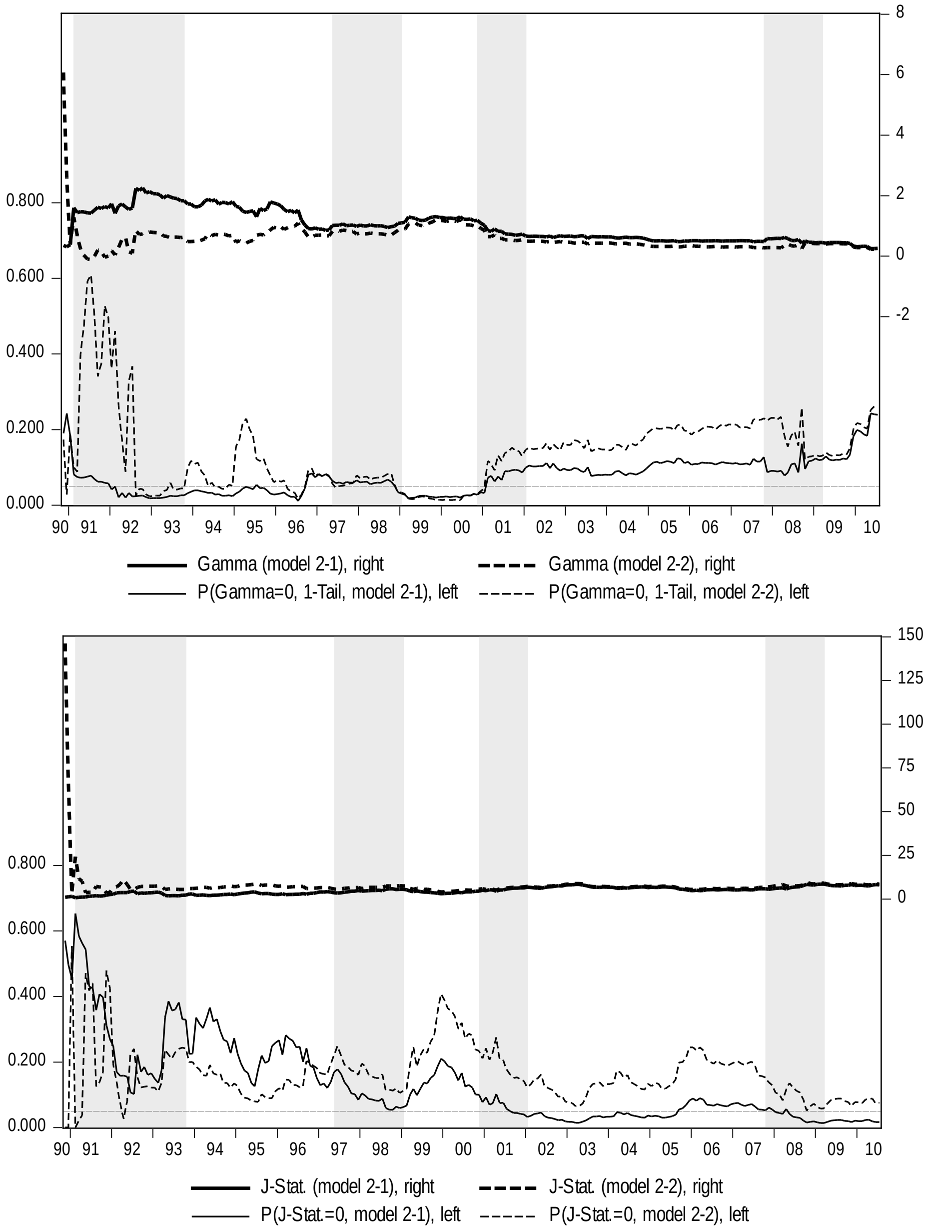
Table 7-2 shows that C-CAPM holds in all models, except in Model 1-1, before the breakpoint. When it works, the estimated γs are relatively high that range from 8.69 in model 1-2 to more than 14 in model 2, while the permissible theoretical value is around 0 to 2. Estimation using post breakpoint sample and full sample show that C-CAPM is rejected in model 1, yet the positive γ is found in model 2 and it remain above its theoretical value. The results confirm many previous empirical studies and left the equity premium in US remain a puzzle.

Figure 7-4: C-CAPM (Model 1) Recursive GMM Estimation for Japan



Model 1-1 and model 1-2 indicate that model 1 with instrument variable set 1 and 2 respectively. Shaded area represents Japan recession period. Horizontal dashed line in all graphs indicates 0.05 significance level.

Figure 7-5: C-CAPM (Model 2) Recursive GMM Estimation for Japan

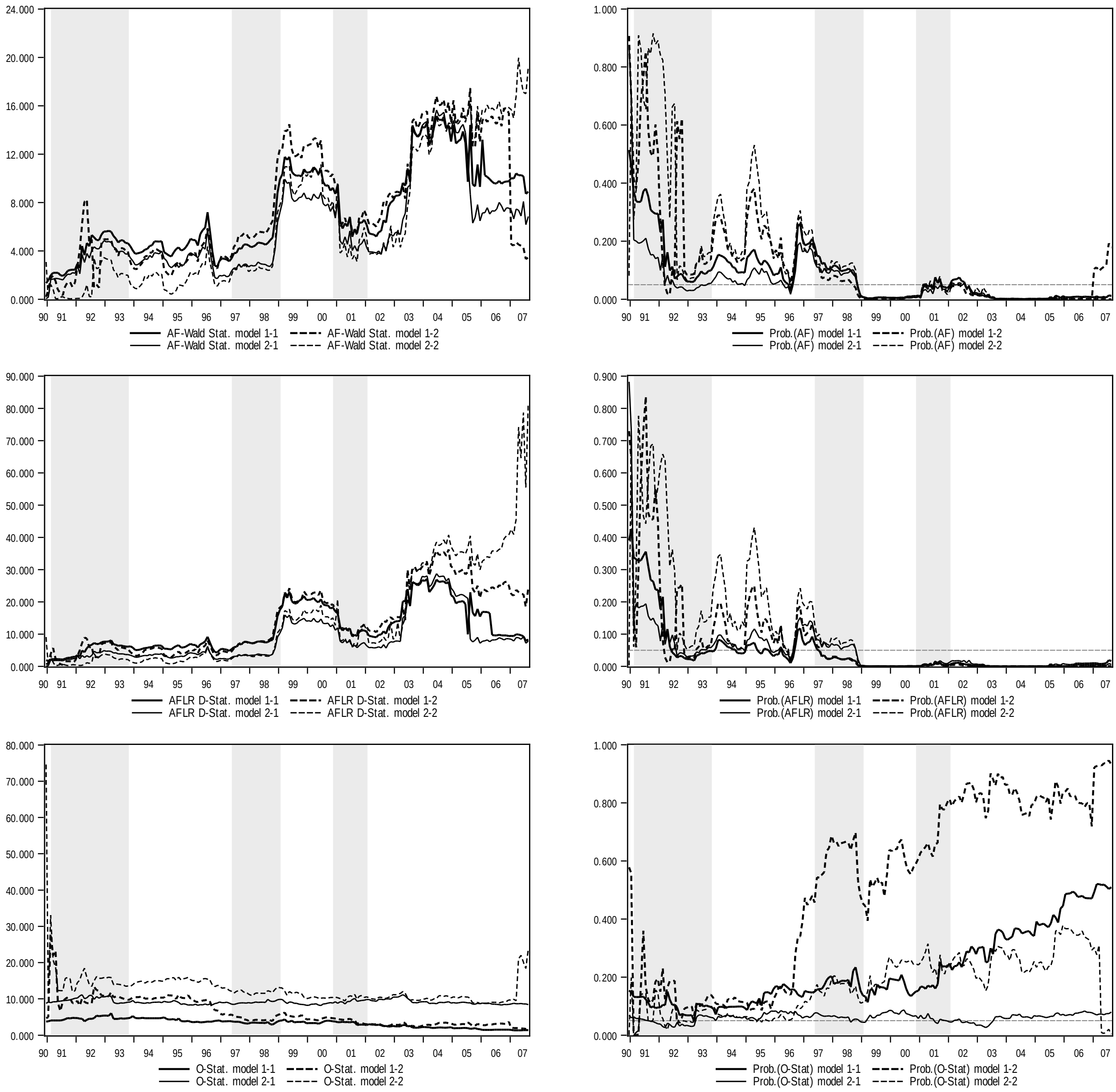


Model 2-1 and model 2-2 indicate that model 2 with instrument variable set 1 and 2 respectively. Shaded area represents Japan recession period. Horizontal dashed line indicates 0.05 significance level.

GMM Estimates for the Japan. The estimation results for Japan can be seen on Figure 7.4 and 7.5 for Model 1 and Model 2 respectively. On both figures, the use of instrument variables set *inst1* and *inst2* do not change the estimated parameter significantly, and even the estimated parameters are very similar when the sample size grows. There is no clear pattern on the estimated parameters changes during the recession periods in Japan. Parameter β is statistically positive, but it is too high that another hypothesis that $\beta = 1$ cannot be rejected in almost all recursive samples.

When $\beta = 1$, it means that the subjective time preference is very low that people have high willingness to postpone their consumption. As describe in the data analysis section, the estimation results for β may be related to lower real consumption growth (and high net saving rate). On the other hand, parameter γ mostly satisfied the sign condition for recursive samples before 2001:1 in all models, and the parameter fits well with its theoretical value.

Figure 7-6: Structural Break Test for Japan using Moving Breakpoint from 1990:12-2007:8



Shaded area represents Japan recession period. Horizontal dashed lines on graphs on the left (P-Value) indicate 0.05 significance level.

Table 7-3: Structural Break Estimation Result for Japan

Breakpoint Test: 2001:2				
Sample: 1987:12 - 2010:07				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
Andrews-Fair Wald Stat.	9.4486	9.1484	7.9911	7.1615
p(χ^2-AF)	0.0089	0.0103	0.0047	0.0074
Andrews-Fair LR-type D Stat.	16.4356	15.9236	10.8902	11.8424
p(χ^2-AFLR)	0.0003	0.0003	0.0010	0.0006
Hall and Sen O Stat.	3.5768	4.0911	8.6964	9.7875
p(χ^2-O-Stat.)	0.1672	0.6643	0.0692	0.2803
Sample: 1987:12 - 2001:1 (before the breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	1.0007	1.0013	-	-
S.E. (β)	0.0051	0.0049	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.5533	0.6023	-	-
γ	1.0637	1.0296	1.0764	0.8629
S.E. (γ)	0.5506	0.5079	0.5538	0.4928
p(γ=0), 1-tail	0.0281	0.0227	0.0274	0.0415
J-Stat.	0.0082	0.0259	4.8052	5.5376
p(J-Stat=0)	0.9280	0.9989	0.0905	0.2364
Sample: 2001:3 - 2010:7 (after the breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9968	0.9966	-	-
S.E. (β)	0.0065	0.0064	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.3093	0.2977	-	-
γ	-0.6703	-0.5372	-0.5110	-0.4582
S.E. (γ)	0.3059	0.2773	0.3116	0.2790
p(γ=0), 1-tail	0.9846	0.9722	0.9479	0.9482
J-Stat.	3.4350	3.9357	3.7573	4.0096
p(J-Stat=0)	0.0638	0.2685	0.1528	0.4047
Sample: 1987m12 - 2010:7 (all sample)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	1.0007	1.0004	-	-
S.E. (β)	0.0051	0.0040	-	-
p(β=0), 1-tail	0.0000	0.0000	-	-
p(β=1), 1-tail	0.5533	0.5353	-	-
γ	1.0637	0.2403	0.2468	-0.4582
S.E. (γ)	0.5506	0.3349	0.3577	0.2790
p(γ=0), 1-tail	0.0281	0.2374	0.2459	0.9482
J-Stat.	0.0082	2.1175	8.2116	4.0096
p(J-Stat=0)	0.9280	0.5484	0.0165	0.4047

Considering γ only, C-CAPM seems fit well in Japan during 1987:12-2001:1. Estimating the parameter using data after 2001:1 produced β that satisfied the sign condition, but $\gamma \leq 0$ in all models. The structural break test performed using moving breakpoint is presented in Figure 7-6, it shows that the estimations on the parameters relatively produce stable estimates before the breakpoint at 1998:9, but then the estimated parameters are unstable after that period. However, C-CAPM is rejected when it is estimated using full sample in all models as it is shown in Table 7-3.

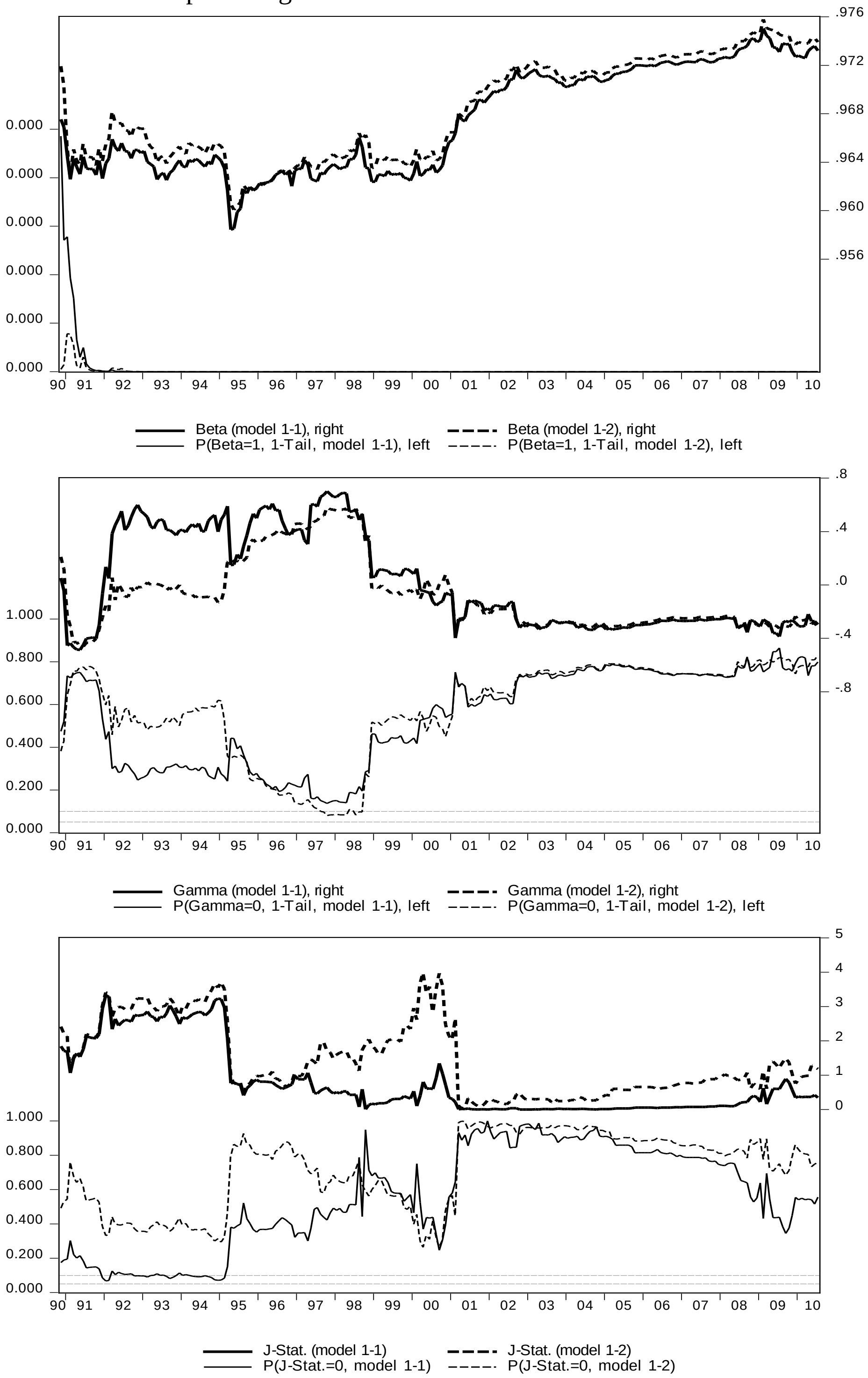
Compared with the estimation results for the US, the coefficient of relative risk aversion γ in Japan is found more plausible in explaining equity pricing using the consumption data. However, extending the sample until 2010:7 we cannot find any evidence on the usefulness of C-CAPM in both countries. C-CAPM seems only prevail in Japan before 2001, meanwhile the model only satisfies the sign condition for all parameters in US until the end of 1996 (yet with extraordinary high γ).

7.6.2. Do Japanese Households Hold US Equities for Consumption Smoothing?

To study the relationship between US stock market returns and Japanese household consumption, the parameters in Equation (7.8) were estimated by GMM similarly to the earlier methodology. The instrumental variables are unity, the lag of the growth in Japanese household real consumption, and the lag of US stock market returns, which created an overidentified system. The lagged variables use lag-1 and lag-2 for instrument variables set inst1 and inst2 respectively. The J-statistic is applied to test whether the overidentified restrictions are satisfied. The results are reported in Figure 7-7 and 7-8 for Model 1 and Model 2 respectively. The J-statistics of Model 1 are all not different from zero, while for Model 2 the violation of the overidentified restriction occurred several times prior to 2000. The βs are larger than zero and tend to increase after the 2000 recession, but are still less than one. The increasing value of β is in line with the decreasing riskless asset's real rate of return in Japan. This data may indicate that the subjective time preference for Japanese households is consistent with the real discount factor of riskless assets.

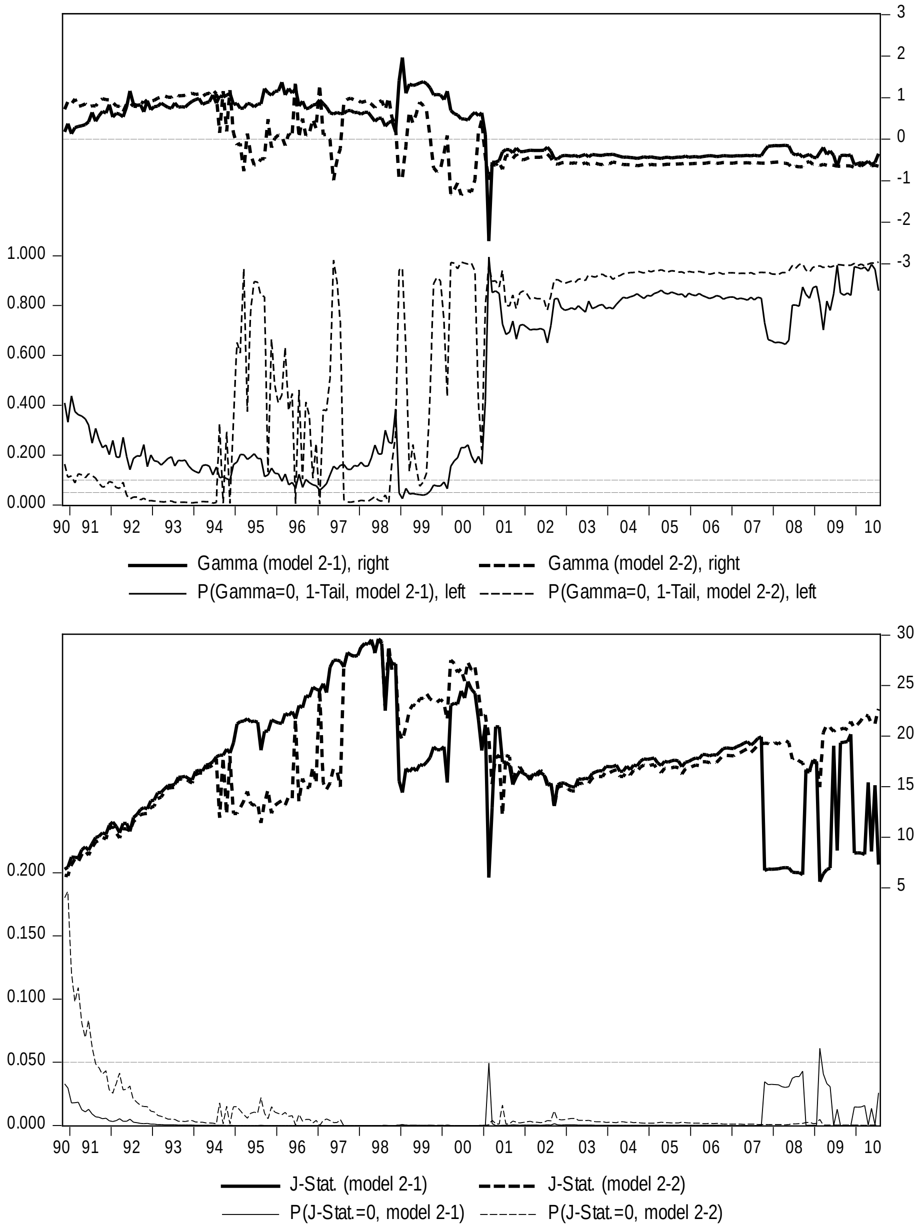
The estimated γs in Model 1 fell sharply in 1998:12 and thereafter, becoming negative and violating the sign condition. Meanwhile, Model 2 produces positive γs when they are estimated using sample up to 1999:8, although the parameter is not stable when instrument variables set inst2 is used.

Figure 7-7: Recursive GMM Estimation on C-CAPM (Model 1) Test in Japan using US Stock Market Return



Model 1-1 and model 1-2 indicate that model 1 with instrument variable set 1 and 2 respectively. Upper and lover horizontal dashed line in all graphs indicate 0.05 and 0.10 significance level respectively.

Figure 7-8: Recursive GMM Estimation on C-CAPM (Model 2) Test in Japan using US Stock Market Return



Model 2-1 and model 2-2 indicate that model 2 with instrument variable set 1 and 2 respectively. On the upper graph, the upper horizontal dashed line indicates zero line. The lower horizontal dashed line on all graph indicate the significance level.

Estimation using sample from 1987:12 to1997:10 produces the most fitted estimates for all Models, but cannot confirm the usefulness of C-CAPM in explaining Japanese household consumption with regard to US stock market performance. The estimation results show that Model 2 cannot meet the overidentifying restriction and γ is not significantly different from zero. Table 7-4 shows the estimation results and structural break test around that sample. Estimation after the breakpoint at 1997:11 produces estimated γ that is not significantly different from zero in all models.

Table 7-4: Structural Break and Estimation Result for International C-CAPM in Japan

Breakpoint Test: 1997:11				
Sample: 1987:12 - 2010:07				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
Andrews-Fair Wald Stat.	14.0746	18.9971	4.3605	11.6997
$p(\chi^2$-AF)	0.0009	0.0001	0.0368	0.0006
Andrews-Fair LR-type D Stat.	13.2413	21.3300	4.9664	15.1662
$p(\chi^2$-AFLR)	0.0013	0.0000	0.0258	0.0001
Hall and Sen O Stat.	1.2236	4.0168	31.5999	34.0699
$p(\chi^2$-O-Stat.)	0.5424	0.6744	0.0000	0.0000
Sample: 1987:12 - 1997:10 (before the breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9634	0.9642	-	-
S.E. (β)	0.0036	0.0035	-	-
$p(\beta=0)$, 1-tail	0.0000	0.0000	-	-
$p(\beta=1)$, 1-tail	0.0000	0.0000	-	-
γ	0.7011	0.5780	0.6913	0.9877
S.E. (γ)	0.6388	0.4074	0.6426	0.4276
$p(\gamma=0)$, 1-tail	0.1375	0.0795	0.1423	0.0115
J-Stat.	0.6420	1.7123	28.0443	28.0175
p(J-Stat=0)	0.4230	0.6342	0.0000	0.0000
Sample: 1997:12-2010:7 (after the breakpoint)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9813	0.9824	-	-
S.E. (β)	0.0046	0.0038	-	-
$p(\beta=0)$, 1-tail	0.0000	0.0000	-	-
$p(\beta=1)$, 1-tail	0.0000	0.0000	-	-
γ	-0.8735	-0.7350	-0.9060	-0.9233736
S.E. (γ)	0.4111	0.3523	0.4195	0.35954577
$p(\gamma=0)$, 1-tail	0.9820	0.9802	0.9834	0.9941
J-Stat.	0.5484	2.1691	3.6530	6.1846
p(J-Stat=0)	0.4590	0.5381	0.1610	0.1858
Sample: 1987m12 - 2010:7 (all sample)				
Model	Model 1	Model 1	Model 2	Model 2
Instrument	inst1	inst2	inst1	inst2
β	0.9732	0.9739	-	-
S.E. (β)	0.0032	0.0031	-	-
$p(\beta=0)$, 1-tail	0.0000	0.0000	-	-
$p(\beta=1)$, 1-tail	0.0000	0.0000	-	-
γ	-0.2959	-0.3108	-0.3469	-0.6557
S.E. (γ)	0.3523	0.3289	0.3209	0.3341
$p(\gamma=0)$, 1-tail	0.7986	0.8265	0.8589	0.9738
J-Stat.	0.3469	1.1821	7.3104	22.6832
p(J-Stat=0)	0.5559	0.7573	0.0259	0.0001

The findings in this section might indicate that home bias presents in Japanese investors or households. The home biasedness might also indicate the existence of asymmetric information between US corporations and Japanese investors. The asymmetry may be widened because of differences in non-economic and economic factors between US and Japan. Such non-economic factors include the differences with regard to corporate culture and values, language, law enforcement problems and regulations. Meanwhile, the economic factors could be in the form of tax regulations, the lack availability of US securities assets in the Japanese capital market, and savings/consumptions-investments condition. More recently, Karabarbounis and Neiman (2012) investigated global phenomena of the uptrend in corporate savings and the downtrend of labor shares. In their paper, they show that the uptrend of corporate savings prevails globally since 1975, including in the US, the European countries and the Japan. The corporate savings is generally the largest component of national savings. The rise of the corporate savings indicates that corporations prefer to finance their investment through retained earnings rather than issuing new stocks or raising new debts. In standard corporate finance theory, cost of capital of retained earnings is much cheaper than that of new equity or debt because a firm is not required to incur flotation costs. Consequently, household savings would not be used for financing the corporate investments, even in the domestic market. Although in Japan households' consumptions was declining and the households' savings was rising, yet the savings was not transmitted to the corporations for investment financing. This may explain why the relationship between households' savings-consumptions and investment is both domestically and internationally disconnected.

7.7. Conclusions

The findings show that the coefficients of risk aversion in Japan are much lower than those in the US and that they conform to their theoretical value according to the standard consumption model. The coefficients of risk aversion in the US are found to be high, well above 8, which are consistent with previous studies, and the coefficients are not plausible in explaining the risk premium. However the results that show the parameters satisfy the sign condition only hold when the models are estimated using sample period from 1987:12 to 1996:12 and from 1987:12 to 2001:2 for US and Japan respectively. Test on the structural stability of the estimated parameters in both countries also show that the parameters are not stable. The results show that the test on C-CAPM using GMM will produce absolutely different conclusion when estimated using different sample. However, extending the sample period until 2010:7 will not change the above findings.

As the parameter γ is more plausible in Japan in explaining the asset pricing, it is interesting to examine whether Japanese households also hold foreign stocks (in this paper, I focus on US stocks) to anticipate future income uncertainty in order to maintain their consumption levels. The findings show that while β lying between 0 and 1 in all recursive samples for Model 1, but γ is statistically not different from zero. In Model 2, the estimated γ is also not stable. Taking these results into consideration, it is conclusive to say that Japanese households do not use assets traded in US stock market as a mean of consumption smoothing. The results deviate from previous empirical result found by Hamori (1993) that use sample in the period of 1980-1990.

These results may indicate that US stocks are no longer attractive for the Japanese. Considering the rapid development in Asian capital markets including the markets in newly industrialized economies such as China, Korea, India, and other emerging markets (ASEAN-5 countries for example), further investigation is needed to determine whether assets in those emerging markets have become more attractive for the Japanese in forming their international portfolios.

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APPENDIX – A

APPENDIX – A

Codes of EViews Program for ICAPM Test in Ch. 5

Introduction

Every command started with {'} sign is basically a note or comment that will not be executed by EViews. The comment provides information regarding the data used and or the function will be performed.

```
'===============================================================
'International Conditional Capital Asset Pricing Model Test
'Programmer: Kusdhianto Setiawan
'Estimation of SUR-GARCH models based on Modified FGLS Estimator
'of Maekawa-Setiawan (2012)
'Workfile: ICAPM_DATASET_2012_WEEKLY.wf1
'===============================================================
```

A program file in EViews has .prg file extension, while the workfile that contains dataset and output (figures, estimation results, equations, etc.) has .wf1 file extension.

The following program is stored in a file: "ICAPM_PROG_2012_FINAL.prg" and using workfile stored in ICAPM_DATASET_2012_WEEKLY.wf1

Features of the Program

Options for Multivariate GARCH Model

The codes in the program file has flexibility with regard to the multivariate GARCH model for composing matrix Ω that will be used in modified FGLS estimator. In the 'Setting' section of the program, user may use Constant Conditional Correlation (CCC) or Dynamic Conditional Correlation (DCC) by giving value of 1 or zero respectively for `!CCC`. For example `!CCC=1` indicates that Constant Conditional Correlation will be used in the estimation.

Sample

Full sample period is defined as time series data that span from 7/02/1997 until 7/25/2012. The date format is mm/dd/yyyy. Meanwhile, non-recession period is defined as the observation of the time series data that span from 10//31/2001 until 11/28/2007. This periodization of the business cycle is based on report of NBER's Business Cycle Dating Committee (BCDC). To use the full sample, set the command `!FullSample=1` and `!FullSample=0` for non-recession dataset.

Data Frequency

The workfile contains data in both weekly and monthly frequency. To use the weekly dataset, set `!Freq=1`, and set it to 0 for the monthly.

Realized Return vs. Expected Return

The program can be used to test ICAPM in ex-post test and ex-ante test by using realized return and expected return respectively. To test ICAPM in ex-ante setting, set `!REEX=0`, and set it to 1 for ex-post test.

Measuring Performance of Market Portfolio

The performance is solely based on Sharpe-ratio. The world market portfolio is not affected by this setting. The setting is for computing time varying Sharpe ratio of a mean-variance efficient portfolio to attain a specific target return. The target return can be varied x% above the riskless rate (`!Target=1`) or fixed at particular rate (`!Target=0`) defined in !vartgtret.

To set the intended setting of the ICAPM test, input the appropriate parameters in following part of the program.

```
'Setting
'----------------------------------------------------------------------
!CCC=0    '1: CCC, 0:DCC
!FullSample=0  '1: Full Sample, 0: Non-Recession
!Freq=1   '1:weekly, 0:Monthly
!REEX = 1   '1: Realized Return Based, 0: Expected Return Based
!Target = 1       '1: x% above Rf as Portfolio Return Target,
                  '0: Fixed Portfolio Return Target
!vartgtret = 0.1 'the x%
'----------------------------------------------------------------------
```

Components of the Program

Defining Sample Periods

```
IF !FullSample=1 AND !Freq=1 THEN
  'Full Sample Monthly
  %Start = "7/02/1997"
  %End = "7/25/2012"
ENDIF

IF !FullSample=0 AND !Freq=1 THEN
  'Non-Recession Monthly
  %Start = "10/31/2001"
  %End = "11/28/2007"
ENDIF

IF !FullSample=1 AND !Freq=0 THEN
  'Full Sample Weekly
  %Start = "1997m7"
  %End = "2012m7"
ENDIF

IF !FullSample=0 AND !Freq=0 THEN
  'Non-Recession Weekly
  %Start = "2001m10"
  %End = "2007m11"
ENDIF

IF !Freq=1 THEN
  !divfreq = 48
ELSE
  !divfreq = 12
ENDIF

!N=12  'Number of Indexes
```

Adjusting Index Value into US Dollars Value

Series of index is stored in `_????_ADJCLOSE` where the "????" represent the name of the index. Series of exchange rate from currency ??? to US Dollar is represented by ???2USD. The index that already stated in US Dollar and taken in natural logarithmic form will be named `dm_i` and grouped into `DMI`, where `i` is from 1 to 12 that represent stock market in US, Germany, Hong Kong, Japan, Singapore, UK, Argentina, Brazil, China, Indonesia, Malaysia, and Mexico.

```
SMPL @ALL
Group all_dom_mkt
all_dom_mkt.append _GSPC_ADJCLOSE
all_dom_mkt.append _GDAXI_ADJCLOSE
all_dom_mkt.append _HSI_ADJCLOSE
all_dom_mkt.append _N225_ADJCLOSE
all_dom_mkt.append _STI_ADJCLOSE
all_dom_mkt.append _FTSE_ADJCLOSE
all_dom_mkt.append _MERV_ADJCLOSE
all_dom_mkt.append _BVSP_ADJCLOSE
all_dom_mkt.append _SSEC_ADJCLOSE
all_dom_mkt.append _JKSE_ADJCLOSE
all_dom_mkt.append _KLSE_ADJCLOSE
all_dom_mkt.append _MXX_ADJCLOSE

Group exrt
exrt.append USD2USD
exrt.append DEM2USD_OK
exrt.append HKD2USD
exrt.append JPY2USD
exrt.append SGD2USD
exrt.append GBP2USD
exrt.append ARS2USD
exrt.append BRL2USD
exrt.append CNY2USD
exrt.append IDR2USD
exrt.append MYR2USD
exrt.append MXN2USD
STOM(all_dom_mkt,dmi)
STOM(exrt,exrt_)

'Converting Close_Adj Price from Local Currency to USD and taking its
log.

MTOS(dmi)
MTOS(exrt_)
FOR !i=1 TO !N
  !j=!N+!i
  IF !i<10 THEN
    Series __retcurrexch_{!i} = D(log(ser{!j}))
    Series dm_{!i} = log(ser0{!i}*ser{!j})
  ELSE
    Series __retcurrexch_{!i} = D(log(ser{!j}))
    Series dm_{!i} = log(ser{!i}*ser{!j})
  ENDIF
NEXT

Delete(noerr) ser*
Delete(noerr) DMI
Delete(noerr) exrt_
```

```
'Group Domestic Market Index (in USD)
Group DMI
FOR !i=1 TO !N
  DMI.append dm_{!i}
NEXT
```

Adjusting data frequency for riskless rate and target return

```
' Riskless Asset
    Series rf_ser = (us_tbills_3mo/100)/!divfreq
    stom(rf_ser,rf_mat)

' Target Expected Return
    IF !Target = 0 THEN
      !tgtreturn = !fixtgtret/!divfreq
      ELSE
      Series tgtreturn = (!vartgtret/!divfreq) + rf_ser
    ENDIF
```

Setting for Sample and Defining Number of Sample Size

```
SMPL %Start %End
!T=@OBSSMPL 'Number of Observation Sample
```

Johansen's Cointegration Test

```
Freeze(__Summary_CointTest) DMI.coint(s,1) 'Cointegration Test with
Lag=1
```

Estimation of Expected Return and Its Conditional Variance

```
VAR __DMI_VECM.Ec(b,1) 1 1 DMI
__DMI_VECM.Makesystem(n=__SYS_VECM_DMI)  'System of VECM of Expected
Return

'*** Estimation of VEC-GARCH Model - MLE
' __SYS_VECM_DMI.ARCH(DERIV=AA) @DIAGBEKK C(DIAG) ARCH(1,DIAG)
GARCH(1,DIAG) '(VECM with GARCH, Beware of Failure to achieve
convergence!)

'*** Estimation of VEC-GARCH Model - Alternative Method:: VEC-GARCH
(Maekawa-Setiawan, 2012)

' Make Cointegrating Series from VECM (Series name: __CES) and
Vectorize it (!T-2)
  __dmi_vecm.makecoint __CEQ
  rename cointeq01 __CES  'this Series start at %Start+2

  SMPL %Start+2 %End
  STOM(__CES,v__CES) 'Vector size (!T-2)
  delete(noerr) __ceq

' Make Residuals of VECM
  __dmi_vecm.makeresid  'will create resid01 resid02 ...residN
     Group __resVECM
    FOR !i=1 TO !N
      IF !i<10 THEN
        Rename resid0{!i} __resVECM{!i}
      ELSE
        Rename resid{!i} __resVECM{!i}
```

```
      ENDIF
      __resVECM.append __resVECM{!i}
    NEXT

'  Estimate GARCH from VECM residuals
    System __VecResGARCH
    FOR !i=1 TO !N
      __VecResGARCH.append __resVECM{!i} = C({!i})
    NEXT
    IF !CCC=1 THEN 'Constant Conditional Correlation (CCC)
      __VecResGARCH.ARCH(M=5000, DERIV=AA) @CCC C ARCH(1) GARCH(1)

    ELSE 'Dynamic Conditional Correlation (DCC)
      __VecResGARCH.ARCH(DERIV=AA) @DIAGBEKK C(DIAG) ARCH(1,DIAG)
GARCH(1,DIAG)
    ENDIF

    __VecResGARCH.makeresid
    Group __resVECGARCH
    FOR !i=1 TO !N
      IF !i<10 THEN
        Rename resid0{!i} __resVECGARCH{!i}
      ELSE
        Rename resid{!i} __resVECGARCH{!i}
      ENDIF
      __resVECGARCH.append __resVECGARCH{!i}

      FOR !j=1 TO !N
        'create empty Vector of variance/covariance INVERSE
        Vector(!T-2) S_GARCH_inv_{!i}_{!j}
      NEXT
    NEXT

    __VecResGARCH.Makegarch(cov,name=__Var_resVECM)
    Group __VECGH_CVar
    FOR !i=1 TO !N
      IF !i<10 THEN
        __VECGH_CVar.append __Var_resVECM0{!i}
      ELSE
          __VECGH_CVar.append __Var_resVECM{!i}
      ENDIF
    NEXT

    FOR !tt=1 TO !T-2
      %dt=@otods(!tt)
      'Var_Covar Matrix for every t
      __VecResGARCH.Makegarch(mat,cov,date=%dt,name=garch_{!tt})
      'Inverse of Var_Covar Matrix
      Matrix garchinv_!tt = @INVERSE(garch_!tt)
      FOR !i=1 TO !N
        FOR !j=1 TO !N
          'filling in variance/covariance INVERSE
          S_GARCH_inv_{!i}_{!j}(!tt) = garchinv_!tt(!i,!j)
        NEXT
      NEXT
    NEXT

'  Make First Difference of each Series (dm* to ddm*)
'  and Vectorize them (!N-2)
    FOR !i=1 TO !N
      SMPL %Start %End
```

```
      Series ddm_{!i} = D(dm_{!i}) 'this Series start at %Start+1
      Series ddm_{!i}_l1 = ddm_{!i}(-1)'this Series start at
                                            '%Start+2
      SMPL %Start+2 %End
      STOM(ddm_{!i},vddm_{!i})  'Vector size (!T-2)
      STOM(ddm_{!i}_l1,vddm_{!i}_l1)'Vector size (!T-2)
    NEXT

    SMPL %Start %End
    !T=@OBSSMPL

' Make Vector Y and Matrix X_cap (Large X)
    Vector(!N*(!T-2)) Y
      FOR !i=1 TO !N
        !row=!i+(1*(!i-1)*(!T-2))-(1*(!i-1))
        Matplace(Y,vddm_{!i},!row,1)
      NEXT

    Matrix(!N*(!T-2),!N*(!N+1)) X_cap
    Matrix(!T-2,!N+1) X 'Columns: CES,ddm1_l1,ddm2_l1,...ddmN_l1
    Matplace(X,V__CES,1,1)
    FOR !p=1 TO !N
      Matplace(X,vddm_{!p}_l1,1,!p+1)
    NEXT

    FOR !i=1 TO !N
      !row=!i+(1*(!i-1)*(!T-2))-(1*(!i-1))
      !col=!i+(!N+1)*(!i-1)-(1*(!i-1))
      Matplace(X_cap,X,!row,!col)
    NEXT

' Make Matrix Omega Inverse
    Matrix((!T-2)*!N,(!T-2)*!N) Omega_inv
    FOR !i=1 TO !N
      Matrix Diagonal_{!i} = @Makediagonal(S_GARCH_inv_{!i}_{!i})
      !roco=!i+(!T-2)*(!i-1)-(1*(!i-1))
' Diagonal elements of Omega_inv = inverse of variances
      Matplace(Omega_inv,Diagonal_{!i},!roco,!roco)
      FOR !j=1 TO !N
        !col=!j+(!T-2)*(!j-1)-(1*(!j-1))
        Matrix Diagonal_{!i}_{!j} =
@Makediagonal(S_GARCH_inv_{!i}_{!j}) 'Off-Diagonal elements
      Matplace(Omega_inv,Diagonal_{!i}_{!j},!roco,!col)
      NEXT
    NEXT
    Delete(noerr) Diagonal*
    Delete(noerr) s_garch*
'   Delete(noerr) garch* 'garch_tt is variance-covariance Matrix per
date from VECM's residuals
    Delete(noerr) v*

' Modified (Omega) FGLS Estimator:: Beta=[X'OminvX]inv * X'Ominv * Y
    MATRIX _delta1 = @TRANSPOSE(X_cap)
    MATRIX _delta2 = _delta1*Omega_inv
    MATRIX _delta3_ = _delta2*X_cap
    SYM _delta3 = @IMPLODE(_delta3_)
    delete(noerr) _delta3_
    MATRIX _delta4 = @INVERSE(_delta3)
    MATRIX _delta5 = _delta4*@TRANSPOSE(X_cap)
    MATRIX _delta6 = _delta5*Omega_inv
    MATRIX __delta = _delta6*Y
```

```
' Estimated Y (Returns)
    MATRIX estDDM = X_cap*__delta
    FOR !v=1 TO !N
      VECTOR(!T-2) estDDM{!v}
      FOR !i=1 TO !T-2
      !rs=!v+((!v-1)*(!T-2))+!i-1+((!v-1)*-1)
        estDDM{!v}(!i) = estDDM(!rs)
      NEXT
      SMPL %Start+2 %End
      MTOS(estDDM{!v},estDDM_{!v})
      SERIES resFECG{!v} = ddm_{!v} - estDDM_{!v}'forecast error
'     Series FFECG{!v} = dm_{!v}(-1)*(1+estDDM_{!v}) 'forecasted
future price index
      Scalar __RMSE_VECG{!v} = @Rmse(ddm_{!v},estDDM_{!v})
    NEXT

' Standard Error (SE) of Parameter
    MATRIX XOX = _delta3
    MATRIX XOXinv = _delta4
    MATRIX Y_Xdelta = Y - estDDM
    Scalar Sigma_sq =
(@Transpose(Y_Xdelta)*Omega_inv*Y_Xdelta)/((!T*!N)-(!N*(!N+1)))
    Matrix __EXCRET__VarCov = Sigma_sq*XOXinv
    Vector __EXCRET__Var = @GETMAINDIAGONAL(__EXCRET__VarCov)
    Vector(!N*(!N+1)) __EXCRET__SE
      FOR !p=1 TO !N*(!N+1)
        __EXCRET__SE(!p) = __EXCRET__Var(!p)^0.5
      NEXT
    Vector __EXCRET__Coef = __delta
    Vector __EXCRET__t = @EDIV(__EXCRET__Coef,__EXCRET__SE)

  'Summary of VEC-GARCH
  Table((!N+1)+1,!N+1) __VEC_GARCH_Ret   'Coefficients
   __VEC_GARCH_Ret(1,1) = "Param"
   __VEC_GARCH_Ret(2,1) = "EC"

  FOR !i=1 TO !N+1 'col
    FOR !j=1 TO !N 'row
    __VEC_GARCH_Ret(!j+2,1) = "VAR{!j}"
    __VEC_GARCH_Ret(1,!j+1) = "R{!j}"
      !row=!i+1
      !col=!j+1
      !rdelta=!i+((!N+1)*(!j-1))
      __VEC_GARCH_Ret(!row,!col) = __delta(!rdelta)
    NEXT
  NEXT

  Table((!N+1)+1,!N+1) __VEC_GARCH_SE 'Standard Error
   __VEC_GARCH_SE(1,1) = "Param"
   __VEC_GARCH_SE(2,1) = "EC"
  FOR !i=1 TO !N+1 'col
    FOR !j=1 TO !N 'row
    __VEC_GARCH_SE(!j+2,1) = "VAR{!j}"
    __VEC_GARCH_SE(1,!j+1) = "R{!j}"
      !row=!i+1
      !col=!j+1
      !rdelta=!i+((!N+1)*(!j-1))
      __VEC_GARCH_SE(!row,!col) = __EXCRET__SE(!rdelta)
    NEXT
  NEXT
```

```
  Table((!N+1)+1,!N+1) __VEC_GARCH_tStat 't-Statistic
   __VEC_GARCH_tStat(1,1) = "Param"
   __VEC_GARCH_tStat(2,1) = "EC"
  FOR !i=1 TO !N+1 'col
    FOR !j=1 TO !N 'row
    __VEC_GARCH_tStat(!j+2,1) = "VAR{!j}"
    __VEC_GARCH_tStat(1,!j+1) = "R{!j}"
      !row=!i+1
      !col=!j+1
      !rdelta=!i+((!N+1)*(!j-1))
      __VEC_GARCH_tStat(!row,!col) = __EXCRET__t(!rdelta)
    NEXT
  NEXT

Delete(noerr) __se*
Delete(noerr) _delta*
'Delete(noerr) ddm*
'Delete(noerr) estddm
'Delete(noerr) estddm1?
'Delete(noerr) estddm?
Delete(noerr) sqrt*
Delete(noerr) sse*
Delete(noerr) xxinv
'<in all codes above, N+1=#parameter>
```

World Market Portfolio Formation

```
SMPL %Start+1 %End
!T=@OBSSMPL

' Individual Returns  (realized and ex-ante)
    !q=12
    !n=@obssmpl
'   Realized Return
    IF !REEX = 1 THEN
      SYSTEM R_MGARCH
      GROUP RET
      FOR !i=1 TO !q
        RET.APPEND DDM_{!i}   'realized return
        R_MGARCH.APPEND DDM_{!i} = C({!i})
      NEXT

      STOM(RET,RXT_)
      MATRIX RXT = @TRANSPOSE(RXT_)

'     New System of MGARCH from Realized Return
        IF !CCC=1 THEN
          R_MGARCH.ARCH(M=5000, DERIV=AA) @CCC C ARCH(1) GARCH(1)
        ELSE
          R_MGARCH.ARCH(DERIV=AA) @DIAGBEKK C(DIAG) ARCH(1,DIAG)
GARCH(1,DIAG)
        ENDIF

        FOR !tt=1 TO !n-1
          !crut=!tt+1
          %dt=@otods(!crut)
          'Cov-Var-Matrix/Date
          R_MGARCH.MAKEGARCH(cov,mat,date=%dt,name=COVM_OBS_{!tt})
          'Vector of Return
          VECTOR RXT_{!tt} = @COLUMNEXTRACT(RXT,!tt)
            delete(noerr) RET*
```

```
            VECTOR(!q) e=1   'Vector of ones
            IF !Target = 0 THEN   'Return Target
              Scalar rp_{!tt} = !tgtreturn
              ELSE
              Scalar rp_{!tt} = @elem(tgtreturn, @otods(!tt))
            ENDIF
          NEXT
      ENDIF

'     Expected Return

      IF !REEX=0 THEN
        GROUP RET
        FOR !i=1 TO !q
            RET.APPEND ESTDDM_{!i}  'expected return
        NEXT
        STOM(RET,RXT_)
        MATRIX RXT = @TRANSPOSE(RXT_)
        FOR !tt=1 TO !n-1
          VECTOR RXT_{!tt} = @COLUMNEXTRACT(RXT,!tt)    'Return
            delete(noerr) RET*
          MATRIX COVM_OBS_{!tt} = garch_{!tt}    'Cov-Var-Matrix/Date
          VECTOR(!q) e=1                         'Vector of ones
          IF !Target = 0 THEN                    'Return Target
            Scalar rp_{!tt} = !tgtreturn
          ELSE
            Scalar rp_{!tt} = @elem(tgtreturn, @otods(!tt))
          ENDIF
        NEXT
      ENDIF

'----------------------------------------------------------------------
'                          EFFICIENT FRONTIER
'----------------------------------------------------------------------

  Matrix(!T-1,!q)  Mat_Cov_i_m
  FOR !tt=1 TO !n-1
' Create Scalar: alpha, sigma, delta for each observation (Pennacchi
' (2008)p. 38, below 2.29)
    Scalar alpha_{!tt} =
      @transpose(rxt_{!tt})*@inverse(covm_obs_{!tt})*e
    Scalar sigma_{!tt} =
      @transpose(rxt_{!tt})*@inverse(covm_obs_{!tt})*rxt_{!tt}
    Scalar delta_{!tt} = @transpose(e)*@inverse(covm_obs_{!tt})*e

' Output:
' GLOBAL SOLUTION (p.39)
    'Portfolio's Expected Return (rmv)
      Scalar rmv_{!tt} = alpha_{!tt}/delta_{!tt}
    'Portolio's Variance (vmv)
      Scalar vmv_{!tt} = 1/delta_{!tt}
    'Coefficient of Variation (cvmv)
      Scalar cvmv_{!tt} = @sqrt(vmv_{!tt})/rmv_{!tt}
    'Weight (wmv)
      Vector({!q}) wmv_{!tt} =
        (1/delta_{!tt})*@inverse(covm_obs_{!tt})*e
```

```
'  Create Vector: a and b, for obtaining minimum portfolio's variance

'  Vector a
     Vector({!q}) a_{!tt} =
        ((sigma_{!tt}*@inverse(covm_obs_{!tt})*e)-
        (alpha_{!tt}*@inverse(covm_obs_{!tt})*rxt_{!tt}))/
        ((sigma_{!tt}*delta_{!tt})-alpha_{!tt}^2)

'  Vector b
     Vector({!q}) b_{!tt} =
        ((delta_{!tt}*@inverse(covm_obs_{!tt})*rxt_{!tt})-
        (alpha_{!tt}*@inverse(covm_obs_{!tt})*e))/((sigma_{!tt}
        *delta_{!tt})-alpha_{!tt}^2)

'  OUTPUT AFTER ACHIEVING TARGET: optimum weight (w) for each asset
and minimum portfolio's variance on each observation

     'weight
        Vector({!q}) w_{!tt} = a_{!tt}+b_{!tt}*rp_{!tt}
     'variance
        Scalar v_{!tt} = (1/delta_{!tt})+(delta_{!tt}*(rp_{!tt}-
           (alpha_{!tt}/delta_{!tt}))^2)/(sigma_{!tt}*delta_{!tt}-
              alpha_{!tt}^2)
     'expected return
        Scalar rpt_{!tt} = @transpose(w_{!tt})*rxt_{!tt}

'  RISKY & RISKLESS EFFICIENT FRONTIER AT TANGENT OF CML

'  Original Version - Tangent of CML can be negative
   'lambda when riskfree asset weight = 0 (before eq. 3.3)
     '  Scalar lambdam_{!tt} = (alpha_{!tt}
                              delta_{!tt}*rf_mat(!tt))^-1
   'weight of portfolio-m --> Eq. (3.3)
     '  Vector wrisky_{!tt} =
           lambdam_{!tt}*@Inverse(covm_obs_{!tt})*(rxt_{!tt}-
              rf_mat(!tt))
   'Vector of covariance(Ri,Rm) --> Eq. (3.4)
     '  Vector Cov_i_m_{!tt} =
           @Transpose(covm_obs_{!tt}*wrisky_{!tt})
     '  MATPLACE(Mat_Cov_i_m,Cov_i_m_{!tt},!tt,1)
   'std.dev of portfolio-m --> Eq. (3.5)
     '  Scalar stddevport_{!tt} =
           @SQRT(@Transpose(wrisky_{!tt})*covm_obs_{!tt}*wrisky_{!tt})
   'Return of portfolio-m, Rm.
     '  Scalar riskyret_{!tt}_ = @Transpose(rxt_{!tt})*wrisky_{!tt}
     '     IF riskyret_{!tt}_<rf_mat(!tt) THEN
     '        Scalar riskyret_{!tt}=rf_mat(!tt)-riskyret_{!tt}_
     '     ELSE
     '        Scalar riskyret_{!tt}=riskyret_{!tt}_
     '     ENDIF
     '     Delete(noerr) riskyret_{!tt}_
     '     Scalar maxsr_{!tt} = (riskyret_{!tt}-
              rf_mat(!tt))/stddevport_{!tt} 'Maximum Sharpe Ratio

'    Vector(1) one = 1
'    Scalar wriskless_{!tt} = one-@transpose(e)*wrisky_{!tt}
     'riskless asset weight on portfolio-m -> IRRELEVANT
     'because it must be = 0
```

```
' Revised Version - Tangent of CML always be positive
  'Maximum Sharpe Ratio (2.47)
    Scalar maxsr_{!tt} = (sigma_{!tt}-
      (2*alpha_{!tt}*rf_mat(!tt))+(delta_{!tt}*rf_mat(!tt)^2))^0.5
  'Return of Risky Portfolio at Tangent of CML (see note p.46)
    Scalar riskyret_{!tt}_ =  (sigma_{!tt}-
      (alpha_{!tt}*rf_mat(!tt)))/(alpha_{!tt}
        -(delta_{!tt}*rf_mat(!tt)))
    IF riskyret_{!tt}_<rf_mat(!tt) THEN
      Scalar riskyret_{!tt}=rf_mat(!tt)-riskyret_{!tt}_
    ELSE
      Scalar riskyret_{!tt}=riskyret_{!tt}_
    ENDIF
    Delete(noerr) riskyret_{!tt}_
  'Risky Assets Weights (2.42)
    Vector({!q}) wrisky_{!tt} = ((riskyret_{!tt}-
      rf_mat(!tt)))/@ABS(sigma_{!tt}-
        (2*alpha_{!tt}*rf_mat(!tt))+(delta_{!tt}*rf_mat(!tt)^2))
          *@inverse(covm_obs_{!tt})*((rxt_{!tt}-rf_mat(!tt)*e))
  'Riskless Asset Weight (2.42)
    Vector(1) one = 1
    Scalar wriskless_{!tt} = one-@transpose(e)*wrisky_{!tt}
  'Std.Dev. (Risk) of Portfolio at Tanget of CML (2.43)
    Scalar stddevport_{!tt} =
      @SQRT(@transpose(wrisky_{!tt})*covm_obs_{!tt}*wrisky_{!tt})
  'Vector of covariance(Ri,Rm) --> Eq. (3.4)
    Vector Cov_i_m_{!tt} = @Transpose(covm_obs_{!tt}*wrisky_{!tt})
    MATPLACE(Mat_Cov_i_m,Cov_i_m_{!tt},!tt,1)

  NEXT


' OUTPUT SUMMARY
    FOR !tt=1 TO !n-1
      'Global Solution
      Vector(!n-1) G_RET
      G_RET(!tt) = rmv_{!tt}                        'return
      Vector(!n-1) G_SD
      G_SD(!tt) = @SQRT(vmv_{!tt})                  'std.dev.
      Matrix(!n-1,!q) __G_W
      ROWPLACE(__G_W,@transpose(wmv_{!tt}),!tt)     'weight

      'Target of Expected Return
      Matrix(!n-1,!q) __T_W
      ROWPLACE(__T_W,@transpose(w_{!tt}),!tt)       'weight
      Vector(!n-1) T_SD
      T_SD(!tt) = @SQRT(v_{!tt})                    'std.dev.
      Vector(!n) T_RET
      T_RET(!tt) = rpt_{!tt}                        'return
      'Sharpe Ratio
      Vector(!n-1) T_SR
      T_SR(!tt) = (rpt_{!tt}-rf_mat(!tt))/@SQRT(v_{!tt})

      'Market Portfolio at Tangent of CML
      Vector(!n-1) M_SR
      M_SR(!tt) = maxsr_{!tt}
      'sharpe ratio or slope of CML
      Matrix(!n-1,!q) __M_W_R
      'risky weight
      ROWPLACE(__M_W_R,@transpose(wrisky_{!tt}),!tt)
```

```
        'riskless weight
        Vector(!n-1) M_W_RF
        M_W_RF(!tt) = wriskless_{!tt}

        Vector(!n-1) M_SD
        M_SD(!tt) = stddevport_{!tt}        'Std.Dev.
        Vector(!n-1) M_RET
        M_RET(!tt) = riskyret_{!tt}         'return
        'For Checking Sharpe Ratio
        Vector(!n-1) M_SR_CEK
        M_SR_CEK(!tt) = (riskyret_{!tt}-rf_mat(!tt))/stddevport_{!tt}
      NEXT

'Converting Vectors into Series
  SMPL %Start+2 %End
  MTOS(G_RET,__G_RET)
  MTOS(G_SD,__G_SD)
  MTOS(T_SD,__T_SD)
  MTOS(T_SR,__T_SR)
  MTOS(M_SR,__M_SR)
  MTOS(M_W_RF,__M_W_RF)
  MTOS(M_SD,__M_SD)
  MTOS(M_RET,__M_RET)
  MTOS(M_SR_CEK,__M_SR_CEK)
  MTOS(mat_cov_i_m,ser_cov_i_m)
  Delete(noerr) ser_cov_i_m
```

Test of International CAPM with Time Varying Beta

```
‘SUR:: Seeamingly Unrelated Regression
‘GH::SUR with GARCH
     Group __TVBETA
     SYSTEM __TESTCAPM_SUR ‘adding currency exchange to the model
     SYSTEM __TESTCAPM_GH  ‘adding currency exchange to the model
     SYSTEM __TESTCAPMWOCE_SUR  ‘without currency exchange
     SYSTEM __TESTCAPMWOCE_GH   ‘without currency exchange
     Series __mrp_rlz = __m_ret - rf_ser 'market risk premium
     Scalar __mean_mrp = @MEAN(__mrp_rlz)

     FOR !i=1 TO !q
       IF !i<10 THEN
         RENAME ser0{!i} ser_cov_{!i}_m
       ELSE
         RENAME ser{!i} ser_cov_{!i}_m
       ENDIF
       Series __TV_Beta{!i} = (ser_cov_{!i}_m)/__m_sd^2
       __TVBETA.append __TV_Beta{!i}
       IF !REEX=0 THEN
         'expected excess return
         Series __excret_{!i} = estddm_{!i} - rf_ser
       ELSE
         'realized excess return
         Series __excret_{!i} = ddm_{!i} - rf_ser
       ENDIF
       !crut=!i+!q
       !crut2=!i+!q*2
       !crut3=!i+!q*3

       IF !i=1 THEN
         __TESTCAPM_SUR.append __excret_{!i} = C({!i}) +
           C({!crut})*__TV_Beta{!i} '+ [AR(1)=C({!crut3})]
```

```
        __TESTCAPM_GH.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} '+ [AR(1)=C({!crut3})]
        __TESTCAPMWOCE_SUR.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} '+ [AR(1)=C({!crut3})]
        __TESTCAPMWOCE_GH.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} '+ [AR(1)=C({!crut3})]
      ELSE

        __TESTCAPM_SUR.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} + C({!crut2})*__retcurrexch_{!i}
        __TESTCAPM_GH.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} + C({!crut2})*__retcurrexch_{!i}
        __TESTCAPMWOCE_SUR.append __excret_{!i} = C({!i}) +
          C({!crut})*__TV_Beta{!i} '+
            C({!crut2})*__retcurrexch_{!i} + [AR(1)=C({!crut3})]
        __TESTCAPMWOCE_GH.append __excret_{!i} = C({!i}) +
            C({!crut})*__TV_Beta{!i} '+
              C({!crut2})*__retcurrexch_{!i} + [AR(1)=C({!crut3})]
      ENDIF
    NEXT

'  Replacing Outliers (if any)
    FOR !tt=1 TO !n-1
      IF @ABS(__M_RET(!tt))>1 THEN
        FOR !i=1 TO !q
          __excret_{!i}(!tt) = __excret_{!i}(!tt-1)
          __TV_Beta{!i}(!tt) = __TV_Beta{!i}(!tt-1)
        NEXT
          __m_ret(!tt) = __m_ret(!tt-1)
          __m_sd(!tt) = __m_sd(!tt-1)
          __m_sr(!tt) = __m_sr(!tt-1)
          rf_ser(!tt) = rf_ser(!tt-1)
      ENDIF
    NEXT

'  SUR-based Test
    __TESTCAPM_SUR.SUR(DERIV=AA)
    __TESTCAPMWOCE_SUR.SUR(DERIV=AA)
    FREEZE(__CAPM_LS_ALPHA) __TESTCAPM_SUR.WALD
      C(1)=C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10)
        =C(11)=C(12)=0
    FREEZE(__CAPMWOCE_LS_ALPHA) __TESTCAPMWOCE_SUR.WALD
      C(1)=C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10)
        =C(11)=C(12)=0
    FREEZE(__CAPM_LS_BETAMRPABS) __TESTCAPM_SUR.WALD
      @ABS(C(13))=@ABS(C(14))=@ABS(C(15))=@ABS(C(16))=@ABS(C(17))=@
        ABS(C(18))=@ABS(C(19))=@ABS(C(20))=@ABS(C(21))=@ABS(C(22))=
          @ABS(C(23))=@ABS(C(24))=@ABS(__mean_mrp)
    FREEZE(__CAPM_LS_BETAHOMABS) __TESTCAPM_SUR.WALD
      @ABS(C(13))=@ABS(C(14))=@ABS(C(15))=@ABS(C(16))=@ABS(C(17))=@
        ABS(C(18))=@ABS(C(19))=@ABS(C(20))=@ABS(C(21))=@ABS(C(22))=
          @ABS(C(23))=@ABS(C(24))
    FREEZE(__CAPM_LS_BETAMRP) __TESTCAPM_SUR.WALD
      (C(13))=(C(14))=(C(15))=(C(16))=(C(17))=(C(18))=(C(19))
        =(C(20))=(C(21))=(C(22))=(C(23))=(C(24))=(__mean_mrp)
    FREEZE(__CAPM_LS_BETAHOM) __TESTCAPM_SUR.WALD
      (C(13))=(C(14))=(C(15))=(C(16))=(C(17))=(C(18))=(C(19))
        =(C(20))=(C(21))=(C(22))=(C(23))=(C(24))
```

```
' SUR-GARCH by MLE Test
    IF !CCC=1 THEN
      __TESTCAPM_GH.ARCH(M=5000, DERIV=AA) @CCC C ARCH(1) GARCH(1)
      __TESTCAPMWOCE_GH.ARCH(M=5000, DERIV=AA) @CCC C ARCH(1)
        GARCH(1)
    ELSE
      __TESTCAPM_GH.ARCH(DERIV=AA) @DIAGBEKK C(DIAG) ARCH(1,DIAG)
        GARCH(1,DIAG)
      __TESTCAPMWOCE_GH.ARCH(DERIV=AA) @DIAGBEKK C(DIAG)
        ARCH(1,DIAG) GARCH(1,DIAG)
    ENDIF

    FREEZE(__CAPM_GH_ALPHA) __TESTCAPM_GH.WALD
      C(1)=C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10)=C(11)
        =C(12)=0
    FREEZE(__CAPMWOCE_GH_ALPHA) __TESTCAPMWOCE_GH.WALD
      C(1)=C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=C(8)=C(9)=C(10)=C(11)
        =C(12)=0
    FREEZE(__CAPM_GH_BETAMRPABS) __TESTCAPM_GH.WALD
      @ABS(C(13))=@ABS(C(14))=@ABS(C(15))=@ABS(C(16))=@ABS(C(17))
        =@ABS(C(18))=@ABS(C(19))=@ABS(C(20))=@ABS(C(21))
          =@ABS(C(22))=@ABS(C(23))=@ABS(C(24))=@ABS(__mean_mrp)
    FREEZE(__CAPM_GH_BETAHOMABS) __TESTCAPM_GH.WALD
      @ABS(C(13))=@ABS(C(14))=@ABS(C(15))=@ABS(C(16))=@ABS(C(17))
        =@ABS(C(18))=@ABS(C(19))=@ABS(C(20))=@ABS(C(21))
          =@ABS(C(22))=@ABS(C(23))=@ABS(C(24))
    FREEZE(__CAPM_GH_BETAMRP) __TESTCAPM_GH.WALD
      (C(13))=(C(14))=(C(15))=(C(16))=(C(17))=(C(18))=(C(19))
        =(C(20))=(C(21))=(C(22))=(C(23))=(C(24))=(__mean_mrp)
    FREEZE(__CAPM_GH_BETAHOM) __TESTCAPM_GH.WALD
      (C(13))=(C(14))=(C(15))=(C(16))=(C(17))=(C(18))=(C(19))
        =(C(20))=(C(21))=(C(22))=(C(23))=(C(24))

              'Cleaning Up
              Delete(noerr) alpha_*
              Delete(noerr) sigma_*
              Delete(noerr) delta_*
              Delete(noerr) a_*
              Delete(noerr) b_*
              Delete(noerr) cov_i_m_*
              Delete(noerr) covm_obs_*
              Delete(noerr) cvmv_*
              Delete(noerr) garch_*
              Delete(noerr) garchinv_*
              Delete(noerr) lambdam_*
              Delete(noerr) maxsr_*
              Delete(noerr) resfecg*
              Delete(noerr) resid0*
              Delete(noerr) resid1*
              Delete(noerr) riskyret_*
              Delete(noerr) rmv_*
              Delete(noerr) rp_*
              Delete(noerr) rpt_*
              Delete(noerr) rxt*
              Delete(noerr) ser_cov_*
              Delete(noerr) stddevport_*
              Delete(noerr) v_*
              Delete(noerr) vmv_*
              Delete(noerr) w_*

              Delete(noerr) wmv_*
```

```
                Delete(noerr) wriskless_*
                Delete(noerr) wrisky_*
                Delete(noerr) x*
                Delete(noerr) g_*
                Delete(noerr) m_*
                Delete(noerr) omega*
                Delete(noerr) one
                Delete(noerr) rf_mat
                Delete(noerr) t_*
                Delete(noerr) e
                Delete(noerr) y

'  SUR-GARCH by Modified FGLS
     !q=12
     __TESTCAPM_SUR.makeresid
     System __CAPM_GARCH
     FOR !i=1 TO !q
       IF !i<10 THEN
         Rename resid0{!i} res_capm_{!i}
         __CAPM_GARCH.append res_capm_{!i} = C({!i})
       ELSE
         Rename resid{!i} res_capm_{!i}
         __CAPM_GARCH.append res_capm_{!i} = C({!i})
       ENDIF
     NEXT

     IF !CCC=1 THEN
       __CAPM_GARCH.ARCH(M=5000, DERIV=AA) @CCC C ARCH(1) GARCH(1)
     ELSE
       __CAPM_GARCH.ARCH(M=5000, DERIV=AA) @DIAGBEKK C(DIAG)
         ARCH(1,DIAG) GARCH(1,DIAG)
     ENDIF

     SMPL %Start+2 %End
     !T=@OBSSMPL
     !N=!q '#equation or indexes
     !param=3  'coefficients for (1)Constant, (2)__TV_BETAi,
               ' (3)__RETCURREXCH_i (#paran/equation,excep for US)
     Vector(!T) V__one=1
     FOR !i=1 TO !N
       STOM(__EXCRET_{!i},V__EXCRET{!i})
       STOM(__TV_BETA{!i},V__TV_BETA{!i})
       STOM(__RETCURREXCH_{!i},V__RETCURREXCH{!i})
     NEXT

'    Make Vector Y, Matrix X_cap
     Vector(!N*(!T)) Y
       FOR !i=1 TO !N
         !row=!i+(1*(!i-1)*(!T))-(1*(!i-1))
         Matplace(Y,V__EXCRET{!i},!row,1)
       NEXT

     Matrix(!N*(!T),!N*(!param)-1) X_cap
       FOR !i=1 TO !N
         IF !i=1 THEN   'for home country - no forex risk
           Matrix(!T,!param) X{!i} 'Columns: (1)Constant,
                                   '(2)__TV_BETAi,
                                   '(3)__RETCURREXCH_i
           Matplace(X{!i},V__one,1,1)

           Matplace(X{!i},V__TV_BETA{!i},1,2)
```

```
        ELSE
          Matrix(!T,!param) X{!i} 'Columns: (1)Constant,
                                  '(2)__TV_BETAi,
                                  '(3)__RETCURREXCH_i
          Matplace(X{!i},V__one,1,1)
          Matplace(X{!i},V__TV_BETA{!i},1,2)
          Matplace(X{!i},V__RETCURREXCH{!i},1,3)
        ENDIF
      NEXT

      FOR !i=1 TO !N
        IF !i=1 THEN
          !row=1
          !col=1
          Matplace(X_cap,X{!i},!row,!col)
        ELSE
          !row=!i+(1*(!i-1)*(!T))-(1*(!i-1))
          !col=!i+(!param)*(!i-1)-(1*(!i-1))-1
          Matplace(X_cap,X{!i},!row,!col)
        ENDIF
      NEXT

'   Make Matrix Omega Inverse
    FOR !i=1 TO !N
      FOR !j=1 TO !N
        'create empty Vector of variance/covariance INVERSE
        Vector(!T-2) CAPMS_GARCH_inv_{!i}_{!j}
      NEXT
    NEXT
    __CAPM_GARCH.Makegarch(cov,name=__Var_resVECM)
    FOR !tt=1 TO !T-2
      !idate=@dtoo(%start)+1+!tt
      'Var_Covar Matrix for every t
      __CAPM_GARCH.Makegarch(mat,cov,date=@FIRST+!idate,name=garch_
          !tt)
      'Inverse of Var_Covar Matrix
      Matrix garchinv_!tt = @INVERSE(garch_!tt)
      FOR !i=1 TO !N
        FOR !j=1 TO !N
          'filling in variance/covariance INVERSE
          CAPMS_GARCH_inv_{!i}_{!j}(!tt) = garchinv_!tt(!i,!j)
        NEXT
      NEXT
    NEXT

    Matrix((!T)*!N,(!T)*!N) Omega_inv
      FOR !i=1 TO !N
        Matrix Diagonal_{!i} =
          @Makediagonal(CAPMS_GARCH_inv_{!i}_{!i})
        !roco=!i+(!T)*(!i-1)-(1*(!i-1))
        'Diagonal elements of Omega_inv = inverse of variances
        Matplace(Omega_inv,Diagonal_{!i},!roco,!roco)
        FOR !j=1 TO !N
          !col=!j+(!T)*(!j-1)-(1*(!j-1))
          'Off-Diagonal elements
          Matrix Diagonal_{!i}_{!j} =
            @Makediagonal(CAPMS_GARCH_inv_{!i}_{!j})
          Matplace(Omega_inv,Diagonal_{!i}_{!j},!roco,!col)
        NEXT
      NEXT
      Delete(noerr) Diagonal*
```

```
       Delete(noerr) s_garch*
'      Delete(noerr) garch* 'garch_tt is variance-covariance Matrix
'                            per date from VECM's residuals
       Delete(noerr) v*

'  FGLS-GARCH Estimator:: Delta=[X'OminvX]inv * X'Ominv * Y
   MATRIX _delta1 = @TRANSPOSE(X_cap)
   MATRIX _delta2 = _delta1*Omega_inv
   MATRIX _delta3_ = _delta2*X_cap
   SYM _delta3 = @IMPLODE(_delta3_)
   delete(noerr) _delta3_
   MATRIX _delta4 = @INVERSE(_delta3)
   MATRIX _delta5 = _delta4*@TRANSPOSE(X_cap)
   MATRIX _delta6 = _delta5*Omega_inv
   MATRIX __delta = _delta6*Y

'  Estimated Y (Returns)
   MATRIX estEXCRET = X_cap*__delta
   FOR !v=1 TO !N
     VECTOR(!T) estEXCRET{!v}
     FOR !i=1 TO !T
     !rs=!v+((!v-1)*(!T))+!i-1+((!v-1)*-1)
       estEXCRET{!v}(!i) = estEXCRET(!rs)
     NEXT

     SMPL %Start+2 %End
     MTOS(estEXCRET{!v},estEXCRET_{!v})
     'forecast error
     SERIES resFECAPM{!v} = __EXCRET_{!v} - estEXCRET_{!v}
     Scalar __RMSE_CAPM_GH{!v} = @Rmse(__EXCRET_{!v},estEXCRET_{!v})
   NEXT

'  Standard Error (SE) of Parameter
   MATRIX XOX = _delta3
   MATRIX XOXinv = _delta4
   MATRIX Y_Xdelta = Y - estEXCRET
   Scalar eOe = (@Transpose(Y_Xdelta)*Omega_inv*Y_Xdelta)
   Scalar Sigma_sq = eOe/((!T*!q)-(!param*!q-1))
   Matrix __CAPM__VarCov = Sigma_sq*XOXinv
   Vector __CAPM__Var = @GETMAINDIAGONAL(__CAPM__VarCov)
   Vector(!q*!param-1) __CAPM__SE
     FOR !p=1 TO !q*!param-1
       __CAPM__SE(!p) = __CAPM__Var(!p)^0.5
     NEXT
   Vector __CAPM__Coef = __delta
   Vector __capm__coef_abs = @ABS(__delta)
   Vector __CAPM__t = @EDIV(__CAPM__Coef,__CAPM__SE)


'  Test of Hypotheses
'  Matrix R (restriction matrix) & Vector q (null hypothesis value)
'    Restrictions for Alpha_CAPM
     Matrix(!q,!q*!param-1) R_alpha
     Vector(!q) q_alpha = 0
       R_alpha(1,1) = 1
     FOR !p=3 TO 33 STEP 3
       !rowr=(!p/3)+1
       R_alpha(!rowr,!p) = 1
     NEXT

'    Restrictions for BetaHom_CAPM
```

```
    Matrix(!q,!q*!param-1) R_betahomabs
    Vector(!q) q_betahomabs = @ABS(__capm__coef(2))
      R_betahomabs(1,2) = 1
    FOR !p=4 TO 34 STEP 3
      !rowr=((!p-1)/3)+1
      R_betahomabs(!rowr,!p) = 1
    NEXT

    Matrix(!q,!q*!param-1) R_betahom
    Vector(!q) q_betahom = __capm__coef(2)
      R_betahom(1,2) = 1
    FOR !p=4 TO 34 STEP 3
      !rowr=((!p-1)/3)+1
      R_betahom(!rowr,!p) = 1
    NEXT

'   Restrictions for BetaMRP_CAPM
    Matrix(!q,!q*!param-1) R_betamrpabs
    Vector(!q) q_betamrpabs = @ABS(__mean_mrp)
      R_betamrpabs(1,2) = 1
    FOR !p=4 TO 34 STEP 3
      !rowr=((!p-1)/3)+1
      R_betamrpabs(!rowr,!p) = 1
    NEXT

    Matrix(!q,!q*!param-1) R_betamrp
    Vector(!q) q_betamrp = __mean_mrp
      R_betamrp(1,2) = 1
    FOR !p=4 TO 34 STEP 3
      !rowr=((!p-1)/3)+1
      R_betamrp(!rowr,!p) = 1
    NEXT

' Matrix (R.delta-q)
    Matrix Rdelta_q_alpha = (R_alpha*__capm__coef)-q_alpha
    Matrix Rdelta_q_betahomabs = (R_betahomabs*__capm__coef_abs)-
      q_betahomabs
    Matrix Rdelta_q_betamrpabs = (R_betamrpabs*__capm__coef_abs)-
      q_betamrpabs
    Matrix Rdelta_q_betahom = (R_betahom*__capm__coef)-q_betahom
    Matrix Rdelta_q_betamrp = (R_betamrp*__capm__coef)-q_betamrp

' Degree of Freedom
    Scalar df = (!T*!q)-(!param*!q-1)

' F-Statistics and Wald Test (FxJ)
    Scalar __F_alpha =
      (@Transpose(Rdelta_q_alpha)*@Inverse(R_alpha*Sigma_sq*XOXinv*
        @Transpose(R_alpha))*Rdelta_q_alpha)/!q
    Scalar __F_betahomabs =
      (@Transpose(Rdelta_q_betahomabs)*@Inverse(R_betahomabs
        *Sigma_sq*XOXinv*@Transpose(R_betahomabs))
          *Rdelta_q_betahomabs)/!q
    Scalar __F_betamrpabs =
      (@Transpose(Rdelta_q_betamrpabs)*@Inverse(R_betamrpabs
        *Sigma_sq*XOXinv*@Transpose(R_betamrpabs))
          *Rdelta_q_betamrpabs)/!q



    Scalar __F_betahom =
```

```
        (@Transpose(Rdelta_q_betahom)*@Inverse(R_betahom*Sigma_sq
          *XOXinv*@Transpose(R_betahom))*Rdelta_q_betahom)/!q
      Scalar __F_betamrp =
        (@Transpose(Rdelta_q_betamrp)*@Inverse(R_betamrp*Sigma_sq
          *XOXinv*@Transpose(R_betamrp))*Rdelta_q_betamrp)/!q
      Scalar __W_alpha = __F_alpha*!q
      Scalar __W_betahomabs = __F_betahomabs*!q
      Scalar __W_betamrpabs = __F_betamrpabs*!q
      Scalar __W_betahom = __F_betahom*!q
      Scalar __W_betamrp = __F_betamrp*!q

'  P-Value
      Scalar __FPval_alpha = 1-@cfdist(__F_alpha,!q,df)
      Scalar __FPval_betahomabs = 1-@cfdist(__F_betahomabs,!q,df-1)
      Scalar __FPval_betamrpabs = 1-@cfdist(__F_betamrpabs,!q,df-1)
      Scalar __FPval_betahom = 1-@cfdist(__F_betahom,!q,df-1)
      Scalar __FPval_betamrp = 1-@cfdist(__F_betamrp,!q,df-1)
      Scalar __WPval_alpha = 1-@cchisq(__W_alpha,!q)
      Scalar __WPval_betahomabs = 1-@cchisq(__W_betahomabs,!q)
      Scalar __WPval_betamrpabs = 1-@cchisq(__W_betamrpabs,!q)
      Scalar __WPval_betahom = 1-@cchisq(__W_betahom,!q)
      Scalar __WPval_betamrp = 1-@cchisq(__W_betamrp,!q)

Delete(noerr) __se*
Delete(noerr) _delta*
'Delete(noerr) ddm*
'Delete(noerr) estEXCRET
Delete(noerr) estEXCRET1?
Delete(noerr) estEXCRET?
Delete(noerr) sqrt*
Delete(noerr) sse*
Delete(noerr) XOXinv
Delete(noerr) __var_resvecm??_??
Delete(noerr) capms*
Delete(noerr) garch_*
Delete(noerr) garchinv*
Delete(noerr) x*
Delete(noerr) _delta*
Delete(noerr) capms*
Delete(noerr) garch_*
Delete(noerr) garchinv*
Delete(noerr) x*
Delete(noerr) y*
'===================================================================
'                              END OF PROGRAM
'===================================================================
```

APPENDIX – B

APPENDIX – B
Codes of EViews Program for Monte Carlo Simulation in Ch. 6

Introduction

Every command started with {'} sign is basically a note or comment that will not be executed by EViews. The comment provides information regarding the data used and or the function will be performed.

A program file in EViews has .prg file extension, while the workfile that contains dataset and output (figures, estimation results, equations, etc.) has .wf1 file extension.

The following program is stored in a file: “montecarlo_final.prg”. When the program is executed, it will create workfile defined in `%FileName = "{file name}"`

Features of the Program

Options for Multivariate GARCH Model
The codes in the program file has flexibility with regard to the multivariate GARCH model for composing matrix Ω that will be used in modified FGLS estimator. In the ‘Setting’ section of the program, user may use Constant Conditional Correlation (CCC) or Dynamic Conditional Correlation (DCC) by giving value of 1 or zero respectively for `!CONSTANT={1 or 0}`. For example `!CONSTANT=1` indicates that Constant Conditional Correlation will be used in the estimation.

Sample Size in Data Generating Process
Number of sample size is defined by `!mc={1,2,3}` where 1,2 and 3 represents sample size of 100, 300, and 400 respectively. Or it can be assigned to different sample size by defining `!obs={sample size}.`

Estimation Methods Evaluation
The program will run Monte Carlo 1000 times simulation. The number of iteration can be changed in `!run={#iteration}`. Estimation Methods that will be evaluated including OLS, VECM (without GARCH), SUR (without GARCH), FGLS-OLS, and FGLS-VECM.

Components of the Program

Monte Carlo Simulation Setup

```
'#simulation run
!run=1000
'CCC-GARCH (CONSTANT=1) vs. TVC-GARCH (CONSTANT=0)
!CONSTANT = 0
FOR !mc=1 TO 1
   IF !mc=1 THEN
   !obs=300
ENDIF
IF !mc=2 THEN
   !obs=400
```

```
ENDIF
IF !mc=3 THEN
   !obs=500
ENDIF

%FileName = "MCMK_{!obs}"
!q=3          'number of equation
!spare=!obs    'additional generated observation to remove initial
value effect
!n=!spare+!obs
!data=3+!obs
wfcreate(wf=%FileName, page=!obs) u !n
```

Data Generating Process

```
'VECM Parameters
MATRIX(!q,!q) A1
   A1(1,1) = 0.7
   A1(1,2) = 0
   A1(1,3) = 0
   A1(2,1) = 0
   A1(2,2) = 0.3
   A1(2,3) = 0
   A1(3,1) = 0.5
   A1(3,2) = 0
   A1(3,3) = 0.4
MATRIX(!q,!q) A2
   A2(1,1) = 0.3
   A2(1,2) = 0
   A2(1,3) = 0
   A2(2,1) = 0
   A2(2,2) = 0.7
   A2(2,3) = 0
   A2(3,1) = 0.5
   A2(3,2) = 1
   A2(3,3) = 0.1
MATRIX P = -(@IDENTITY(!q)-(A1)-A2)

'GARCH Paramaters
MATRIX(!q,!q) M = 0
   M(1,1) = 0.5^2
   M(2,1) = 0
   M(2,2) = 0.3^2
   M(3,1) = 0
   M(3,2) = 0
   M(3,3) = 0.7^2

vector(3) ax
ax(1) = 0.3
ax(2) = 0.6
ax(3) = 0.2
MATRIX A = ax*@transpose(ax)

vector(3) bx
bx(1) = 0.3
bx(2) = 0.5
bx(3) = 0.4

MATRIX B = bx*@transpose(bx)
'FOR CCC-GARCH
scalar RHO12 = 0.6
```

```
scalar RHO13 = 0.8
scalar RHO23 = 0.8


FOR !i=1 TO !run
  pagestruct(freq=u, start=1, end=!n)
  'Error GARCH Structure
  'INITIAL VALUES
  MATRIX(!n,!q) U
    FOR !t=1 TO !n
      U(!t,1) = @NRND
      U(!t,2) = @NRND
      U(!t,3) = @NRND
      SYM(!q) H{!t}
    NEXT
  VECTOR(!q) E = 0
  MATRIX(!q,!q) LW = 0
  MATRIX(!n,!q) V = 0
  ' FROM t=2 TO n
  !t=2
  WHILE !t<!n+1
    !t_1 = !t-1
    SYM(!q) H{!t}
    H{!t}(1,1) = M(1,1) + A(1,1)*U(!t_1,1)^2 + B(1,1)*H{!t_1}(1,1)
    H{!t}(2,2) = M(2,2) + A(2,2)*U(!t_1,2)^2 + B(1,1)*H{!t_1}(2,2)
    H{!t}(3,3) = M(3,3) + A(3,3)*U(!t_1,3)^2 + B(3,3)*H{!t_1}(3,3)

  '    TIME VARYING CONDITIONAL CORRELATION
      IF !CONSTANT=0 THEN
        H{!t}(1,2)=M(1,2)+A(1,2)*U(!t_1,1)*U(!t_1,2)
                    +B(1,2)*H{!t_1}(1,2)
        H{!t}(1,3)=M(1,3)+A(1,3)*U(!t_1,1)*U(!t_1,3)
                    +B(1,3)*H{!t_1}(1,3)
        H{!t}(2,3)=M(2,3)+A(2,3)*U(!t_1,2)*U(!t_1,3)
                    +B(2,3)*H{!t_1}(2,3)
      ENDIF

  '    CONSTANT CONDITIONAL CORRELATION
      IF !CONSTANT=1 THEN
        H{!t}(1,2) = RHO12*@SQRT(H{!t}(1,1)*H{!t}(2,2))
        H{!t}(1,3) = RHO13*@SQRT(H{!t}(1,1)*H{!t}(3,3))
        H{!t}(2,3) = RHO23*@SQRT(H{!t}(2,2)*H{!t}(3,3))
      ENDIF

    MATRIX LW{!t} = @CHOLESKY(H{!t})
  ' MATRIX UP{!t} = @TRANSPOSE(LW{!t})
    E(1) = U(!t,1)
    E(2) = U(!t,2)
    E(3) = U(!t,3)
    MATRIX(1,!q) Vt = LW{!t}*E
    ROWPLACE(V,@TRANSPOSE(Vt),!t)
    delete(noerr) Vt
    !ct = !t
    !t = !ct+1
  WEND
  delete(noerr) H*
  delete(noerr) lw*

  'YY
  MATRIX(!n,!q) YY
  !t=3
```

```
  WHILE !t<!n+1
    !t_1 = !t-1
    !t_2 = !t-2
    VECTOR Y_{!t_1} = @TRANSPOSE(@ROWEXTRACT(YY,!t_1))
    VECTOR Y_{!t_2} = @TRANSPOSE(@ROWEXTRACT(YY,!t_2))
    VECTOR Y_{!t} = A1*Y_{!t_1} + A2*Y_{!t_2}
                   + @TRANSPOSE(@ROWEXTRACT(V,!t))
    ROWPLACE(YY,@TRANSPOSE(Y_{!t}),!t)
    !ct = !t
    !t = !ct+1
  WEND
  delete(noerr) Y_*

  MTOS(YY,_Y)
  MTOS(V,_V)
  SMPL !SPARE-2 @LAST
  STOM(SER01,_Y1)
  STOM(SER02,_Y2)
  STOM(SER03,_Y3)
  STOM(SER04,_V1)
  STOM(SER05,_V2)
  STOM(SER06,_V3)
  pagestruct(freq=u, start=1, end=!data)
  SMPL @ALL
  MTOS(_Y1,Y{!i}_1)
  MTOS(_Y2,Y{!i}_2)
  MTOS(_Y3,Y{!i}_3)
  MTOS(_V1,V{!i}_1)
  MTOS(_V2,V{!i}_2)
  MTOS(_V3,V{!i}_3)
NEXT
delete(noerr) _V*
delete(noerr) _Y*
delete(noerr) e
delete(noerr) ser*
delete(noerr) yy
```

Estimation Models

```
SMPL 4 @LAST
'VECM without GARCH
  VECTOR(!run) _R_ESTPI_VEC
  VECTOR(!run) _R_ESTPHI_VEC
  MATRIX(!run,!q*!q*2) _SUM_VECNOGARCH
FOR !i=1 TO !run
  VAR _VEC_{!i}.EC(A,1) 1 1 Y{!i}_1 Y{!i}_2 Y{!i}_3
  _VEC_{!i}.MAKERESIDS resvec1_{!i} resvec2_{!i} resvec3_{!i}

  'Summary Results
    MATRIX(3,3) _ESTPIVEC_{!i}
      FOR !v=1 TO !q
        _ESTPIVEC_{!i}(!v,1) = _VEC_{!i}.A(!v,1)*_VEC_{!i}.B(1,1)
        _ESTPIVEC_{!i}(!v,2) = _VEC_{!i}.A(!v,1)*_VEC_{!i}.B(1,2)
        _ESTPIVEC_{!i}(!v,3) = _VEC_{!i}.A(!v,1)*_VEC_{!i}.B(1,3)
      NEXT
    MATRIX(3,3) _ESTPHIVEC_{!i}
      FOR !v=1 TO !q
        FOR !u=1 TO !q
          _ESTPHIVEC_{!i}(!v,!u) = _VEC_{!i}.C(!v,!u)
        NEXT
```

```
        NEXT
      'RANK of Estimated Pi and Estimated Phi
      _R_ESTPI_VEC(!i) = @RANK(_ESTPIVEC_{!i})
      _R_ESTPHI_VEC(!i) = @RANK(_ESTPHIVEC_{!i})
      'SUMMARY Statistics of VECM Without GARCH
      _SUM_VECNOGARCH(!i,1) = _ESTPIVEC_{!i}(1,1)
      _SUM_VECNOGARCH(!i,2) = _ESTPIVEC_{!i}(1,2)
      _SUM_VECNOGARCH(!i,3) = _ESTPIVEC_{!i}(1,3)
      _SUM_VECNOGARCH(!i,4) = _ESTPIVEC_{!i}(2,1)
      _SUM_VECNOGARCH(!i,5) = _ESTPIVEC_{!i}(2,2)
      _SUM_VECNOGARCH(!i,6) = _ESTPIVEC_{!i}(2,3)
      _SUM_VECNOGARCH(!i,7) = _ESTPIVEC_{!i}(3,1)
      _SUM_VECNOGARCH(!i,8) = _ESTPIVEC_{!i}(3,2)
      _SUM_VECNOGARCH(!i,9) = _ESTPIVEC_{!i}(3,3)
      _SUM_VECNOGARCH(!i,10) = _ESTPHIVEC_{!i}(1,1)
      _SUM_VECNOGARCH(!i,11) = _ESTPHIVEC_{!i}(1,2)
      _SUM_VECNOGARCH(!i,12) = _ESTPHIVEC_{!i}(1,3)
      _SUM_VECNOGARCH(!i,13) = _ESTPHIVEC_{!i}(2,1)
      _SUM_VECNOGARCH(!i,14) = _ESTPHIVEC_{!i}(2,2)
      _SUM_VECNOGARCH(!i,15) = _ESTPHIVEC_{!i}(2,3)
      _SUM_VECNOGARCH(!i,16) = _ESTPHIVEC_{!i}(3,1)
      _SUM_VECNOGARCH(!i,17) = _ESTPHIVEC_{!i}(3,2)
      _SUM_VECNOGARCH(!i,18) = _ESTPHIVEC_{!i}(3,3)
NEXT
delete(noerr) _estpivec*
delete(noerr) _estphivec*

'Maximum Likelihood Estimator (MLE)

  VECTOR(!run) _R_ESTPI_MLE
  VECTOR(!run) _R_ESTPHI_MLE
  MATRIX(!run,!q*!q*2) _SUM_MLE
MATRIX(!run,!q*2) __M_VARMLE
MATRIX(!run,!q) __A_VARMLE
MATRIX(!run,!q) __B_VARMLE
FOR !i=1 TO !run
  SYSTEM MLE_{!i}
  MLE_{!i}.append D(Y{!i}_1) = C(1)* Y{!i}_1(-1) + C(2)*Y{!i}_2(-1)
       + C(3)*Y{!i}_3(-1) + C(10)*D(Y{!i}_1(-1))
       + C(11)*D(Y{!i}_2(-1)) + C(12)*D(Y{!i}_3(-1))
  MLE_{!i}.append D(Y{!i}_2) = C(4)* Y{!i}_1(-1) + C(5)*Y{!i}_2(-1)
       + C(6)*Y{!i}_3(-1) + C(13)*D(Y{!i}_1(-1))
       + C(14)*D(Y{!i}_2(-1)) + C(15)*D(Y{!i}_3(-1))
  MLE_{!i}.append D(Y{!i}_3) = C(7)* Y{!i}_1(-1) + C(8)*Y{!i}_2(-1)
       + C(9)*Y{!i}_3(-1) + C(16)*D(Y{!i}_1(-1))
       + C(17)*D(Y{!i}_2(-1)) + C(18)*D(Y{!i}_3(-1))
' MLE_{!i}.ARCH(DERIV=AA)@DIAGVECH
       C(SCALAR)ARCH(1,SCALAR)GARCH(1,SCALAR)
  MLE_{!i}.ARCH(DERIV=AA)@DIAGBEKK C(FULLRANK)ARCH(1,DIAG)
       GARCH(1,DIAG)  'FOR Diagonal BEKK

  MLE_{!i}.MAKERESIDS resmle1_{!i} resmle2_{!i} resmle3_{!i}
  __M_VARMLE(!i,1) = MLE_{!i}.C(19)
  __M_VARMLE(!i,2) = MLE_{!i}.C(20)
  __M_VARMLE(!i,3) = MLE_{!i}.C(21)
  __M_VARMLE(!i,4) = MLE_{!i}.C(22)
  __M_VARMLE(!i,5) = MLE_{!i}.C(23)
  __M_VARMLE(!i,6) = MLE_{!i}.C(24)
  __A_VARMLE(!i,1) = MLE_{!i}.C(25)
  __A_VARMLE(!i,2) = MLE_{!i}.C(26)
  __A_VARMLE(!i,3) = MLE_{!i}.C(27)
```

```
   __B_VARMLE(!i,1) = MLE_{!i}.C(28)
   __B_VARMLE(!i,2) = MLE_{!i}.C(29)
   __B_VARMLE(!i,3) = MLE_{!i}.C(30)

   'Summary Results
     MATRIX(3,3) _ESTPI_{!i}
       FOR !v=1 TO !q
         FOR !u=1 TO !q
         !kopi = ((!v-1)*!q)+!u
         _ESTPI_{!i}(!v,!u) = MLE_{!i}.C(!kopi)
         NEXT
       NEXT
     MATRIX(3,3) _ESTPHI_{!i}
       FOR !v=1 TO !q
         FOR !u=1 TO !q
         !kophi = ((!v-1)*!q)+!u+!q^2
         _ESTPHI_{!i}(!v,!u) = MLE_{!i}.C(!kophi)
         NEXT
       NEXT

     'RANK of Estimated Pi and Estimated Phi
     _R_ESTPI_MLE(!i) = @RANK(_ESTPI_{!i})
     _R_ESTPHI_MLE(!i) = @RANK(_ESTPHI_{!i})

     'SUMMARY Statistics of MLE
     _SUM_MLE(!i,1) = _ESTPI_{!i}(1,1)
     _SUM_MLE(!i,2) = _ESTPI_{!i}(1,2)
     _SUM_MLE(!i,3) = _ESTPI_{!i}(1,3)
     _SUM_MLE(!i,4) = _ESTPI_{!i}(2,1)
     _SUM_MLE(!i,5) = _ESTPI_{!i}(2,2)
     _SUM_MLE(!i,6) = _ESTPI_{!i}(2,3)
     _SUM_MLE(!i,7) = _ESTPI_{!i}(3,1)
     _SUM_MLE(!i,8) = _ESTPI_{!i}(3,2)
     _SUM_MLE(!i,9) = _ESTPI_{!i}(3,3)
     _SUM_MLE(!i,10) = _ESTPHI_{!i}(1,1)
     _SUM_MLE(!i,11) = _ESTPHI_{!i}(1,2)
     _SUM_MLE(!i,12) = _ESTPHI_{!i}(1,3)
     _SUM_MLE(!i,13) = _ESTPHI_{!i}(2,1)
     _SUM_MLE(!i,14) = _ESTPHI_{!i}(2,2)
     _SUM_MLE(!i,15) = _ESTPHI_{!i}(2,3)
     _SUM_MLE(!i,16) = _ESTPHI_{!i}(3,1)
     _SUM_MLE(!i,17) = _ESTPHI_{!i}(3,2)
     _SUM_MLE(!i,18) = _ESTPHI_{!i}(3,3)
NEXT
delete(noerr) _estpi*
delete(noerr) _estphi*


'Ordinary Least Square (OLS)

   VECTOR(!run) _R_ESTPI_OLS
   VECTOR(!run) _R_ESTPHI_OLS
   MATRIX(!run,!q*!q*2) _SUM_OLS
FOR !i=1 TO !run
   SMPL 1 @LAST
   FOR !v=1 TO !q
   series DY{!v} = D(y{!i}_{!v})
   series D_Y{!v} = DY{!v}(-1)
   series Y_{!v} = Y{!i}_{!v}(-1)
   NEXT
```

```
   EQUATION OLS1_{!i}.LS DY1 = C(1)*Y_1 + C(2)*Y_2 + C(3)*Y_3
     + C(4)*D_Y1 + C(5)*D_Y2 + C(6)*D_Y3

     OLS1_{!i}.MAKERESIDS resols1_{!i}

   EQUATION OLS2_{!i}.LS DY2 = C(1)*Y_1 + C(2)*Y_2 + C(3)*Y_3
     + C(4)*D_Y1 + C(5)*D_Y2 + C(6)*D_Y3

     OLS2_{!i}.MAKERESIDS resols2_{!i}

   EQUATION OLS3_{!i}.LS DY3 = C(1)*Y_1 + C(2)*Y_2 + C(3)*Y_3
     + C(4)*D_Y1 + C(5)*D_Y2 + C(6)*D_Y3

     OLS3_{!i}.MAKERESIDS resols3_{!i}

   delete(noerr) DY*
   delete(noerr) D_Y*
   delete(noerr) Y_*

   'Summary Results
     MATRIX(3,3) _ESTPI_{!i}
       FOR !v=1 TO !q
         _ESTPI_{!i}(!v,1) = OLS{!v}_{!i}.C(1)
         _ESTPI_{!i}(!v,2) = OLS{!v}_{!i}.C(2)
         _ESTPI_{!i}(!v,3) = OLS{!v}_{!i}.C(3)
       NEXT

     MATRIX(3,3) _ESTPHI_{!i}
       FOR !v=1 TO !q
         _ESTPHI_{!i}(!v,1) = OLS{!v}_{!i}.C(4)
         _ESTPHI_{!i}(!v,2) = OLS{!v}_{!i}.C(5)
         _ESTPHI_{!i}(!v,3) = OLS{!v}_{!i}.C(6)
       NEXT

     'RANK of Estimated Pi and Estimated Phi
     _R_ESTPI_OLS(!i) = @RANK(_ESTPI_{!i})
     _R_ESTPHI_OLS(!i) = @RANK(_ESTPHI_{!i})

     'SUMMARY Statistics of OLS
     _SUM_OLS(!i,1) = _ESTPI_{!i}(1,1)
     _SUM_OLS(!i,2) = _ESTPI_{!i}(1,2)
     _SUM_OLS(!i,3) = _ESTPI_{!i}(1,3)
     _SUM_OLS(!i,4) = _ESTPI_{!i}(2,1)
     _SUM_OLS(!i,5) = _ESTPI_{!i}(2,2)
     _SUM_OLS(!i,6) = _ESTPI_{!i}(2,3)
     _SUM_OLS(!i,7) = _ESTPI_{!i}(3,1)
     _SUM_OLS(!i,8) = _ESTPI_{!i}(3,2)
     _SUM_OLS(!i,9) = _ESTPI_{!i}(3,3)
     _SUM_OLS(!i,10) = _ESTPHI_{!i}(1,1)
     _SUM_OLS(!i,11) = _ESTPHI_{!i}(1,2)
     _SUM_OLS(!i,12) = _ESTPHI_{!i}(1,3)
     _SUM_OLS(!i,13) = _ESTPHI_{!i}(2,1)
     _SUM_OLS(!i,14) = _ESTPHI_{!i}(2,2)
     _SUM_OLS(!i,15) = _ESTPHI_{!i}(2,3)
     _SUM_OLS(!i,16) = _ESTPHI_{!i}(3,1)
     _SUM_OLS(!i,17) = _ESTPHI_{!i}(3,2)
     _SUM_OLS(!i,18) = _ESTPHI_{!i}(3,3)
NEXT
delete(noerr) _estpi*
delete(noerr) _estphi*
delete(noerr) ols*
```

```
'FGLS-VECGARCH

SMPL 4 @LAST
!k=(!q*2) '# of exogeneous variables (including intercepts)
!n= @obssmpl  '# of observation time (for conditional
              'variance/covariance)
Matrix(18,!run)  Delta_All_FVEC 'Matrix to store all estimated
                                'parameters from simulation
MATRIX(!run,!q*2) __M_VARFVEC
MATRIX(!run,!q) __A_VARFVEC
MATRIX(!run,!q) __B_VARFVEC
VECTOR(!run) _DETO_FGLSVECGARCH_n{!obs}

FOR !i=1 TO !run
SMPL 4 @LAST
'  GARCH Structure
   SYSTEM resvecGARCH_{!i}
   resvecGARCH_{!i}.append resvec1_{!i} = C(1)'resvec1_{!i}
        resvec2_{!i} resvec3_{!i}
   resvecGARCH_{!i}.append resvec2_{!i} = C(2)
   resvecGARCH_{!i}.append resvec3_{!i} = C(3)
'  resvecGARCH_{!i}.ARCH(DERIV=AA) @DIAGVECH  C(SCALAR)
     ARCH(1,SCALAR)  GARCH(1,SCALAR)   'FOR Diagonal VECH
   resvecGARCH_{!i}.ARCH(DERIV=AA) @DIAGBEKK C(FULLRANK) ARCH(1,DIAG)
     GARCH(1,DIAG)  'FOR Diagonal BEKK
   resvecGARCH_{!i}.MAKEGARCH(COV)

   __M_VARFVEC(!i,1) =resvecGARCH_{!i}.C(4)
   __M_VARFVEC(!i,2) =resvecGARCH_{!i}.C(5)
   __M_VARFVEC(!i,3) =resvecGARCH_{!i}.C(6)
   __M_VARFVEC(!i,4) =resvecGARCH_{!i}.C(7)
   __M_VARFVEC(!i,5) =resvecGARCH_{!i}.C(8)
   __M_VARFVEC(!i,6) =resvecGARCH_{!i}.C(9)
   __A_VARFVEC(!i,1) =resvecGARCH_{!i}.C(10)
   __A_VARFVEC(!i,2) =resvecGARCH_{!i}.C(11)
   __A_VARFVEC(!i,3) =resvecGARCH_{!i}.C(12)
   __B_VARFVEC(!i,1) =resvecGARCH_{!i}.C(13)
   __B_VARFVEC(!i,2) =resvecGARCH_{!i}.C(14)
   __B_VARFVEC(!i,3) =resvecGARCH_{!i}.C(15)

'INVERSE OMEGA
   FOR !tt=4 TO !data
     resvecGARCH_{!i}.MAKEGARCH(mat, cov, date=!tt, name=H{!tt})
     MATRIX INV_H{!tt} = @INVERSE(H{!tt})
   NEXT

'  elements of VARIANCE
   FOR !v=1 TO !q
     VECTOR(!data-3) INV_H_{!v}
     FOR !tt=4 TO !data
        !ttt=!tt-3
        INV_H_{!v}(!ttt) = INV_H{!tt}(!v,!v)
     NEXT
   NEXT

'  elements of COVARIANCE
   FOR !ii=1 TO !q
     FOR !jj=1 TO !q
        IF !jj<!ii THEN
           VECTOR(!data-3) INV_H_{!ii}_{!jj}
           VECTOR(!data-3) INV_H_{!jj}_{!ii}
```

```
        FOR !qq=4 TO !data
          INV_H_{!ii}_{!jj}(!qq-3) = INV_H{!qq}(!ii,!jj)
          INV_H_{!jj}_{!ii}(!qq-3) = INV_H{!qq}(!ii,!jj)
        NEXT
      ENDIF
    NEXT
  NEXT

' INVERSE Matrix Omega
  !n=@obssmpl+2
  MATRIX((!n-2)*!q,(!n-2)*!q) invomega_
  FOR !v=1 TO !q
      MATRIX(!n-2,!n-2) __mvar{!v} = @makediagonal(INV_H_{!v})
  'inverse variance
  NEXT

  FOR !v=1 TO !q
  !rc=1+((!v-1)*(!n-2))
    FOR !j=1 TO !q
      !rcj=1+((!j-1)*(!n-2))
      !rcj1=1+(!j*(!n-2))
      !rci=1+((!v-1)*(!n-2))
      !rci1=1+(!v*(!n-2))
      IF !j<!v THEN
        MATRIX(!n-2,!n-2) __mvar_{!j}_{!v} =
@makediagonal(INV_H_{!j}_{!v}) 'inverse covariance
        MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj1}, {!rcj})
        MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj}, {!rcj1})
      ENDIF

      IF !j>!v THEN
        MATRIX(!n-2,!n-2) __mvar_{!v}_{!j} =
@makediagonal(INV_H_{!v}_{!j}) 'iverse covariance
        MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rci}, {!rcj})
        MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rcj}, {!rci})
      ENDIF
    NEXT

  MATPLACE(invomega_, __mvar{!v}, {!rc}, {!rc})
  NEXT
  SYM omegainv = @IMPLODE(invomega_)
  delete(noerr) invomega_


  'VECTOR Y (D(Y))
  VECTOR(!q*(!n-2)) Y
  SMPL 4 @LAST
    FOR !v=1 TO !q
      !r=(!v-1)*(!n-2)+1
      SERIES dY{!i}_{!v}_ = D(Y{!i}_{!v})
      STOM(dY{!i}_{!v}_,dY{!i}_{!v})
      MATPLACE(Y,dY{!i}_{!v},{!r},1)
    NEXT

  'MATRIX BigX
  !x=!q*(!n-2)
  MATRIX(!x,!q*!k) BigX_{!i}
    'VECTOR X
      MATRIX((!n-2),(!q*2)) X
          FOR !v=1 TO !q
          !dlag=!v+!q
```

```
            SERIES x{!v}_ = Y{!i}_{!v}(-1)
            STOM(x{!v}_,x{!v})
            SERIES X{!dlag}_ = D(Y{!i}_{!v}(-1))
            STOM(X{!dlag}_,X{!dlag})
           NEXT

       FOR !v=1 TO (!q*2)
         COLPLACE(X,X{!v},{!v})
       NEXT

   FOR !v=1 TO !q
   !r=1+((!v-1)*(!n-2))
   !c=1+((!v-1)*!k)
     MATPLACE(BigX_{!i},X,!r,!c)
   NEXT

'FGLS ESTIMATOR (delta)
   'MATRIX delta =
@INVERSE(@TRANSPOSE(BigX)*omegainv*BigX)*@TRANSPOSE(BigX)*omegainv*Y
   MATRIX delta1 = @TRANSPOSE(BigX_{!i})
   MATRIX delta2 = delta1*omegainv
   MATRIX delta3_ = delta2*BigX_{!i}
   SYM delta3 = @IMPLODE(delta3_)
   delete(noerr) delta3_
   MATRIX delta4 = @INVERSE(delta3)
   MATRIX delta5 = delta4*@TRANSPOSE(BigX_{!i})
   MATRIX delta6 = delta5*omegainv
   MATRIX delta = delta6*Y

   delete(noerr) __mvar*
   delete(noerr) delta?
   delete(noerr) mvarresvecm_*
'  delete(noerr) omega*

   'Estimated D(Y)
   MATRIX estY = BigX_{!i}*delta
   FOR !v=1 TO !q
     VECTOR(!n-2) estY{!v}
     FOR !t=1 TO !n-2
     !rs=!v+((!v-1)*(!n-2))+!t-1+((!v-1)*-1)
       estY{!v}(!t) = estY(!rs)
     NEXT

     MTOS(estY{!v},eDY{!v})
     SERIES resfvec{!v} = D(Y{!i}_{!v}) - eDY{!v}
   NEXT

   'PARAMETERS
   FOR !v=1 TO !q
     !c=1+((!q*2))*(!v-1)
     FOR !j=1 TO !q
     !pi=!c+!j-1
     !phi=!pi+!q
         SCALAR Pi_{!v}_{!j} = delta(!pi)
         SCALAR Phi_{!v}_{!j} = delta(!phi)
     NEXT
   NEXT

   VECTOR(!run) _R_ESTPI_FGLSVEC
   VECTOR(!run) _R_ESTPHI_FGLSVEC
'  MATRIX(!run,!q*!q*2) _SUM_FGLSVEC
```

```
FOR !x=1 TO !run
  'Summary Results
    MATRIX(3,3) _ESTPI_{!x}
      FOR !v=1 TO !q
        _ESTPI_{!x}(!v,1) = Pi_{!v}_1
        _ESTPI_{!x}(!v,2) = Pi_{!v}_2
        _ESTPI_{!x}(!v,3) = Pi_{!v}_3
      NEXT
    MATRIX(3,3) _ESTPHI_{!x}
      FOR !v=1 TO !q
        _ESTPHI_{!x}(!v,1) = Phi_{!v}_1
        _ESTPHI_{!x}(!v,2) = Phi_{!v}_2
        _ESTPHI_{!x}(!v,3) = Phi_{!v}_3
      NEXT

    'RANK of Estimated Pi and Estimated Phi
    _R_ESTPI_FGLSVEC(!x) = @RANK(_ESTPI_{!x})
    _R_ESTPHI_FGLSVEC(!x) = @RANK(_ESTPHI_{!x})

NEXT

  'STANDARD ERROR OF PARAMETER
  MATRIX XX = @TRANSPOSE(X)*X
  MATRIX XXinv = @INVERSE(XX)
  FOR !v=1 TO !q   'Equation
      SCALAR SSE_{!v} = @SUMSQ(resfvec{!v})/(!n-!k)
    FOR !p=1 TO !k 'Parameter
      SCALAR sqrtXXINV_{!p}_{!p} = @SQRT(XXinv(!p,!p))
      SCALAR SE{!p}_{!v} = @SQRT(SSE_{!v})*sqrtXXINV_{!p}_{!p}
    NEXT
  NEXT

  TABLE PARAMS_FOLS
    PARAMS_FOLS(1,1) = "Equation"
    PARAMS_FOLS(1,2) = "Coefficient"
    PARAMS_FOLS(1,3) = "S.E.(Coef.)"
  FOR !v=1 TO !q
    !c=1+((!q*2))*(!v-1)
    FOR !j=1 TO !q
    !pi=!c+!j - 1
      !g=!pi - !c +1
    !phi=!pi+!q
      !r=!phi-!c + 1
    %v = @str(!v)
    %j = @str(!j)
    %Pi = "Pi_" +%v+ "_" + %j
    PARAMS_FOLS(!pi+1,1) = %Pi          'label
    PARAMS_FOLS(!pi+1,2) = Pi_{!v}_{!j} 'coefficient   OK
    PARAMS_FOLS(!pi+1,3) = SE{!g}_{!v}  'S.E.
    %Phi = "Phi_" +%v+ "_" + %j
    PARAMS_FOLS(!phi+1,1) = %Phi        'label
    PARAMS_FOLS(!phi+1,2) = Phi_{!v}_{!j}  'coefficient
    PARAMS_FOLS(!phi+1,3) = SE{!r}_{!v} 'S.E.
    NEXT
  NEXT


'Simulation Summary
COLPLACE(Delta_All_FVEC,delta,{!i})
  delete(noerr) XX
  delete(noerr) XXinv
```

```
  delete(noerr) SSE_*
  delete(noerr) sqrtxxinv_*
  delete(noerr) bigx_*
  delete(noerr) delta
  delete(noerr) dy?_?
  delete(noerr) dy?_??
  delete(noerr) dy?_???
  delete(noerr) dy?_????
' delete(noerr) dy?_?_      'Actual (Simulated delta y
' delete(noerr) dy?_??_     'Actual (Simulated delta y
' delete(noerr) dy?_???_    'Actual (Simulated delta y
' delete(noerr) dy?_????_   'Actual (Simulated delta y
  delete(noerr) edy?        'Estimated delta y
  delete(noerr) esty*
  delete(noerr) h??_*
  delete(noerr) h?_*
  delete(noerr) params      'Table of Estimated Parameters
' delete(noerr) phi_?_*
' delete(noerr) pi_?_?
  delete(noerr) pi
  delete(noerr) res?_*      'Errors in DGP
' delete(noerr) resfvec?    'Residual of FGLS model
' delete(noerr) resvec*     'Residual of VECM without GARCH
  delete(noerr) resvecgarch*'GARCH model of VECM's Residuals
  delete(noerr) se?_*       'Standard Error of Paramaters of FGLS
  delete(noerr) varresvecm* 'Conditional Variance-Covariance of VECM
  delete(noerr) vecm_*      'VECM model in simulation
  delete(noerr) x*
  delete(noerr) y
' delete(noerr) y?_*        'Simulated data (DGP)
NEXT
delete(noerr) _estphi*
delete(noerr) _estpi*
delete(noerr) _statols
delete(noerr) phi*
delete(noerr) pi*

'SUMMARY OF ALL SUMMARIES
     IF !run>!n THEN
       pagestruct(freq=u, start=1, end=!run)
     ENDIF
     SMPL 1 !run

     'VEC No GARCH
     MTOS(_SUM_VECNOGARCH,_STATVEC)
     FREEZE(__Stat_VECNOGARCH) _STATVEC.stats
       delete(noerr) ser*
       delete(noerr) _statvec

     'MLE
     MTOS(_SUM_MLE,_STATMLE)
     FREEZE(__Stat_MLE) _STATMLE.stats
       delete(noerr) ser*
       delete(noerr) _statmle

     'OLS
     MTOS(_SUM_OLS,_STATOLS)
     FREEZE(__Stat_OLS) _STATOLS.stats
       delete(noerr) ser*
       delete(noerr) statmle
       delete(noerr) _statols
```

```
    'FGLS-VECGARCH
    MATRIX _Sum_FGLS_VECGARCH
    _Sum_FGLS_VECGARCH = @TRANSPOSE(Delta_All_FVEC)
    MATRIX Sim_Par_FVEC = _Sum_FGLS_VECGARCH
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,1),1,1)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,2),1,2)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,3),1,3)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,7),1,4)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,8),1,5)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,9),1,6)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,13),1,7)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,14),1,8)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,15),1,9)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,4),1,10)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,5),1,11)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,6),1,12)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,10),1,13)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,11),1,14)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,12),1,15)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,16),1,16)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,17),1,17)
  MATPLACE(Sim_Par_FVEC,@COLUMNEXTRACT(_Sum_FGLS_VECGARCH,18),1,18)
    MTOS(Sim_Par_FVEC,Param_FVEC)
    FREEZE(__Stat_FGLSVECGARCH) Param_FVEC.stats
    delete(noerr) Sim_Par_FVEC
    delete(noerr) SER??
    delete(noerr) Param_FVEC

'FGLS OLSGARCH   Maekawa's Matrix Inversion Method (MMIM)

pagestruct(freq=u, start=1, end=!data)
SMPL 4 @LAST
!q=3   '# of equation
!k=(!q*2) '# of exogeneous variables (including intercepts)
!n= @obssmpl '# of observation time (for conditional
variance/covariance)
Matrix(18,!run)  Delta_All_FOLS 'Matrix to store all estimated
parameters from simulation
MATRIX(!run,!q*2) __M_VARFOLS
MATRIX(!run,!q) __A_VARFOLS
MATRIX(!run,!q) __B_VARFOLS
VECTOR(!run) _DETO_FGLSOLSGARCH_n{!obs}

FOR !i=1 TO !run
SMPL 4 @LAST
  SYSTEM resolsGARCH_{!i}
  resolsGARCH_{!i}.append resols1_{!i} = C(1)
  resolsGARCH_{!i}.append resols2_{!i} = C(2)
  resolsGARCH_{!i}.append resols3_{!i} = C(3)
'  resolsGARCH_{!i}.ARCH(DERIV=AA) @DIAGVECH  C(SCALAR)
ARCH(1,SCALAR)  GARCH(1,SCALAR)'FOR Diagonal VECH
  resolsGARCH_{!i}.ARCH(DERIV=AA) @DIAGBEKK C(FULLRANK) ARCH(1,DIAG)
GARCH(1,DIAG)  'FOR Diagonal BEKK

  __M_VARFOLS(!i,1) = resolsGARCH_{!i}.C(4)
  __M_VARFOLS(!i,2) = resolsGARCH_{!i}.C(5)
  __M_VARFOLS(!i,3) = resolsGARCH_{!i}.C(6)
  __M_VARFOLS(!i,4) = resolsGARCH_{!i}.C(7)
  __M_VARFOLS(!i,5) = resolsGARCH_{!i}.C(8)
  __M_VARFOLS(!i,6) = resolsGARCH_{!i}.C(9)
  __A_VARFVEC(!i,1) = resolsGARCH_{!i}.C(10)
```

```
   __A_VARFVEC(!i,2) = resolsGARCH_{!i}.C(11)
   __A_VARFVEC(!i,3) = resolsGARCH_{!i}.C(12)
   __B_VARFVEC(!i,1) = resolsGARCH_{!i}.C(13)
   __B_VARFVEC(!i,2) = resolsGARCH_{!i}.C(14)
   __B_VARFVEC(!i,3) = resolsGARCH_{!i}.C(15)

'INVERSE OMEGA
   FOR !tt=4 TO !data
     resolsGARCH_{!i}.MAKEGARCH(mat, cov, date=!tt, name=H{!tt})
     MATRIX INV_H{!tt} = @INVERSE(H{!tt})
   NEXT

'  elements of VARIANCE
   FOR !v=1 TO !q
     VECTOR(!data-3) INV_H_{!v}
     FOR !tt=4 TO !data
       !ttt=!tt-3
       INV_H_{!v}(!ttt) = INV_H{!tt}(!v,!v)
     NEXT
   NEXT

'  elements of COVARIANCE
   FOR !ii=1 TO !q
     FOR !jj=1 TO !q
       IF !jj<!ii THEN
         VECTOR(!data-3) INV_H_{!ii}_{!jj}
         VECTOR(!data-3) INV_H_{!jj}_{!ii}
         FOR !qq=4 TO !data
           INV_H_{!ii}_{!jj}(!qq-3) = INV_H{!qq}(!ii,!jj)
           INV_H_{!jj}_{!ii}(!qq-3) = INV_H{!qq}(!ii,!jj)
         NEXT
       ENDIF
     NEXT
   NEXT


'  INVERSE Matrix Omega
   !n=@obssmpl+2
   MATRIX((!n-2)*!q,(!n-2)*!q) invomega_
   FOR !v=1 TO !q
       MATRIX(!n-2,!n-2) __mvar{!v} = @makediagonal(INV_H_{!v})
   'inverse variance
   NEXT

   FOR !v=1 TO !q
   !rc=1+((!v-1)*(!n-2))
     FOR !j=1 TO !q
       !rcj=1+((!j-1)*(!n-2))
       !rcj1=1+(!j*(!n-2))
       !rci=1+((!v-1)*(!n-2))
       !rci1=1+(!v*(!n-2))
       IF !j<!v THEN
         MATRIX(!n-2,!n-2) __mvar_{!j}_{!v} =
@makediagonal(INV_H_{!j}_{!v}) 'inverse covariance
         MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj1}, {!rcj})
         MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj}, {!rcj1})
       ENDIF

       IF !j>!v THEN
         MATRIX(!n-2,!n-2) __mvar_{!v}_{!j} =
@makediagonal(INV_H_{!v}_{!j}) 'iverse covariance
```

```
          MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rci}, {!rcj})
          MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rcj}, {!rci})
        ENDIF
      NEXT
    MATPLACE(invomega_, __mvar{!v}, {!rc}, {!rc})
    NEXT
    SYM omegainv = @IMPLODE(invomega_)
    delete(noerr) invomega_

    'VECTOR Y (D(Y))
    VECTOR(!q*(!n-2)) Y
      FOR !v=1 TO !q
        !r=(!v-1)*(!n-2)+1
        SERIES dY{!i}_{!v}_ = D(Y{!i}_{!v})
        STOM(dY{!i}_{!v}_,dY{!i}_{!v})
        MATPLACE(Y,dY{!i}_{!v},{!r},1)
      NEXT

    'MATRIX BigX
    !x=!q*(!n-2)
    MATRIX(!x,!q*!k) BigX_{!i}
      'VECTOR X
        MATRIX((!n-2),(!q*2)) X
            FOR !v=1 TO !q
            !dlag=!v+!q
              SERIES x{!v}_ = Y{!i}_{!v}(-1)
              STOM(x{!v}_,x{!v})
              SERIES X{!dlag}_ = D(Y{!i}_{!v}(-1))
              STOM(X{!dlag}_,X{!dlag})
            NEXT
        FOR !v=1 TO (!q*2)
          COLPLACE(X,X{!v},{!v})
        NEXT

    FOR !v=1 TO !q
    !r=1+((!v-1)*(!n-2))
    !c=1+((!v-1)*!k)
      MATPLACE(BigX_{!i},X,!r,!c)
    NEXT



  'FGLS ESTIMATOR (delta)
  '  MATRIX delta =
  @INVERSE(@TRANSPOSE(BigX)*omegainv*BigX)*@TRANSPOSE(BigX)*omegainv*Y
    MATRIX delta1 = @TRANSPOSE(BigX_{!i})
    MATRIX delta2 = delta1*omegainv
    MATRIX delta3_ = delta2*BigX_{!i}
    SYM delta3 = @IMPLODE(delta3_)
    delete(noerr) delta3_
    MATRIX delta4 = @INVERSE(delta3)
    MATRIX delta5 = delta4*@TRANSPOSE(BigX_{!i})
    MATRIX delta6 = delta5*omegainv
    MATRIX delta = delta6*Y

    delete(noerr) __mvar*
    delete(noerr) delta?
    delete(noerr) mvarresvecm_*
    delete(noerr) omega*
```

```
'Estimated D(Y)
MATRIX estY = BigX_{!i}*delta
FOR !v=1 TO !q
  VECTOR(!n-2) estY{!v}
  FOR !t=1 TO !n-2
  !rs=!v+((!v-1)*(!n-2))+!t-1+((!v-1)*-1)
    estY{!v}(!t) = estY(!rs)
  NEXT
  MTOS(estY{!v},eDY{!v})
  SERIES resfols{!v} = D(Y{!i}_{!v}) - eDY{!v}
NEXT

'PARAMETERS
FOR !v=1 TO !q
  !c=1+((!q*2))*(!v-1)
  FOR !j=1 TO !q
  !pi=!c+!j-1
  !phi=!pi+!q
      SCALAR Pi_{!v}_{!j} = delta(!pi)
      SCALAR Phi_{!v}_{!j} = delta(!phi)
  NEXT
NEXT

'STANDARD ERROR OF PARAMETER
MATRIX XX = @TRANSPOSE(X)*X
MATRIX XXinv = @INVERSE(XX)
FOR !v=1 TO !q   'Equation
    SCALAR SSE_{!v} = @SUMSQ(resfols{!v})/(!n-2-!k)
  FOR !p=1 TO !k 'Parameter
    SCALAR sqrtXXINV_{!p}_{!p} = @SQRT(XXinv(!p,!p))
    SCALAR SE{!p}_{!v} = @SQRT(SSE_{!v})*sqrtXXINV_{!p}_{!p}
  NEXT
NEXT

TABLE PARAMS_FVEC
  PARAMS_FVEC(1,1) = "Equation"
  PARAMS_FVEC(1,2) = "Coefficient"
  PARAMS_FVEC(1,3) = "S.E.(Coef.)"
FOR !v=1 TO !q
  !c=1+((!q*2))*(!v-1)
  FOR !j=1 TO !q
  !pi=!c+!j - 1
  !g=!pi - !c +1
  !phi=!pi+!q
  !r=!phi-!c + 1
  %v = @str(!v)
  %j = @str(!j)
  %Pi = "Pi_" +%v+ "_" + %j
  PARAMS_FVEC(!pi+1,1) = %Pi          'label
  PARAMS_FVEC(!pi+1,2) = Pi_{!v}_{!j} 'coefficient  OK
  PARAMS_FVEC(!pi+1,3) = SE{!g}_{!v}  'S.E.
  %Phi = "Phi_" +%v+ "_" + %j
  PARAMS_FVEC(!phi+1,1) = %Phi        'label
  PARAMS_FVEC(!phi+1,2) = Phi_{!v}_{!j}    'coefficient
  PARAMS_FVEC(!phi+1,3) = SE{!r}_{!v}      'S.E.
  NEXT
NEXT
```

```
'Simulation Summary
COLPLACE(Delta_All_FOLS,delta,{!i})

  delete(noerr) XX
  delete(noerr) XXinv
  delete(noerr) SSE_*
  delete(noerr) sqrtxxinv_*
  delete(noerr) bigx_*
  delete(noerr) delta
  delete(noerr) dy?_?
  delete(noerr) dy?_??
  delete(noerr) dy?_???
  delete(noerr) dy?_????
' delete(noerr) dy?_?_      'Actual (Simulated delta y
' delete(noerr) dy?_??_     'Actual (Simulated delta y
' delete(noerr) dy?_???_    'Actual (Simulated delta y
' delete(noerr) dy?_????_   'Actual (Simulated delta y
  delete(noerr) edy?        'Estimated delta y
  delete(noerr) esty*
  delete(noerr) h??_*
  delete(noerr) h?_*
  delete(noerr) params      'Table of Estimated Parameters
  delete(noerr) phi_?_*
  delete(noerr) pi_?_?
  delete(noerr) pi
  delete(noerr) res?_*      'Errors in DGP
' delete(noerr) resfols?    'Residual of FGLS model
' delete(noerr) resols*     'Residual of VECM without GARCH
  delete(noerr) resolsgarch*'GARCH model of VECM's Residuals
  delete(noerr) se?_*       'Standard Error of Paramaters of FGLS
  delete(noerr) varresvecm* 'Conditional Variance-Covariance of VECM
  delete(noerr) vecm_*      'VECM model in simulation
  delete(noerr) x*
  delete(noerr) y
' delete(noerr) y?_*        'Simulated data (DGP)
  NEXT

  MATRIX _Sum_FGLS_OLSGARCH_
  _Sum_FGLS_OLSGARCH_ = @TRANSPOSE(Delta_All_FOLS)
  IF !run>!n THEN
    pagestruct(freq=u, start=1, end=!run)
  ENDIF
  SMPL 1 !run
      MATRIX Sim_Par_FOLS = _Sum_FGLS_OLSGARCH_
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,1),1,1)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,2),1,2)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,3),1,3)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,7),1,4)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,8),1,5)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,9),1,6)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,13),1,7)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,14),1,8)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,15),1,9)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,4),1,10)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,5),1,11)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,6),1,12)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,10),1,13)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,11),1,14)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,12),1,15)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,16),1,16)
  MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,17),1,17)
```

```
   MATPLACE(Sim_Par_FOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSGARCH_,18),1,18)
   MTOS(Sim_Par_FOLS,Param_FOLS)
   FREEZE(__Stat_FGLSOLSGARCH) Param_FOLS.stats
   delete(noerr) Sim_Par_FOLS
   delete(noerr) SER??
   delete(noerr) Param_FOLS
         SMPL 4 @LAST


'FGLS OLSGARCH-CCC

pagestruct(freq=u, start=1, end=!data)
SMPL 4 @LAST
!q=3   '# of equation
!k=(!q*2) '# of exogeneous variables (including intercepts)
!n= @obssmpl '# of observation time (for conditional
variance/covariance)
Matrix(18,!run)  Delta_All_FOLS 'Matrix to store all estimated
parameters from simulation
MATRIX(!run,!q) __M_VARCCC
MATRIX(!run,!q) __A_VARCCC
MATRIX(!run,!q) __B_VARCCC
MATRIX(!run,!q) __RHO_ij_CCC
VECTOR(!run) _DETO_FGLSOLSCCC_n{!obs}
FOR !i=1 TO !run
SMPL 4 @LAST
   SYSTEM resolsCCC_{!i}
   resolsCCC_{!i}.append resols1_{!i} = C(1)
   resolsCCC_{!i}.append resols2_{!i} = C(2)
   resolsCCC_{!i}.append resols3_{!i} = C(3)
'  resolsCCC_{!i}.ARCH(DERIV=AA) @DIAGVECH  C(SCALAR)  ARCH(1,SCALAR)
GARCH(1,SCALAR)  'FOR Diagonal VECH
'  resolsCCC_{!i}.ARCH(DERIV=AA) @DIAGBEKK C(FULLRANK) ARCH(1,DIAG)
GARCH(1,DIAG)    'FOR Diagonal BEKK
   resolsCCC_{!i}.ARCH(DERIV=AA) @CCC C ARCH(1) GARCH(1)
             'FOR CCC-GARCH
   __M_VARCCC(!i,1) = resolsCCC_{!i}.C(4)
   __M_VARCCC(!i,2) = resolsCCC_{!i}.C(7)
   __M_VARCCC(!i,3) = resolsCCC_{!i}.C(10)
   __A_VARCCC(!i,1) = resolsCCC_{!i}.C(5)
   __A_VARCCC(!i,2) = resolsCCC_{!i}.C(8)
   __A_VARCCC(!i,3) = resolsCCC_{!i}.C(11)
   __B_VARCCC(!i,1) = resolsCCC_{!i}.C(6)
   __B_VARCCC(!i,2) = resolsCCC_{!i}.C(9)
   __B_VARCCC(!i,3) = resolsCCC_{!i}.C(12)
   __RHO_ij_CCC(!i,1) = resolsCCC_{!i}.C(13)
   __RHO_ij_CCC(!i,2) = resolsCCC_{!i}.C(14)
   __RHO_ij_CCC(!i,3) = resolsCCC_{!i}.C(15)

'INVERSE OMEGA
   FOR !tt=4 TO !data
     resolsCCC_{!i}.MAKEGARCH(mat, cov, date=!tt, name=H{!tt})
     MATRIX INV_H{!tt} = @INVERSE(H{!tt})
   NEXT

'  elements of VARIANCE
   FOR !v=1 TO !q
     VECTOR(!data-3) INV_H_{!v}
     FOR !tt=4 TO !data
       !ttt=!tt-3
       INV_H_{!v}(!ttt) = INV_H{!tt}(!v,!v)
```

```
    NEXT
  NEXT

' elements of COVARIANCE
  FOR !ii=1 TO !q
    FOR !jj=1 TO !q
      IF !jj<!ii THEN
        VECTOR(!data-3) INV_H_{!ii}_{!jj}
        VECTOR(!data-3) INV_H_{!jj}_{!ii}
        FOR !qq=4 TO !data
          INV_H_{!ii}_{!jj}(!qq-3) = INV_H{!qq}(!ii,!jj)
          INV_H_{!jj}_{!ii}(!qq-3) = INV_H{!qq}(!ii,!jj)
        NEXT
      ENDIF
    NEXT
  NEXT

' INVERSE Matrix Omega
  !n=@obssmpl+2
  MATRIX((!n-2)*!q,(!n-2)*!q) invomega_
  FOR !v=1 TO !q
      MATRIX(!n-2,!n-2) __mvar{!v} = @makediagonal(INV_H_{!v})
  'inverse variance
  NEXT

  FOR !v=1 TO !q
  !rc=1+((!v-1)*(!n-2))
    FOR !j=1 TO !q
      !rcj=1+((!j-1)*(!n-2))
      !rcj1=1+(!j*(!n-2))
      !rci=1+((!v-1)*(!n-2))
      !rci1=1+(!v*(!n-2))
      IF !j<!v THEN
        MATRIX(!n-2,!n-2) __mvar_{!j}_{!v} =
@makediagonal(INV_H_{!j}_{!v}) 'inverse covariance
        MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj1}, {!rcj})
        MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj}, {!rcj1})
      ENDIF
      IF !j>!v THEN
        MATRIX(!n-2,!n-2) __mvar_{!v}_{!j} =
@makediagonal(INV_H_{!v}_{!j}) 'iverse covariance
        MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rci}, {!rcj})
        MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rcj}, {!rci})
      ENDIF
    NEXT
  MATPLACE(invomega_, __mvar{!v}, {!rc}, {!rc})
  NEXT
  SYM omegainv = @IMPLODE(invomega_)
  delete(noerr) invomega_


  'VECTOR Y (D(Y))
  VECTOR(!q*(!n-2)) Y
    FOR !v=1 TO !q
      !r=(!v-1)*(!n-2)+1
      SERIES dY{!i}_{!v}_ = D(Y{!i}_{!v})
      STOM(dY{!i}_{!v}_,dY{!i}_{!v})
      MATPLACE(Y,dY{!i}_{!v},{!r},1)
    NEXT
```

```
  'MATRIX BigX
  !x=!q*(!n-2)
  MATRIX(!x,!q*!k) BigX_{!i}
    'VECTOR X
      MATRIX((!n-2),(!q*2)) X
          FOR !v=1 TO !q
          !dlag=!v+!q
            SERIES x{!v}_ = Y{!i}_{!v}(-1)
            STOM(x{!v}_,x{!v})
            SERIES X{!dlag}_ = D(Y{!i}_{!v}(-1))
            STOM(X{!dlag}_,X{!dlag})
          NEXT

      FOR !v=1 TO (!q*2)
        COLPLACE(X,X{!v},{!v})
      NEXT
  FOR !v=1 TO !q
  !r=1+((!v-1)*(!n-2))
  !c=1+((!v-1)*!k)
    MATPLACE(BigX_{!i},X,!r,!c)
  NEXT

'FGLS ESTIMATOR (delta)
'  MATRIX delta =
@INVERSE(@TRANSPOSE(BigX)*omegainv*BigX)*@TRANSPOSE(BigX)*omegainv*Y
  MATRIX delta1 = @TRANSPOSE(BigX_{!i})
  MATRIX delta2 = delta1*omegainv
  MATRIX delta3_ = delta2*BigX_{!i}
  SYM delta3 = @IMPLODE(delta3_)
  delete(noerr) delta3_
  MATRIX delta4 = @INVERSE(delta3)
  MATRIX delta5 = delta4*@TRANSPOSE(BigX_{!i})
  MATRIX delta6 = delta5*omegainv
  MATRIX delta = delta6*Y

  delete(noerr) __mvar*
  delete(noerr) delta?
  delete(noerr) mvarresvecm_*
  delete(noerr) omega*

  'Estimated D(Y)
  MATRIX estY = BigX_{!i}*delta
  FOR !v=1 TO !q
    VECTOR(!n-2) estY{!v}
    FOR !t=1 TO !n-2
    !rs=!v+((!v-1)*(!n-2))+!t-1+((!v-1)*-1)
      estY{!v}(!t) = estY(!rs)
    NEXT
    MTOS(estY{!v},eDY{!v})
    SERIES resfols{!v} = D(Y{!i}_{!v}) - eDY{!v}
  NEXT
```

```
   'PARAMETERS
   FOR !v=1 TO !q
     !c=1+((!q*2))*(!v-1)
     FOR !j=1 TO !q
     !pi=!c+!j-1
     !phi=!pi+!q
          SCALAR Pi_{!v}_{!j} = delta(!pi)
          SCALAR Phi_{!v}_{!j} = delta(!phi)
     NEXT
   NEXT

   'STANDARD ERROR OF PARAMETER
   MATRIX XX = @TRANSPOSE(X)*X
   MATRIX XXinv = @INVERSE(XX)
   FOR !v=1 TO !q   'Equation
        SCALAR SSE_{!v} = @SUMSQ(resfols{!v})/(!n-2-!k)
     FOR !p=1 TO !k 'Parameter
        SCALAR sqrtXXINV_{!p}_{!p} = @SQRT(XXinv(!p,!p))
        SCALAR SE{!p}_{!v} = @SQRT(SSE_{!v})*sqrtXXINV_{!p}_{!p}
     NEXT
   NEXT

   TABLE PARAMS_FCCC
     PARAMS_FCCC(1,1) = "Equation"
     PARAMS_FCCC(1,2) = "Coefficient"
     PARAMS_FCCC(1,3) = "S.E.(Coef.)"
   FOR !v=1 TO !q
     !c=1+((!q*2))*(!v-1)
     FOR !j=1 TO !q
     !pi=!c+!j - 1
     !g=!pi - !c +1
     !phi=!pi+!q
     !r=!phi-!c + 1
     %v = @str(!v)
     %j = @str(!j)
     %Pi = "Pi_" +%v+ "_" + %j
     PARAMS_FCCC(!pi+1,1) = %Pi           'label
     PARAMS_FCCC(!pi+1,2) = Pi_{!v}_{!j} 'coefficient
     PARAMS_FCCC(!pi+1,3) = SE{!g}_{!v}  'S.E.
     %Phi = "Phi_" +%v+ "_" + %j
     PARAMS_FCCC(!phi+1,1) = %Phi           'label
     PARAMS_FCCC(!phi+1,2) = Phi_{!v}_{!j}  'coefficient
     PARAMS_FCCC(!phi+1,3) = SE{!r}_{!v}    'S.E.
     NEXT
   NEXT

'Simulation Summary
COLPLACE(Delta_All_FOLS,delta,{!i})
   delete(noerr) XX
   delete(noerr) XXinv
   delete(noerr) SSE_*
   delete(noerr) sqrtxxinv_*
   delete(noerr) bigx_*
   delete(noerr) delta
   delete(noerr) dy?_?
   delete(noerr) dy?_??
   delete(noerr) dy?_???
   delete(noerr) dy?_????
'  delete(noerr) dy?_?_      'Actual (Simulated delta y
'  delete(noerr) dy?_??_     'Actual (Simulated delta y
```

```
' delete(noerr) dy?_???_    'Actual (Simulated delta y
' delete(noerr) dy?_????_   'Actual (Simulated delta y
  delete(noerr) edy?        'Estimated delta y
  delete(noerr) esty*
  delete(noerr) h??_*
  delete(noerr) h?_*
  delete(noerr) params      'Table of Estimated Parameters
  delete(noerr) phi_?_*
  delete(noerr) pi_?_?
  delete(noerr) pi
  delete(noerr) res?_*      'Errors in DGP
' delete(noerr) resfols?    'Residual of FGLS model
' delete(noerr) resols*     'Residual of VECM without GARCH
  delete(noerr) resolsccc*  'CCC-GARCH model of VECM's Residuals
  delete(noerr) se?_*       'Standard Error of Paramaters of FGLS
  delete(noerr) varresvecm* 'Conditional Variance-Covariance of VECM
  delete(noerr) vecm_*      'VECM model in simulation
  delete(noerr) x*
  delete(noerr) y
' delete(noerr) y?_*        'Simulated data (DGP)

NEXT

MATRIX _Sum_FGLS_OLSCCC_
_Sum_FGLS_OLSCCC_ = @TRANSPOSE(Delta_All_FOLS)
IF !run>!n THEN
  pagestruct(freq=u, start=1, end=!run)
ENDIF
SMPL 1 !run
  MATRIX Sim_Par_FCCC = _Sum_FGLS_OLSCCC_
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,1),1,1)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,2),1,2)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,3),1,3)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,7),1,4)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,8),1,5)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,9),1,6)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,13),1,7)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,14),1,8)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,15),1,9)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,4),1,10)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,5),1,11)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,6),1,12)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,10),1,13)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,11),1,14)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,12),1,15)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,16),1,16)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,17),1,17)
  MATPLACE(Sim_Par_FCCC,@COLUMNEXTRACT(_Sum_FGLS_OLSCCC_,18),1,18)
MTOS(Sim_Par_FCCC,Param_FCCC)
FREEZE(__Stat_FGLSOLSCCC) Param_FCCC.stats
delete(noerr) Sim_Par_FCCC
delete(noerr) SER??
delete(noerr) Param_FCCC
    SMPL 4 @LAST
```

```
'FGLS OLSGARCH - TRUE GARCH

pagestruct(freq=u, start=1, end=!data)
SMPL 4 @LAST
!q=3   '# of equation
!k=(!q*2)'# of exogeneous variables (including intercepts)
!n= @obssmpl '# of observation time (for conditional
variance/covariance)
Matrix(18,!run)  Delta_All_FOLST  'Matrix to store all estimated
parameters from simulation
VECTOR(!run) _DETO_FOLSTrGARCH_n{!obs}
FOR !i=1 TO !run
  !st=!n-!obs-4+!i
  !ed=!n
  'resols1_{!i}
  SMPL 1 3
  SERIES _H11 = 0
  SERIES _H22 = 0
  SERIES _H33 = 0
  SERIES _H12 = 0
  SERIES _H13 = 0
  SERIES _H23 = 0

  SMPL 4 @LAST
  SERIES _H11 = M(1,1) + A(1,1)*resols1_{!i}(-1)^2 + B(1,1)*_H11(-1)
  SERIES _H22 = M(2,2) + A(2,2)*resols2_{!i}(-1)^2 + B(2,2)*_H22(-1)
  SERIES _H33 = M(3,3) + A(3,3)*resols3_{!i}(-1)^2 + B(3,3)*_H33(-1)
  SERIES _H12 = M(1,2) + A(1,2)*resols1_{!i}(-1)*resols2_{!i}(-1)
                + B(1,2)*_H12(-1)
  SERIES _H13 = M(1,3) + A(1,3)*resols1_{!i}(-1)*resols3_{!i}(-1)
                + B(1,3)*_H13(-1)
  SERIES _H23 = M(2,3) + A(2,3)*resols2_{!i}(-1)*resols3_{!i}(-1)
                + B(2,3)*_H23(-1)

  STOM(_H11,mvarresTols_1)
  STOM(_H22,mvarresTols_2)
  STOM(_H33,mvarresTols_3)
  STOM(_H12,mvarresTols_1_2)
  STOM(_H13,mvarresTols_1_3)
  STOM(_H23,mvarresTols_2_3)

  FOR !tt=1 TO !n-2
    SYM(!q) H{!tt}
    H{!tt}(1,1) = mvarresTols_1(!tt)
    H{!tt}(1,2) = mvarresTols_1_2(!tt)
    H{!tt}(1,3) = mvarresTols_1_3(!tt)
    H{!tt}(2,2) = mvarresTols_2(!tt)
    H{!tt}(2,3) = mvarresTols_2_3(!tt)
    H{!tt}(3,3) = mvarresTols_3(!tt)
  NEXT

  'INVERSE OMEGA
  FOR !tt=4 TO !data
    MATRIX INV_H{!tt} = @INVERSE(H{!tt})
  NEXT

'  elements of VARIANCE
  FOR !v=1 TO !q
    VECTOR(!data-3) INV_H_{!v}
    FOR !tt=4 TO !data
      !ttt=!tt-3
```

```
        INV_H_{!v}(!ttt) = INV_H{!tt}(!v,!v)
      NEXT
    NEXT

'   elements of COVARIANCE
    FOR !ii=1 TO !q
      FOR !jj=1 TO !q
        IF !jj<!ii THEN
          VECTOR(!data-3) INV_H_{!ii}_{!jj}
          VECTOR(!data-3) INV_H_{!jj}_{!ii}
          FOR !qq=4 TO !data
            INV_H_{!ii}_{!jj}(!qq-3) = INV_H{!qq}(!ii,!jj)
            INV_H_{!jj}_{!ii}(!qq-3) = INV_H{!qq}(!ii,!jj)
          NEXT
        ENDIF
      NEXT
    NEXT

'   INVERSE Matrix Omega
    !n=@obssmpl+2
    MATRIX((!n-2)*!q,(!n-2)*!q) invomega_
    FOR !v=1 TO !q
        MATRIX(!n-2,!n-2) __mvar{!v} = @makediagonal(INV_H_{!v})
    'inverse variance
    NEXT

    FOR !v=1 TO !q
    !rc=1+((!v-1)*(!n-2))
      FOR !j=1 TO !q
        !rcj=1+((!j-1)*(!n-2))
        !rcj1=1+(!j*(!n-2))
        !rci=1+((!v-1)*(!n-2))
        !rci1=1+(!v*(!n-2))
        IF !j<!v THEN
          MATRIX(!n-2,!n-2) __mvar_{!j}_{!v} =
@makediagonal(INV_H_{!j}_{!v}) 'inverse covariance
          MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj1}, {!rcj})
          MATPLACE(invomega_, __mvar_{!j}_{!v}, {!rcj}, {!rcj1})
        ENDIF

        IF !j>!v THEN
          MATRIX(!n-2,!n-2) __mvar_{!v}_{!j} =
@makediagonal(INV_H_{!v}_{!j}) 'iverse covariance
          MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rci}, {!rcj})
          MATPLACE(invomega_, __mvar_{!v}_{!j}, {!rcj}, {!rci})
        ENDIF
      NEXT

    MATPLACE(invomega_, __mvar{!v}, {!rc}, {!rc})
    NEXT

    SYM omegainv = @IMPLODE(invomega_)
    delete(noerr) invomega_
```

```
'VECTOR Y (D(Y))
  VECTOR(!q*(!n-2)) Y
    FOR !v=1 TO !q
      !r=(!v-1)*(!n-2)+1
      SERIES dY{!i}_{!v}_ = D(Y{!i}_{!v})
      STOM(dY{!i}_{!v}_,dY{!i}_{!v})
      MATPLACE(Y,dY{!i}_{!v},{!r},1)
    NEXT

  'MATRIX BigX
  !x=!q*(!n-2)
  MATRIX(!x,!q*!k) BigX_{!i}
    'VECTOR X
      MATRIX((!n-2),(!q*2)) X
          FOR !v=1 TO !q
          !dlag=!v+!q
            SERIES x{!v}_ = Y{!i}_{!v}(-1)
            STOM(x{!v}_,x{!v})
            SERIES X{!dlag}_ = D(Y{!i}_{!v}(-1))
            STOM(X{!dlag}_,X{!dlag})
          NEXT

      FOR !v=1 TO (!q*2)
        COLPLACE(X,X{!v},{!v})
      NEXT

  FOR !v=1 TO !q
    !r=1+((!v-1)*(!n-2))
    !c=1+((!v-1)*!k)
    MATPLACE(BigX_{!i},X,!r,!c)
  NEXT



'FGLS ESTIMATOR (delta)

'  MATRIX delta =
@INVERSE(@TRANSPOSE(BigX)*omegainv*BigX)*@TRANSPOSE(BigX)*omegainv*Y
  MATRIX delta1 = @TRANSPOSE(BigX_{!i})
  MATRIX delta2 = delta1*omegainv
  MATRIX delta3_ = delta2*BigX_{!i}
  SYM delta3 = @IMPLODE(delta3_)
  delete(noerr) delta3_
  MATRIX delta4 = @INVERSE(delta3)
  MATRIX delta5 = delta4*@TRANSPOSE(BigX_{!i})
  MATRIX delta6 = delta5*omegainv
  MATRIX delta = delta6*Y

  delete(noerr) __mvar*
  delete(noerr) delta?
  delete(noerr) mvarresTols_*
  delete(noerr) omega*
```

```
'Estimated D(Y)
  MATRIX estY = BigX_{!i}*delta
  FOR !v=1 TO !q
    VECTOR(!n-2) estY{!v}
    FOR !t=1 TO !n-2
      !rs=!v+((!v-1)*(!n-2))+!t-1+((!v-1)*-1)
      estY{!v}(!t) = estY(!rs)
    NEXT
    MTOS(estY{!v},eDY{!v})
    SERIES resfols{!v} = D(Y{!i}_{!v}) - eDY{!v}
  NEXT

  'PARAMETERS
  FOR !v=1 TO !q
    !c=1+((!q*2))*(!v-1)
    FOR !j=1 TO !q
    !pi=!c+!j-1
    !phi=!pi+!q
        SCALAR Pi_{!v}_{!j} = delta(!pi)
        SCALAR Phi_{!v}_{!j} = delta(!phi)
    NEXT
  NEXT

  'STANDARD ERROR OF PARAMETER
  MATRIX XX = @TRANSPOSE(X)*X
  MATRIX XXinv = @INVERSE(XX)
  FOR !v=1 TO !q   'Equation
      SCALAR SSE_{!v} = @SUMSQ(resfols{!v})/(!n-2-!k)
    FOR !p=1 TO !k 'Parameter
      SCALAR sqrtXXINV_{!p}_{!p} = @SQRT(XXinv(!p,!p))
      SCALAR SE{!p}_{!v} = @SQRT(SSE_{!v})*sqrtXXINV_{!p}_{!p}
    NEXT
  NEXT

  TABLE PARAMS_TFVEC
    PARAMS_TFVEC(1,1) = "Equation"
    PARAMS_TFVEC(1,2) = "Coefficient"
    PARAMS_TFVEC(1,3) = "S.E.(Coef.)"
  FOR !v=1 TO !q
    !c=1+((!q*2))*(!v-1)
    FOR !j=1 TO !q
      !pi=!c+!j - 1
      !g=!pi - !c +1
      !phi=!pi+!q
      !r=!phi-!c + 1
      %v = @str(!v)
      %j = @str(!j)
      %Pi = "Pi_" +%v+ "_" + %j
      PARAMS_TFVEC(!pi+1,1) = %Pi            'label
      PARAMS_TFVEC(!pi+1,2) = Pi_{!v}_{!j}   'coefficient  OK
      PARAMS_TFVEC(!pi+1,3) = SE{!g}_{!v}    'S.E.
      %Phi = "Phi_" +%v+ "_" + %j
      PARAMS_TFVEC(!phi+1,1) = %Phi          'label
      PARAMS_TFVEC(!phi+1,2) = Phi_{!v}_{!j} 'coefficient
      PARAMS_TFVEC(!phi+1,3) = SE{!r}_{!v}   'S.E.
    NEXT
  NEXT
```

```
'Simulation Summary
COLPLACE(Delta_All_FOLST,delta,{!i})

  delete(noerr) XX
  delete(noerr) XXinv
  delete(noerr) SSE_*
  delete(noerr) sqrtxxinv_*
  delete(noerr) bigx_*
  delete(noerr) delta
  delete(noerr) dy?_?
  delete(noerr) dy?_??
  delete(noerr) dy?_???
  delete(noerr) dy?_????
' delete(noerr) dy?_?_       'Actual (Simulated delta y
' delete(noerr) dy?_??_      'Actual (Simulated delta y
' delete(noerr) dy?_???_     'Actual (Simulated delta y
' delete(noerr) dy?_????_    'Actual (Simulated delta y
  delete(noerr) edy?         'Estimated delta y
  delete(noerr) esty*
  delete(noerr) h??_*
  delete(noerr) h?_*
  delete(noerr) params       'Table of Estimated Parameters
  delete(noerr) phi_?_*
  delete(noerr) pi_?_?
  delete(noerr) pi
  delete(noerr) res?_*       'Errors in DGP
' delete(noerr) resfols?     'Residual of FGLS model
' delete(noerr) resols*      'Residual of VECM without GARCH
  delete(noerr) se?_*        'Standard Error of Paramaters of FGLS
  delete(noerr) varresTols*  'Conditional Variance-Covariance of VECM
  delete(noerr) vecm_*       'VECM model in simulation
  delete(noerr) x*
  delete(noerr) y
' delete(noerr) y?_*         'Simulated data (DGP)
NEXT

MATRIX _Sum_FGLS_OLSTrGARCH_
_Sum_FGLS_OLSTrGARCH_ = @TRANSPOSE(Delta_All_FOLST)
IF !run>!n THEN
  pagestruct(freq=u, start=1, end=!run)
ENDIF

SMPL 1 !run
MATRIX Sim_Par_TFOLS = _Sum_FGLS_OLSTrGARCH_
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,1),1,1)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,2),1,2)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,3),1,3)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,7),1,4)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,8),1,5)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,9),1,6)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,13),1,7)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,14),1,8)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,15),1,9)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,4),1,10)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,5),1,11)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,6),1,12)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,10),1,13)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,11),1,14)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,12),1,15)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,16),1,16)
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,17),1,17)
```

```
MATPLACE(Sim_Par_TFOLS,@COLUMNEXTRACT(_Sum_FGLS_OLSTrGARCH_,18),1,18)
MTOS(Sim_Par_TFOLS,Param_TFOLS)
FREEZE(__Stat_TFGLSOLSGARCH) Param_TFOLS.stats
delete(noerr) Sim_Par_TFOLS
delete(noerr) SER??
delete(noerr) Param_TFOLS
delete(noerr) _H??
SMPL 4 @LAST

'FGLS OLSGARCH - SQUARRED RESIDUAL (FGLS-SR)

pagestruct(freq=u, start=1, end=!data)
SMPL 4 @LAST
!q=3   '# of equation
!k=(!q*2) '# of exogeneous variables (including intercepts)
!n= @obssmpl '# of observation time (for conditional
variance/covariance)
Matrix(18,!run)  Delta_All_FGLS 'Matrix to store all estimated
parameters from simulation
VECTOR(!run) _DETO_FGLSOLSSR_n{!obs}
FOR !i=1 TO !run
   !st=!n-!obs-4+!i
   !ed=!n
   SMPL 1 3
   SERIES _H11 = 0
   SERIES _H22 = 0
   SERIES _H33 = 0
   SERIES _H12 = 0
   SERIES _H13 = 0
   SERIES _H23 = 0

   'SMPL 2 @LAST
   '  SERIES _H11 = M(1,1) + A(1,1)*V{!i}_1(-1)^2 + B(1,1)*_H11(-1)
   '  SERIES _H22 = M(2,2) + A(2,2)*V{!i}_2(-1)^2 + B(2,2)*_H22(-1)
   '  SERIES _H33 = M(3,3) + A(3,3)*V{!i}_3(-1)^2 + B(3,3)*_H33(-1)
   '  SERIES _H12 = M(1,2) + A(1,2)*V{!i}_1(-1)*V{!i}_2(-1) +
                   B(1,2)*_H12(-1)
   '  SERIES _H13 = M(1,3) + A(1,3)*V{!i}_1(-1)*V{!i}_3(-1) +
                   B(1,3)*_H13(-1)
   '  SERIES _H23 = M(2,3) + A(2,3)*V{!i}_2(-1)*V{!i}_3(-1) +
                   B(2,3)*_H23(-1)

   SMPL 4 @LAST
   SERIES _H11 = resols1_{!i}^2
   SERIES _H22 = resols2_{!i}^2
   SERIES _H33 = resols3_{!i}^2
   SERIES _H12 = resols1_{!i}*resols2_{!i}
   SERIES _H13 = resols1_{!i}*resols3_{!i}
   SERIES _H23 = resols2_{!i}*resols3_{!i}
   STOM(_H11,mvarresFGLS_1)
   STOM(_H22,mvarresFGLS_2)
   STOM(_H33,mvarresFGLS_3)
   STOM(_H12,mvarresFGLS_1_2)
   STOM(_H13,mvarresFGLS_1_3)
   STOM(_H23,mvarresFGLS_2_3)

'  Matrix Omega
!n=@obssmpl+2
   MATRIX((!n-2)*!q,(!n-2)*!q) omega_
   FOR !v=1 TO !q
        MATRIX(!n-2,!n-2) __mvar{!v} =
```

```
        @makediagonal(mvarresFGLS_{!v})
   NEXT

   FOR !v=1 TO !q
   !rc=1+((!v-1)*(!n-2))
     FOR !j=1 TO !q
       !rcj=1+((!j-1)*(!n-2))
       !rcj1=1+(!j*(!n-2))
       !rci=1+((!v-1)*(!n-2))
       !rci1=1+(!v*(!n-2))
       IF !j<!v THEN
         MATRIX(!n-2,!n-2) __mvar_{!j}_{!v} =
@makediagonal(mvarresFGLS_{!j}_{!v})
         MATPLACE(omega_, __mvar_{!j}_{!v}, {!rcj1}, {!rcj})
         MATPLACE(omega_, __mvar_{!j}_{!v}, {!rcj}, {!rcj1})
       ENDIF
       IF !j>!v THEN
         MATRIX(!n-2,!n-2) __mvar_{!v}_{!j} =
@makediagonal(mvarresFGLS_{!v}_{!j})
         MATPLACE(omega_, __mvar_{!v}_{!j}, {!rci}, {!rcj})
         MATPLACE(omega_, __mvar_{!v}_{!j}, {!rcj}, {!rci})
       ENDIF
     NEXT
   MATPLACE(omega_, __mvar{!v}, {!rc}, {!rc})
   NEXT

   SYM omega = @IMPLODE(omega_)
   delete(noerr) omega_

   'OMEGA INVERSE
   scalar det_omega{!run} = @DET(omega)
   _DETO_FGLSOLSSR_n{!obs}(!run) = det_omega{!run}
   delete(noerr) det_omega*

   MATRIX omegainv = @INVERSE(omega)

   'VECTOR Y (D(Y))
   VECTOR(!q*(!n-2)) Y
     FOR !v=1 TO !q
       !r=(!v-1)*(!n-2)+1
       SERIES dY{!i}_{!v}_ = D(Y{!i}_{!v})
       STOM(dY{!i}_{!v}_,dY{!i}_{!v})
       MATPLACE(Y,dY{!i}_{!v},{!r},1)
     NEXT

   'MATRIX BigX
   !x=!q*(!n-2)
   MATRIX(!x,!q*!k) BigX_{!i}

     'VECTOR X
       MATRIX((!n-2),(!q*2)) X
           FOR !v=1 TO !q
           !dlag=!v+!q
             SERIES x{!v}_ = Y{!i}_{!v}(-1)
             STOM(x{!v}_,x{!v})
             SERIES X{!dlag}_ = D(Y{!i}_{!v}(-1))
             STOM(X{!dlag}_,X{!dlag})
           NEXT
       FOR !v=1 TO (!q*2)
         COLPLACE(X,X{!v},{!v})
       NEXT
```

```
FOR !v=1 TO !q
  !r=1+((!v-1)*(!n-2))
  !c=1+((!v-1)*!k)
  MATPLACE(BigX_{!i},X,!r,!c)
NEXT


'FGLS ESTIMATOR (delta)

'  MATRIX delta =
@INVERSE(@TRANSPOSE(BigX)*omegainv*BigX)*@TRANSPOSE(BigX)*omegainv*Y
  MATRIX delta1 = @TRANSPOSE(BigX_{!i})
  MATRIX delta2 = delta1*omegainv
  MATRIX delta3_ = delta2*BigX_{!i}
  SYM delta3 = @IMPLODE(delta3_)
  delete(noerr) delta3_
  MATRIX delta4 = @INVERSE(delta3)
  MATRIX delta5 = delta4*@TRANSPOSE(BigX_{!i})
  MATRIX delta6 = delta5*omegainv
  MATRIX delta = delta6*Y

  delete(noerr) __mvar*
  delete(noerr) delta?
  delete(noerr) mvarresFGLS_*
  delete(noerr) omega*

  'Estimated D(Y)
  MATRIX estY = BigX_{!i}*delta
  FOR !v=1 TO !q
    VECTOR(!n-2) estY{!v}
    FOR !t=1 TO !n-2
      !rs=!v+((!v-1)*(!n-2))+!t-1+((!v-1)*-1)
      estY{!v}(!t) = estY(!rs)
    NEXT
    MTOS(estY{!v},eDY{!v})
    SERIES resfols{!v} = D(Y{!i}_{!v}) - eDY{!v}
  NEXT

  'PARAMETERS
  FOR !v=1 TO !q
    !c=1+((!q*2))*(!v-1)
    FOR !j=1 TO !q
    !pi=!c+!j-1
    !phi=!pi+!q
        SCALAR Pi_{!v}_{!j} = delta(!pi)
        SCALAR Phi_{!v}_{!j} = delta(!phi)
    NEXT
  NEXT

  'STANDARD ERROR OF PARAMETER
  MATRIX XX = @TRANSPOSE(X)*X
  MATRIX XXinv = @INVERSE(XX)
  FOR !v=1 TO !q   'Equation
      SCALAR SSE_{!v} = @SUMSQ(resfols{!v})/(!n-2-!k)
    FOR !p=1 TO !k 'Parameter
      SCALAR sqrtXXINV_{!p}_{!p} = @SQRT(XXinv(!p,!p))
      SCALAR SE{!p}_{!v} = @SQRT(SSE_{!v})*sqrtXXINV_{!p}_{!p}
    NEXT
  NEXT
```

```
   TABLE PARAMS_TFVEC
     PARAMS_TFVEC(1,1) = "Equation"
     PARAMS_TFVEC(1,2) = "Coefficient"
     PARAMS_TFVEC(1,3) = "S.E.(Coef.)"
   FOR !v=1 TO !q
     !c=1+((!q*2))*(!v-1)
     FOR !j=1 TO !q
       !pi=!c+!j - 1
       !g=!pi - !c +1
       !phi=!pi+!q
       !r=!phi-!c + 1
       %v = @str(!v)
       %j = @str(!j)
       %Pi = "Pi_" +%v+ "_" + %j
       PARAMS_TFVEC(!pi+1,1) = %Pi            'label
       PARAMS_TFVEC(!pi+1,2) = Pi_{!v}_{!j}   'coefficient   OK
       PARAMS_TFVEC(!pi+1,3) = SE{!g}_{!v}    'S.E.
       %Phi = "Phi_" +%v+ "_" + %j
       PARAMS_TFVEC(!phi+1,1) = %Phi          'label
       PARAMS_TFVEC(!phi+1,2) = Phi_{!v}_{!j} 'coefficient
       PARAMS_TFVEC(!phi+1,3) = SE{!r}_{!v}   'S.E.
       NEXT
   NEXT

 'Simulation Summary
 COLPLACE(Delta_All_FGLS,delta,{!i})
   delete(noerr) XX
   delete(noerr) XXinv
   delete(noerr) SSE_*
   delete(noerr) sqrtxxinv_*
   delete(noerr) bigx_*
   delete(noerr) delta
   delete(noerr) dy?_?
   delete(noerr) dy?_??
   delete(noerr) dy?_???
   delete(noerr) dy?_????
'  delete(noerr) dy?_?_      'Actual (Simulated delta y
'  delete(noerr) dy?_??_     'Actual (Simulated delta y
'  delete(noerr) dy?_???_    'Actual (Simulated delta y
'  delete(noerr) dy?_????_   'Actual (Simulated delta y
   delete(noerr) edy?        'Estimated delta y
   delete(noerr) esty*
   delete(noerr) h??_*
   delete(noerr) h?_*
   delete(noerr) params      'Table of Estimated Parameters
   delete(noerr) phi_?_*
   delete(noerr) pi_?_?
   delete(noerr) pi
   delete(noerr) res?_*      'Errors in DGP
'  delete(noerr) resfols?    'Residual of FGLS model
'  delete(noerr) resols*     'Residual of VECM without GARCH
   delete(noerr) se?_*       'Standard Error of Paramaters of FGLS
   delete(noerr) varresTols* 'Conditional Variance-Covariance of VECM
   delete(noerr) vecm_*      'VECM model in simulation
   delete(noerr) x*
   delete(noerr) y
'  delete(noerr) y?_*        'Simulated data (DGP)
 NEXT
```

```
MATRIX _Sum_FGLS_OLSSR_
_Sum_FGLS_OLSSR_ = @TRANSPOSE(Delta_All_FGLS)
IF !run>!n THEN
  pagestruct(freq=u, start=1, end=!run)
ENDIF
SMPL 1 !run
MATRIX Sim_Par_FGLS_SR = _Sum_FGLS_OLSSR_
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,1),1,1)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,2),1,2)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,3),1,3)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,7),1,4)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,8),1,5)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,9),1,6)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,13),1,7)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,14),1,8)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,15),1,9)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,4),1,10)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,5),1,11)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,6),1,12)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,10),1,13)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,11),1,14)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,12),1,15)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,16),1,16)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,17),1,17)
MATPLACE(Sim_Par_FGLS_SR,@COLUMNEXTRACT(_Sum_FGLS_OLSSR_,18),1,18)
MTOS(Sim_Par_FGLS_SR,Param_FGLS_SR)
FREEZE(__STAT_FGLS_SR) Param_FGLS_SR.stats
delete(noerr) Sim_Par_FGLS_SR
delete(noerr) SER??
delete(noerr) Param_FGLS_SR
     SMPL 4 @LAST
NEXT

'=====================================================================
'                               END OF PROGRAM
'=====================================================================
```

APPENDIX – C

APPENDIX C1
DATA FOR CHAPTER 1

Date	US T-Bill 3-Mo	MSCI ACWI	MSCI EAFE	MSCI EM	US S&P500	GE DAX	HK HSI	JP N225
1997:07	5.10	5.490	5.275	6.330	954.310	4405.500	16365.700	20331.000
1997:08	5.09	5.416	5.196	6.193	899.470	3919.800	14135.200	18229.000
1997:09	4.97	5.466	5.250	6.219	947.280	4154.900	15049.300	17888.000
1997:10	5.06	5.403	5.168	6.038	914.620	3753.700	10623.800	16459.000
1997:11	5.06	5.417	5.157	6.001	955.400	3972.100	10526.900	16633.000
1997:12	5.20	5.429	5.164	6.022	970.430	4224.300	10722.800	15259.000
1998:01	5.04	5.449	5.208	5.940	980.280	4442.500	9252.400	16628.000
1998:02	5.18	5.514	5.269	6.038	1049.340	4693.900	11480.700	16832.000
1998:03	4.99	5.554	5.298	6.078	1101.750	5097.300	11518.700	16527.000
1998:04	4.85	5.562	5.304	6.065	1111.750	5107.440	10383.680	15641.260
1998:05	4.89	5.542	5.298	5.914	1090.820	5569.080	8934.560	15670.780
1998:06	4.97	5.558	5.305	5.801	1133.840	5897.440	8543.100	15830.270
1998:07	4.95	5.557	5.314	5.828	1120.670	5873.920	7936.200	16378.970
1998:08	4.76	5.405	5.180	5.482	957.280	4833.890	7275.040	14107.890
1998:09	4.25	5.423	5.147	5.541	1017.010	4474.510	7883.460	13406.390
1998:10	4.21	5.509	5.245	5.640	1098.670	4671.120	10154.940	13564.510
1998:11	4.42	5.567	5.294	5.719	1163.630	5022.700	10402.320	14883.700
1998:12	4.35	5.611	5.332	5.700	1229.230	5002.390	10048.580	13842.170
1999:01	4.36	5.630	5.327	5.683	1279.640	5159.960	9506.900	14499.250
1999:02	4.55	5.603	5.302	5.692	1238.330	4911.810	9858.490	14367.540
1999:03	4.36	5.646	5.342	5.813	1286.370	4884.200	10942.200	15836.590
1999:04	4.43	5.687	5.380	5.929	1335.180	5393.110	13333.200	16701.530
1999:05	4.51	5.649	5.326	5.920	1301.840	5069.830	12147.120	16111.650
1999:06	4.67	5.697	5.363	6.025	1372.710	5378.520	13532.140	17529.740
1999:07	4.62	5.691	5.392	5.996	1328.720	5101.870	13186.860	17861.860
1999:08	4.85	5.689	5.394	6.005	1320.410	5270.770	13482.770	17436.560
1999:09	4.71	5.677	5.403	5.969	1282.710	5149.830	12733.240	17605.460
1999:10	4.96	5.725	5.439	5.989	1362.930	5525.400	13256.950	17942.080
1999:11	5.15	5.755	5.472	6.075	1388.910	5896.040	15377.190	18558.230
1999:12	5.17	5.834	5.557	6.193	1469.250	6958.140	16962.100	18934.340
2000:01	5.53	5.777	5.490	6.197	1394.460	6835.600	15532.340	19539.700
2000:02	5.64	5.779	5.516	6.210	1366.420	7644.550	17169.440	19959.520
2000:03	5.72	5.842	5.553	6.213	1498.580	7599.390	17406.540	20337.320
2000:04	5.65	5.795	5.498	6.112	1452.430	7414.680	15519.300	17973.700
2000:05	5.49	5.768	5.472	6.068	1420.600	7109.670	14713.860	16332.450
2000:06	5.70	5.800	5.510	6.099	1454.600	6882.440	16155.780	17411.050
2000:07	6.02	5.769	5.466	6.045	1430.830	7190.370	16840.980	15727.490
2000:08	6.11	5.798	5.473	6.049	1517.680	7244.790	17097.510	16861.260
2000:09	6.03	5.741	5.422	5.956	1436.510	6798.120	15648.980	15747.260
2000:10	6.15	5.720	5.397	5.880	1429.400	7077.440	14895.340	14539.600
2000:11	6.01	5.655	5.358	5.788	1314.950	6372.330	13984.390	14648.510
2000:12	5.73	5.670	5.392	5.811	1320.280	6433.610	15095.530	13785.690
2001:01	4.84	5.695	5.391	5.938	1366.010	6795.140	16102.350	13843.550
2001:02	4.72	5.606	5.312	5.855	1239.940	6208.240	14787.870	12883.540
2001:03	4.18	5.534	5.241	5.747	1160.330	5829.950	12760.640	12999.700
2001:04	3.83	5.602	5.306	5.792	1249.460	6264.510	13386.040	13934.320
2001:05	3.54	5.589	5.267	5.801	1255.820	6123.260	13174.410	13262.140
2001:06	3.56	5.556	5.224	5.777	1224.380	6058.380	13042.530	12969.050
2001:07	3.44	5.539	5.205	5.709	1211.230	5861.190	12316.690	11860.770
2001:08	3.28	5.491	5.178	5.698	1133.580	5188.170	11090.480	10713.510
2001:09	2.30	5.393	5.069	5.527	1040.940	4308.150	9950.700	9774.680
2001:10	2.01	5.414	5.094	5.587	1059.780	4559.130	10073.970	10366.340
2001:11	1.73	5.472	5.130	5.685	1139.450	4989.910	11279.250	10697.440
2001:12	1.67	5.481	5.136	5.760	1148.080	5160.100	11397.210	10542.620
2002:01	1.72	5.452	5.081	5.792	1130.200	5107.610	10725.300	9997.800
2002:02	1.72	5.443	5.086	5.807	1106.730	5039.080	10482.550	10587.830
2002:03	1.74	5.486	5.136	5.862	1147.390	5397.290	11032.920	11024.940
2002:04	1.73	5.452	5.141	5.866	1076.920	5041.200	11497.580	11492.540
2002:05	1.71	5.450	5.150	5.847	1067.140	4818.300	11301.940	11763.700
2002:06	1.66	5.386	5.108	5.768	989.820	4382.560	10598.550	10621.840
2002:07	1.66	5.297	5.003	5.686	911.620	3700.140	10267.360	9877.940

APPENDIX C1
DATA FOR CHAPTER 1

Date	US T-Bill 3-Mo	MSCI ACWI	MSCI EAFE	MSCI EM	US S&P500	GE DAX	HK HSI	JP N225
2002:08	1.64	5.298	4.998	5.700	916.070	3712.940	10043.870	9619.300
2002:09	1.53	5.180	4.883	5.584	815.280	2769.030	9072.210	9383.290
2002:10	1.42	5.250	4.935	5.646	885.760	3152.850	9441.250	8640.480
2002:11	1.20	5.301	4.978	5.712	936.310	3320.320	10069.870	9215.560
2002:12	1.18	5.251	4.943	5.677	879.820	2892.630	9321.290	8578.950
2003:01	1.15	5.221	4.900	5.671	855.700	2747.830	9258.950	8339.940
2003:02	1.17	5.201	4.875	5.639	841.150	2547.050	9122.660	8363.040
2003:03	1.09	5.194	4.851	5.607	848.180	2423.870	8634.450	7972.710
2003:04	1.10	5.277	4.940	5.688	916.920	2942.040	8717.220	7831.420
2003:05	1.09	5.330	4.995	5.754	963.590	2982.680	9487.380	8424.510
2003:06	0.84	5.347	5.017	5.807	974.500	3220.580	9577.120	9083.110
2003:07	0.93	5.368	5.040	5.865	990.310	3487.860	10134.830	9563.210
2003:08	0.96	5.390	5.061	5.928	1008.010	3484.580	10908.990	10343.550
2003:09	0.93	5.394	5.090	5.934	995.970	3256.780	11229.870	10219.050
2003:10	0.93	5.452	5.150	6.014	1050.710	3655.990	12190.100	10559.590
2003:11	0.91	5.466	5.170	6.024	1058.200	3745.950	12317.470	10100.570
2003:12	0.91	5.526	5.245	6.093	1111.920	3965.160	12575.940	10676.640
2004:01	0.90	5.542	5.259	6.125	1131.130	4058.600	13289.370	10783.610
2004:02	0.93	5.559	5.280	6.169	1144.940	4018.160	13907.030	11041.920
2004:03	0.92	5.551	5.282	6.178	1126.210	3856.700	12681.670	11715.390
2004:04	0.95	5.525	5.256	6.090	1107.300	3985.210	11942.960	11761.790
2004:05	1.05	5.531	5.255	6.067	1120.680	3921.410	12198.240	11236.370
2004:06	1.30	5.549	5.275	6.069	1140.840	4052.730	12285.750	11858.870
2004:07	1.41	5.515	5.241	6.048	1101.720	3895.610	12238.030	11325.780
2004:08	1.57	5.519	5.243	6.086	1104.240	3785.210	12850.280	11081.790
2004:09	1.67	5.539	5.268	6.140	1114.580	3892.900	13120.030	10823.570
2004:10	1.87	5.562	5.301	6.162	1130.200	3960.250	13054.660	10771.420
2004:11	2.18	5.614	5.365	6.250	1173.820	4126.000	14060.050	10899.250
2004:12	2.18	5.651	5.407	6.296	1211.920	4256.080	14230.140	11488.760
2005:01	2.42	5.629	5.388	6.296	1181.270	4254.850	13721.690	11387.590
2005:02	2.69	5.661	5.429	6.378	1203.600	4350.490	14195.350	11740.600
2005:03	2.72	5.637	5.400	6.308	1180.590	4348.770	13516.880	11668.950
2005:04	2.84	5.612	5.372	6.277	1156.850	4184.840	13908.970	11008.900
2005:05	2.88	5.628	5.368	6.307	1191.500	4460.630	13867.070	11276.590
2005:06	3.06	5.636	5.379	6.337	1191.330	4586.280	14201.060	11584.010
2005:07	3.33	5.672	5.409	6.401	1234.180	4886.500	14880.980	11899.600
2005:08	3.43	5.677	5.431	6.407	1220.330	4829.690	14903.550	12413.600
2005:09	3.47	5.706	5.473	6.494	1228.810	5044.120	15428.520	13574.300
2005:10	3.81	5.678	5.443	6.426	1207.010	4929.070	14386.370	13606.500
2005:11	3.86	5.712	5.465	6.504	1249.480	5193.400	14937.140	14872.150
2005:12	3.98	5.735	5.510	6.560	1248.290	5408.260	14876.430	16111.430
2006:01	4.37	5.783	5.570	6.664	1280.080	5674.150	15753.140	16649.820
2006:02	4.51	5.780	5.566	6.662	1280.660	5796.040	15918.480	16205.430
2006:03	4.51	5.798	5.595	6.669	1294.870	5970.080	15805.040	17059.660
2006:04	4.65	5.830	5.639	6.735	1310.610	6009.890	16661.300	16906.230
2006:05	4.72	5.786	5.594	6.621	1270.090	5692.860	15857.890	15467.330
2006:06	4.86	5.784	5.592	6.617	1270.200	5683.310	16267.620	15505.180
2006:07	4.93	5.790	5.601	6.628	1276.660	5681.970	16971.340	15456.810
2006:08	4.91	5.814	5.626	6.650	1303.820	5859.570	17392.270	16140.760
2006:09	4.76	5.824	5.626	6.657	1335.850	6004.330	17543.050	16127.580
2006:10	4.94	5.860	5.663	6.703	1377.940	6268.920	18324.350	16399.390
2006:11	4.89	5.886	5.691	6.773	1400.630	6309.190	18960.480	16274.330
2006:12	4.89	5.907	5.721	6.816	1418.300	6596.920	19964.720	17225.830
2007:01	4.97	5.917	5.728	6.804	1438.240	6789.110	20106.420	17383.420
2007:02	4.99	5.910	5.735	6.797	1406.820	6715.440	19651.510	17604.120
2007:03	4.89	5.928	5.756	6.834	1420.860	6917.030	19800.930	17287.650
2007:04	4.72	5.969	5.796	6.878	1482.370	7408.870	20318.980	17400.410

APPENDIX C1
DATA FOR CHAPTER 1

Date	US T-Bill 3-Mo	MSCI ACWI	MSCI EAFE	MSCI EM	US S&P500	GE DAX	HK HSI	JP N225
2007:05	4.59	5.995	5.808	6.922	1530.620	7883.040	20634.470	17875.750
2007:06	4.67	5.991	5.808	6.966	1503.350	8007.320	21772.730	18138.360
2007:07	4.81	5.975	5.792	7.014	1455.270	7584.140	23184.940	17248.890
2007:08	3.99	5.970	5.774	6.991	1473.990	7638.170	23984.140	16569.090
2007:09	3.70	6.021	5.825	7.094	1526.750	7861.510	27142.470	16785.690
2007:10	3.82	6.058	5.862	7.199	1549.380	8019.220	31352.580	16737.630
2007:11	3.07	6.012	5.827	7.124	1481.140	7870.520	28643.610	15680.670
2007:12	3.14	6.000	5.804	7.127	1468.360	8067.320	27812.650	15307.780
2008:01	1.87	5.913	5.707	6.993	1378.550	6851.750	23455.740	13592.470
2008:02	1.78	5.915	5.719	7.063	1330.630	6748.130	24331.670	13603.020
2008:03	1.27	5.897	5.704	7.007	1322.700	6534.970	22849.200	12525.540
2008:04	1.34	5.949	5.752	7.083	1385.590	6948.820	25755.350	13849.990
2008:05	1.85	5.960	5.755	7.098	1400.380	7096.790	24533.120	14338.540
2008:06	1.71	5.873	5.668	6.991	1280.000	6418.320	22102.010	13481.380
2008:07	1.63	5.846	5.635	6.949	1267.380	6479.560	22731.100	13376.810
2008:08	1.69	5.822	5.591	6.863	1282.830	6422.300	21261.890	13072.870
2008:09	0.90	5.686	5.432	6.668	1166.360	5831.020	18016.210	11259.860
2008:10	0.44	5.464	5.206	6.347	968.750	4987.970	13968.670	8576.980
2008:11	0.02	5.394	5.147	6.267	896.240	4669.440	13888.240	8512.270
2008:12	0.12	5.428	5.205	6.340	903.250	4810.200	14387.480	8859.560
2009:01	0.22	5.338	5.101	6.272	825.880	4338.350	13278.210	7994.050
2009:02	0.25	5.232	4.989	6.213	735.090	3843.740	12811.570	7568.420
2009:03	0.20	5.308	5.046	6.346	797.870	4084.760	13576.020	8109.530
2009:04	0.12	5.417	5.162	6.496	872.810	4769.450	15520.990	8828.260
2009:05	0.13	5.508	5.267	6.650	919.140	4940.820	18171.000	9522.500
2009:06	0.18	5.501	5.259	6.635	919.320	4808.640	18378.730	9958.440
2009:07	0.17	5.584	5.346	6.738	987.480	5332.140	20573.330	10356.830
2009:08	0.13	5.617	5.396	6.733	1020.620	5458.040	19724.190	10492.530
2009:09	0.12	5.660	5.432	6.818	1057.080	5675.160	20955.250	10133.230
2009:10	0.05	5.644	5.419	6.818	1036.190	5414.960	21752.870	10034.740
2009:11	0.05	5.682	5.436	6.860	1095.630	5625.950	21821.500	9345.550
2009:12	0.05	5.702	5.449	6.897	1115.100	5957.430	21872.500	10546.440
2010:01	0.07	5.657	5.404	6.839	1073.870	5608.790	20121.990	10198.040
2010:02	0.12	5.668	5.395	6.842	1104.490	5598.460	20608.700	10126.030
2010:03	0.15	5.728	5.452	6.918	1169.430	6153.550	21239.350	11089.940
2010:04	0.16	5.728	5.430	6.928	1186.690	6135.700	21108.590	11057.400
2010:05	0.15	5.625	5.302	6.831	1089.410	5964.330	19765.190	9768.700
2010:06	0.17	5.592	5.290	6.822	1030.710	5965.520	20128.990	9382.640
2010:07	0.14	5.669	5.380	6.899	1101.600	6147.970	21029.810	9537.300
2010:08	0.14	5.631	5.346	6.877	1049.330	5925.220	20536.490	8824.060
2010:09	0.16	5.721	5.437	6.981	1141.200	6229.020	22358.170	9369.350
2010:10	0.11	5.756	5.472	7.008	1183.260	6601.370	23096.320	9202.450
2010:11	0.16	5.731	5.420	6.981	1180.550	6688.490	23007.990	9937.040
2010:12	0.12	5.801	5.497	7.049	1257.640	6914.190	23035.450	10228.920
2011:01	0.14	5.816	5.520	7.020	1286.120	7077.480	23447.340	10237.920
2011:02	0.14	5.843	5.551	7.010	1327.220	7272.320	23338.020	10624.090
2011:03	0.09	5.840	5.524	7.066	1325.830	7041.310	23527.520	9755.100
2011:04	0.04	5.877	5.578	7.093	1363.610	7514.460	23720.810	9849.740
2011:05	0.04	5.852	5.541	7.063	1345.200	7293.690	23684.130	9693.730
2011:06	0.01	5.834	5.527	7.044	1320.640	7376.240	22398.100	9816.090
2011:07	0.09	5.817	5.510	7.037	1292.280	7158.770	22440.250	9833.030
2011:08	0.01	5.739	5.413	6.940	1218.890	5784.850	20534.850	8955.200
2011:09	0.01	5.637	5.309	6.780	1131.420	5502.020	17592.410	8700.290
2011:10	0.00	5.738	5.400	6.903	1253.300	6141.340	19864.870	8988.390
2011:11	0.01	5.705	5.347	6.833	1246.960	6088.840	17989.350	8434.610
2011:12	0.00	5.702	5.337	6.820	1257.600	5898.350	18434.390	8455.350
2012:01	0.05	5.758	5.388	6.927	1312.410	6458.910	20390.490	8802.510
2012:02	0.08	5.805	5.441	6.984	1365.680	6856.080	21680.080	9723.240
2012:03	0.06	5.809	5.432	6.948	1408.470	6946.830	20555.580	10083.560
2012:04	0.09	5.795	5.408	6.933	1397.910	6761.190	21094.210	9520.890
2012:05	0.06	5.697	5.279	6.809	1310.330	6264.380	18629.520	8542.730
2012:06	0.08	5.743	5.345	6.843	1362.160	6416.280	19441.460	9006.780
2012:07	0.10	5.756	5.355	6.859	1379.320	6772.260	19796.810	8695.060

APPENDIX C1
DATA FOR CHAPTER 1

Date	SI STI	UK FT100	AR MERV	BR BOVESPA	CH SSEC	ID IHSG	MA KLSE	ME MXX
1997:07	1967.100	4907.500	850.030	12872.000	1189.760	721.270	1012.840	5067.800
1997:08	1805.600	4817.500	832.930	10609.000	1221.060	493.960	804.400	4648.400
1997:09	1954.700	5244.200	822.470	11797.000	1097.380	546.690	814.570	5321.500
1997:10	1586.100	4842.300	660.240	8986.000	1180.390	500.420	664.690	4647.800
1997:11	1660.600	4831.800	655.600	9395.000	1139.630	401.710	545.440	4974.600
1997:12	1529.800	5135.500	687.500	10197.000	1194.100	401.710	594.440	5229.400
1998:01	1259.900	5458.500	612.380	9720.000	1222.910	485.940	569.510	4569.400
1998:02	1615.400	5767.300	686.640	10571.000	1206.530	482.380	745.360	4784.500
1998:03	1629.200	5932.200	709.970	11947.000	1243.020	541.420	719.520	5016.200
1998:04	1493.400	5928.300	698.900	11677.000	1343.450	460.140	625.970	5098.530
1998:05	1254.930	5870.700	602.010	9847.000	1411.210	420.460	538.240	4530.010
1998:06	1066.660	5832.500	550.440	9678.000	1339.200	445.920	455.640	4282.620
1998:07	1064.200	5837.000	588.790	10707.000	1316.920	481.720	402.650	4244.960
1998:08	856.430	5249.400	358.490	6472.000	1150.220	342.440	302.910	2991.930
1998:09	939.650	5064.400	380.280	6593.000	1242.900	276.150	373.520	3569.880
1998:10	1204.620	5438.400	457.460	7047.000	1217.320	300.770	405.330	4074.860
1998:11	1416.550	5743.900	488.800	8631.000	1247.420	386.270	501.470	3769.880
1998:12	1392.730	5882.600	430.060	6784.000	1146.700	398.040	586.130	3959.660
1999:01	1428.140	5896.000	371.900	8172.000	1134.670	411.930	591.430	3957.930
1999:02	1411.910	6175.100	380.750	8911.000	1090.090	396.090	542.230	4260.800
1999:03	1518.310	6295.300	419.780	10696.000	1158.050	393.620	502.820	4930.370
1999:04	1886.190	6552.200	563.670	11351.000	1120.930	495.220	674.960	5414.450
1999:05	1903.860	6226.200	524.100	11090.000	1279.330	585.240	743.040	5477.650
1999:06	2167.700	6318.500	498.720	11627.000	1689.430	662.030	811.100	5829.510
1999:07	2145.770	6231.900	475.680	10442.000	1601.460	597.870	768.690	5260.350
1999:08	2117.170	6246.400	506.740	10565.000	1627.120	567.030	767.060	5086.870
1999:09	2021.930	6029.800	534.400	11106.000	1570.700	547.940	675.450	5050.460
1999:10	2047.150	6255.700	538.690	11700.000	1504.560	593.870	742.870	5450.370
1999:11	2237.130	6597.200	536.110	13779.000	1434.970	583.800	734.660	6136.470
1999:12	2479.580	6930.200	550.470	17092.000	1366.580	676.920	812.330	7129.880
2000:01	2230.280	6268.500	566.280	16388.000	1535.000	636.370	922.100	6585.670
2000:02	2120.500	6232.600	631.640	17660.000	1714.580	576.540	982.240	7368.550
2000:03	2132.590	6540.200	569.240	17820.000	1800.230	583.280	974.380	7473.250
2000:04	2164.110	6327.400	509.510	15538.000	1836.320	526.740	898.350	6640.680
2000:05	1795.130	6359.300	464.300	14957.000	1894.550	454.330	911.510	5961.140
2000:06	2037.970	6312.700	496.900	16728.000	1928.110	515.110	833.370	6948.330
2000:07	2051.210	6365.300	502.010	16455.000	2023.540	492.190	798.830	6514.210
2000:08	2147.770	6672.700	474.660	17347.000	2021.200	466.380	795.840	6664.820
2000:09	1997.030	6294.200	475.420	15928.000	1910.160	421.340	713.510	6334.560
2000:10	1976.540	6438.400	440.900	14867.000	1961.290	405.350	752.360	6394.240
2000:11	1952.230	6142.200	399.490	13287.000	2070.610	429.210	729.950	5652.630
2000:12	1926.830	6222.500	416.770	15259.000	2073.480	416.320	679.640	5652.190
2001:01	1991.290	6297.500	532.800	17673.000	2065.610	425.610	727.730	6496.890
2001:02	1947.400	5917.900	435.850	15891.000	1959.180	428.300	709.390	6032.100
2001:03	1674.190	5633.700	443.810	14438.000	2112.770	381.050	647.480	5727.890
2001:04	1722.720	5966.900	435.630	14918.000	2119.180	358.230	584.500	5987.250
2001:05	1657.050	5796.100	439.220	14650.000	2214.260	405.860	572.880	6595.390
2001:06	1726.500	5642.500	402.250	14560.000	2218.030	437.620	592.990	6666.170
2001:07	1666.030	5529.100	320.790	13754.000	1920.320	470.230	659.400	6474.400
2001:08	1619.120	5345.000	319.890	12841.000	1834.140	443.190	687.160	6310.700
2001:09	1319.530	4903.400	243.550	10636.000	1764.870	392.480	615.340	5403.530
2001:10	1367.840	5039.700	224.750	11365.000	1689.170	383.730	600.070	5537.040
2001:11	1478.540	5203.600	202.450	12932.000	1747.990	380.310	638.020	5832.830
2001:12	1623.600	5217.400	295.390	13578.000	1645.970	392.040	696.090	6372.280
2002:01	1786.890	5164.800	439.200	12721.000	1491.670	451.640	718.820	6927.870
2002:02	1715.580	5101.000	398.250	14033.000	1524.700	453.250	708.910	6734.440
2002:03	1803.220	5271.800	436.130	13255.000	1603.910	481.770	756.100	7361.860
2002:04	1725.370	5165.600	387.790	13085.000	1667.750	534.060	793.990	7480.740
2002:05	1671.840	5085.100	317.550	12861.000	1515.730	530.790	741.760	7031.640
2002:06	1552.980	4656.400	350.650	11139.000	1732.760	505.010	725.440	6460.950
2002:07	1508.360	4246.200	359.320	9763.000	1651.590	463.670	721.590	6021.840

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Date	SI STI	UK FT100	AR MERV	BR BOVESPA	CH SSEC	ID IHSG	MA KLSE	ME MXX
2002:08	1488.500	4227.300	375.160	10382.000	1666.620	443.670	711.360	6216.430
2002:09	1352.300	3721.800	395.190	8623.000	1581.620	419.310	638.010	5728.460
2002:10	1463.370	4039.700	434.840	10168.000	1507.500	369.040	659.570	5967.730
2002:11	1391.530	4169.400	497.790	10509.000	1434.180	390.420	629.220	6156.830
2002:12	1341.030	3940.400	524.950	11268.000	1357.650	424.950	646.320	6127.090
2003:01	1291.440	3567.400	549.850	10941.000	1499.810	388.440	664.770	5954.350
2003:02	1273.850	3655.600	593.820	10281.000	1511.930	399.220	646.800	5927.060
2003:03	1267.820	3613.300	566.460	11274.000	1510.580	398.000	635.720	5914.030
2003:04	1281.330	3926.000	635.950	12557.000	1521.440	450.860	630.370	6509.880
2003:05	1349.000	4048.100	678.310	13422.000	1576.260	494.780	671.460	6699.180
2003:06	1447.890	4031.200	765.610	12973.000	1486.020	505.500	691.960	7054.990
2003:07	1558.870	4157.000	755.340	13572.000	1476.740	507.980	720.560	7355.070
2003:08	1599.250	4161.100	713.330	15174.000	1421.980	529.670	743.300	7591.420
2003:09	1630.800	4091.300	827.690	16011.000	1367.160	597.650	733.450	7822.480
2003:10	1723.710	4287.600	929.890	17982.000	1348.300	625.550	817.120	8064.830
2003:11	1714.000	4342.600	996.560	20184.000	1397.220	617.080	779.280	8554.480
2003:12	1764.520	4476.900	1071.950	22236.000	1497.040	691.900	793.940	8795.280
2004:01	1848.360	4390.700	1140.810	21851.000	1590.730	752.930	818.940	9428.770
2004:02	1888.630	4492.200	1183.140	21755.000	1675.070	761.080	879.240	9991.800
2004:03	1858.920	4385.700	1201.660	22142.000	1741.620	735.680	901.850	10517.500
2004:04	1842.030	4489.700	1077.930	19607.000	1595.590	783.410	838.210	9948.130
2004:05	1788.660	4430.700	952.620	19545.000	1555.910	732.520	810.670	10036.290
2004:06	1838.000	4464.100	945.450	21149.000	1399.160	732.400	819.860	10281.820
2004:07	1891.710	4413.100	966.100	22337.000	1386.200	756.980	833.980	10116.390
2004:08	1918.340	4459.300	952.140	22803.000	1342.060	754.700	827.980	10264.320
2004:09	1984.740	4570.800	1142.500	23245.000	1396.700	820.130	849.960	10957.370
2004:10	1980.690	4624.200	1287.140	23052.000	1320.540	860.490	861.140	11564.350
2004:11	2027.660	4703.200	1213.090	25128.000	1340.770	977.770	917.190	12102.550
2004:12	2066.140	4814.300	1375.370	26196.000	1266.500	1000.230	907.430	12917.880
2005:01	2096.320	4852.300	1373.790	24351.000	1191.820	1045.440	916.270	13097.120
2005:02	2119.400	4968.500	1558.620	28139.000	1306.000	1073.830	907.380	13789.460
2005:03	2141.430	4894.400	1400.420	26611.000	1181.240	1080.170	871.350	12676.900
2005:04	2125.250	4801.700	1348.350	24844.000	1159.150	1029.610	878.960	12322.990
2005:05	2161.770	4964.000	1485.550	25207.000	1060.740	1088.170	860.730	12964.390
2005:06	2212.660	5113.200	1367.410	25051.000	1080.940	1122.380	888.320	13486.130
2005:07	2352.560	5282.300	1507.590	26042.000	1083.030	1182.300	937.390	14409.660
2005:08	2275.430	5296.900	1581.650	28045.000	1162.800	1050.090	913.560	14243.190
2005:09	2305.140	5477.700	1694.830	31584.000	1155.610	1079.280	927.540	16120.080
2005:10	2216.770	5317.300	1608.860	30194.000	1092.820	1066.220	910.760	15759.730
2005:11	2300.250	5423.200	1554.670	31917.000	1099.260	1096.640	896.130	16830.960
2005:12	2347.340	5618.800	1543.310	33456.000	1161.060	1162.640	899.790	17802.710
2006:01	2412.080	5760.300	1793.970	38383.000	1258.050	1232.320	914.010	18907.100
2006:02	2481.960	5791.500	1714.050	38610.000	1299.030	1230.660	928.940	18706.320
2006:03	2533.400	5964.600	1800.580	37952.000	1298.300	1322.970	926.630	19272.630
2006:04	2610.710	6023.100	1908.610	40363.000	1440.220	1464.410	949.230	20646.190
2006:05	2383.870	5723.800	1653.720	36530.000	1641.300	1330.000	927.780	18677.920
2006:06	2435.390	5833.400	1711.090	36631.000	1672.210	1310.260	914.690	19147.170
2006:07	2445.430	5928.300	1701.580	37077.000	1612.730	1351.650	935.850	20095.930
2006:08	2482.390	5906.100	1662.840	36232.000	1658.640	1431.260	958.120	21049.350
2006:09	2568.860	5960.800	1637.270	36449.000	1752.420	1534.610	967.550	21937.110
2006:10	2701.750	6129.200	1781.680	39263.000	1837.990	1582.630	988.300	23046.950
2006:11	2838.530	6048.800	1967.020	41932.000	2099.290	1718.960	1080.660	24962.010
2006:12	2985.830	6220.800	2090.460	44474.000	2675.470	1805.520	1096.240	26448.320
2007:01	3125.560	6203.100	2070.640	44642.000	2786.330	1757.260	1189.350	27561.490
2007:02	3104.150	6171.500	2067.640	43892.000	2881.070	1740.970	1196.450	26638.950
2007:03	3231.240	6308.000	2102.780	45805.000	3183.980	1830.920	1246.870	28747.690
2007:04	3361.290	6449.200	2154.550	48956.000	3841.270	1999.170	1322.250	28996.710

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	SI	UK	AR	BR	CH	ID	MA	ME
Date	STI	FT100	MERV	BOVESPA	SSEC	IHSG	KLSE	MXX
2007:05	3511.130	6621.400	2243.030	52268.000	4109.650	2084.320	1346.890	31398.960
2007:06	3548.200	6607.900	2190.870	54392.000	3820.700	2139.280	1354.380	31151.050
2007:07	3547.660	6360.100	2180.250	54183.000	4471.030	2348.670	1373.710	30659.660
2007:08	3392.910	6303.300	2062.080	54637.000	5218.830	2194.340	1273.930	30347.860
2007:09	3706.230	6466.800	2187.970	60465.000	5552.300	2359.210	1336.300	30296.190
2007:10	3805.700	6721.600	2351.440	65318.000	5954.770	2643.490	1413.650	31458.670
2007:11	3521.270	6432.500	2207.160	63006.000	4871.780	2688.330	1396.980	29770.520
2007:12	3482.300	6456.900	2151.730	63886.000	5261.560	2745.830	1445.030	29536.830
2008:01	2981.750	5879.800	2007.270	59490.000	4383.390	2627.250	1393.250	28793.640
2008:02	3026.450	5884.300	2162.200	63489.000	4348.540	2721.940	1357.400	28918.520
2008:03	3007.360	5702.100	2103.720	60968.000	3472.710	2447.300	1247.520	30912.990
2008:04	3147.790	6087.300	2095.530	67868.000	3693.110	2304.520	1279.860	30281.410
2008:05	3192.620	6053.500	2205.720	72593.000	3433.350	2444.350	1276.100	31975.470
2008:06	2947.540	5625.900	2107.870	65018.000	2736.100	2349.100	1186.570	29395.490
2008:07	2929.650	5411.900	1919.820	59505.000	2775.720	2304.510	1163.090	27501.020
2008:08	2739.950	5636.600	1777.140	55680.000	2397.370	2165.940	1100.500	26290.990
2008:09	2358.910	4902.500	1598.170	49541.000	2293.780	1832.510	1018.680	24888.900
2008:10	1794.200	4377.300	1010.790	37257.000	1728.790	1256.700	863.610	20445.320
2008:11	1732.570	4288.000	993.990	36596.000	1871.160	1241.540	866.140	20534.720
2008:12	1761.560	4434.200	1079.660	37550.000	1820.810	1355.410	876.750	22380.320
2009:01	1746.470	4149.600	1077.090	39301.000	1990.660	1332.670	884.450	19565.140
2009:02	1594.870	3830.100	1019.290	38183.000	2082.850	1285.480	890.670	17752.180
2009:03	1699.990	3926.100	1125.950	40926.000	2373.210	1434.070	872.550	19626.750
2009:04	1920.280	4243.700	1275.250	47290.000	2477.570	1722.770	990.740	21898.850
2009:05	2329.080	4417.900	1587.210	53198.000	2632.930	1916.830	1044.110	24331.710
2009:06	2333.140	4249.200	1587.970	51465.000	2959.360	2026.780	1075.240	24368.380
2009:07	2659.200	4608.400	1719.870	54766.000	3412.060	2323.240	1174.900	27043.500
2009:08	2592.900	4908.900	1781.890	56489.000	2667.750	2341.540	1174.270	28129.950
2009:09	2672.570	5133.900	2075.140	61518.000	2779.430	2467.590	1202.080	29232.240
2009:10	2651.130	5044.500	2115.760	61546.000	2995.850	2367.700	1243.230	28646.030
2009:11	2732.120	5190.700	2147.250	67044.000	3195.300	2415.840	1259.110	30957.110
2009:12	2897.620	5412.900	2320.730	68588.000	3277.140	2534.360	1272.780	32120.470
2010:01	2745.350	5188.500	2298.550	65402.000	2989.290	2610.800	1259.160	30391.610
2010:02	2750.860	5354.500	2221.380	66503.000	3051.940	2549.030	1270.780	31634.540
2010:03	2887.460	5679.600	2373.710	70372.000	3109.100	2777.300	1320.570	33266.430
2010:04	2974.610	5553.300	2396.270	67530.000	2870.610	2971.250	1346.380	32687.320
2010:05	2752.600	5188.400	2203.600	63047.000	2592.150	2796.960	1285.010	32038.530
2010:06	2835.510	4916.900	2185.010	60936.000	2398.370	2913.680	1314.020	31156.970
2010:07	2987.700	5258.000	2394.160	67515.000	2637.500	3069.280	1360.920	32308.740
2010:08	2950.330	5225.200	2336.890	65145.000	2638.800	3081.880	1422.490	31679.850
2010:09	3097.630	5548.600	2643.420	69430.000	2655.660	3501.300	1463.500	33330.340
2010:10	3142.620	5675.200	3007.410	70673.000	2978.830	3635.320	1505.660	35568.220
2010:11	3144.700	5528.300	3261.490	67705.000	2820.180	3531.210	1485.230	36817.320
2010:12	3190.040	5899.900	3523.590	69305.000	2808.080	3703.510	1518.910	38550.790
2011:01	3179.720	5862.900	3593.130	66575.000	2790.690	3409.170	1519.940	36982.240
2011:02	3010.510	5994.000	3455.650	67383.000	2905.050	3470.350	1491.250	37019.700
2011:03	3105.850	5908.800	3388.030	68587.000	2928.110	3678.670	1545.130	37440.510
2011:04	3172.730	6069.900	3406.020	66133.000	2911.510	3819.620	1534.950	36962.620
2011:05	3159.930	5990.000	3250.910	64620.000	2743.470	3836.970	1558.290	35832.790
2011:06	3120.440	5945.700	3360.640	62404.000	2762.080	3888.570	1579.070	36558.070
2011:07	3189.260	5815.200	3321.850	58823.000	2701.730	4130.800	1548.810	35999.340
2011:08	2885.260	5394.500	2964.790	56495.000	2567.340	3841.730	1447.270	35721.100
2011:09	2675.160	5128.500	2463.630	52324.000	2359.220	3549.030	1387.130	33503.280
2011:10	2855.770	5544.200	2905.540	58338.000	2468.250	3790.850	1491.890	36159.990
2011:11	2702.460	5505.400	2562.850	56875.000	2333.410	3715.080	1472.100	36829.150
2011:12	2646.350	5572.300	2462.630	56754.000	2199.420	3821.990	1530.730	37077.520
2012:01	2906.690	5681.600	2787.170	63072.000	2292.610	3941.690	1521.290	37422.680
2012:02	2994.060	5871.500	2648.220	65812.000	2428.490	3985.210	1569.650	37816.690
2012:03	3010.460	5768.500	2683.990	64511.000	2262.790	4121.550	1596.330	39521.240
2012:04	2978.570	5737.800	2271.860	61820.000	2396.320	4180.730	1570.610	39461.000
2012:05	2772.540	5320.900	2256.740	54490.000	2372.230	3832.820	1580.670	37872.950
2012:06	2878.450	5571.100	2346.680	54355.000	2225.430	3955.580	1599.150	40199.550
2012:07	3036.400	5635.300	2400.310	56097.000	2103.640	4142.340	1631.600	40704.280

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	GE	HK	JP	SI	UK	AR	BR	CH
Date	DEM2USD*	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD
1997:07	1.067427	0.129100	0.008458	0.680500	1.638900	1.000000	0.923400	0.120600
1997:08	1.080926	0.129100	0.008278	0.662300	1.613900	1.000000	0.916200	0.120700
1997:09	1.107338	0.129200	0.008263	0.653800	1.614300	1.000000	0.912500	0.120700
1997:10	1.133749	0.129300	0.008319	0.631300	1.673000	1.000300	0.907000	0.120700
1997:11	1.109685	0.129400	0.007828	0.628400	1.691000	0.999900	0.901700	0.120800
1997:12	1.092273	0.129100	0.007683	0.596300	1.650500	1.000200	0.896100	0.120800
1998:01	1.068992	0.129300	0.007873	0.584500	1.632500	1.000200	0.890500	0.120800
1998:02	1.077991	0.129100	0.007937	0.617700	1.647600	1.000200	0.885000	0.120800
1998:03	1.059014	0.129100	0.007524	0.620700	1.677500	1.000600	0.879600	0.120800
1998:04	1.090708	0.129100	0.007573	0.631300	1.671600	1.000600	0.874400	0.120800
1998:05	1.097947	0.129100	0.007215	0.595900	1.633200	1.000100	0.869300	0.120800
1998:06	1.082491	0.129100	0.007153	0.588200	1.667200	1.000100	0.864700	0.120800
1998:07	1.099316	0.129100	0.006938	0.579700	1.636600	1.000100	0.859900	0.120800
1998:08	1.108120	0.129100	0.007070	0.562100	1.672800	1.000000	0.849800	0.120800
1998:09	1.169356	0.129100	0.007369	0.593300	1.699000	1.000500	0.843800	0.120800
1998:10	1.183443	0.129100	0.008628	0.616100	1.677000	1.000000	0.838300	0.120800
1998:11	1.149988	0.129200	0.008123	0.605300	1.651800	1.000000	0.832800	0.120800
1998:12	1.167400	0.129100	0.008803	0.605100	1.659500	1.001000	0.828100	0.120800
1999:01	1.143500	0.129100	0.008632	0.591300	1.647500	0.996900	0.483100	0.120800
1999:02	1.104200	0.129100	0.008389	0.580700	1.599900	1.000300	0.492600	0.120800
1999:03	1.073900	0.129000	0.008396	0.578000	1.613000	1.000100	0.583100	0.120800
1999:04	1.059700	0.129000	0.008365	0.589100	1.611800	1.000100	0.602400	0.120800
1999:05	1.046200	0.129000	0.008233	0.579000	1.603400	1.000200	0.579000	0.120800
1999:06	1.033000	0.128900	0.008273	0.588100	1.575800	1.000200	0.557700	0.120800
1999:07	1.071400	0.128800	0.008731	0.593800	1.621800	1.000200	0.554900	0.120800
1999:08	1.054600	0.128800	0.009123	0.594000	1.603700	1.000100	0.514100	0.120800
1999:09	1.065600	0.128700	0.009442	0.587600	1.646700	1.000200	0.520700	0.120800
1999:10	1.055800	0.128700	0.009607	0.601900	1.611700	1.000200	0.513600	0.120800
1999:11	1.009000	0.128800	0.009802	0.594500	1.599400	1.000200	0.520000	0.121400
1999:12	1.004800	0.128700	0.009792	0.601300	1.617500	1.000200	0.553100	0.120800
2000:01	0.977400	0.128500	0.009343	0.584800	1.619600	1.000100	0.557700	0.120800
2000:02	0.972300	0.128500	0.009138	0.582100	1.595600	1.000200	0.563100	0.120800
2000:03	0.961400	0.128400	0.009482	0.582300	1.596900	1.000200	0.572100	0.120800
2000:04	0.912200	0.128400	0.009251	0.585900	1.552400	1.000700	0.554300	0.120800
2000:05	0.930000	0.128300	0.009274	0.577600	1.496100	1.000200	0.546700	0.120800
2000:06	0.952000	0.128300	0.009507	0.576700	1.519100	1.000200	0.552500	0.120800
2000:07	0.924500	0.128200	0.009130	0.576700	1.503500	1.000500	0.560200	0.120800
2000:08	0.893700	0.128200	0.009398	0.581100	1.460000	1.000200	0.548700	0.120800
2000:09	0.879600	0.128300	0.009301	0.573600	1.463900	1.000100	0.542900	0.120800
2000:10	0.841400	0.128200	0.009181	0.569600	1.451400	1.000200	0.522500	0.120800
2000:11	0.858100	0.128200	0.008997	0.569400	1.423000	1.000200	0.511200	0.120800
2000:12	0.942100	0.128200	0.008742	0.577000	1.493500	1.001600	0.513100	0.120800
2001:01	0.926900	0.128200	0.008634	0.573400	1.463100	1.000200	0.509200	0.120800
2001:02	0.918000	0.128200	0.008615	0.574500	1.443600	1.000100	0.491500	0.120800
2001:03	0.879200	0.128200	0.007921	0.554000	1.416800	1.001500	0.464700	0.120800
2001:04	0.890000	0.128200	0.008063	0.549900	1.440000	1.000700	0.454500	0.120800
2001:05	0.857500	0.128200	0.008312	0.552500	1.427600	1.000100	0.427200	0.120800
2001:06	0.849500	0.128200	0.008021	0.548700	1.415200	1.000500	0.432900	0.120800
2001:07	0.874700	0.128200	0.007997	0.554000	1.426900	1.000400	0.415000	0.120800
2001:08	0.916700	0.128200	0.008374	0.572500	1.457700	1.000200	0.395300	0.120800
2001:09	0.909800	0.128200	0.008367	0.566300	1.475200	1.000400	0.386300	0.121000
2001:10	0.904900	0.128200	0.008200	0.548400	1.452000	1.000400	0.377800	0.121000
2001:11	0.888500	0.128200	0.008079	0.545700	1.427600	1.000800	0.414000	0.121000
2001:12	0.886000	0.128300	0.007627	0.540600	1.451500	1.008100	0.449400	0.121000
2002:01	0.861700	0.128200	0.007527	0.545000	1.414900	0.552500	0.428500	0.121000
2002:02	0.865900	0.128200	0.007443	0.544700	1.421100	0.466200	0.434600	0.121000
2002:03	0.870200	0.128200	0.007540	0.542500	1.426200	0.340100	0.448200	0.121000
2002:04	0.904000	0.128200	0.007811	0.553100	1.459400	0.348400	0.423200	0.121000
2002:05	0.937600	0.128200	0.008106	0.560200	1.465900	0.280100	0.398200	0.121000
2002:06	0.992100	0.128200	0.008367	0.565900	1.532800	0.263200	0.354100	0.121000
2002:07	0.983500	0.128200	0.008322	0.567200	1.574400	0.271000	0.298300	0.121000

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Date	GE DEM2USD*	HK HKD2USD	JP JPY2USD	SI SGD2USD	UK GBP2USD	AR ARS2USD	BR BRL2USD	CH CNY2USD
2002:08	0.982600	0.128200	0.008452	0.571800	1.551200	0.276200	0.334400	0.121000
2002:09	0.981200	0.128200	0.008158	0.562400	1.561400	0.272500	0.272200	0.121000
2002:10	0.984400	0.128300	0.008137	0.564700	1.558100	0.282500	0.269800	0.121000
2002:11	0.994600	0.128200	0.008163	0.566200	1.557400	0.286500	0.282800	0.121000
2002:12	1.048300	0.128200	0.008438	0.576500	1.604400	0.296700	0.282700	0.121000
2003:01	1.081500	0.128300	0.008401	0.575600	1.654300	0.308600	0.282600	0.120900
2003:02	1.075900	0.128200	0.008507	0.576300	1.580400	0.314500	0.281300	0.121000
2003:03	1.080000	0.128300	0.008345	0.564500	1.574900	0.348400	0.302000	0.121000
2003:04	1.108600	0.128300	0.008353	0.563200	1.594900	0.350900	0.345300	0.121000
2003:05	1.178300	0.128300	0.008382	0.577400	1.636400	0.347000	0.347800	0.121000
2003:06	1.144000	0.128300	0.008361	0.569600	1.650300	0.358800	0.353600	0.121000
2003:07	1.134600	0.128300	0.008316	0.569300	1.616500	0.344800	0.348300	0.121000
2003:08	1.098600	0.128300	0.008556	0.570600	1.577600	0.341300	0.346900	0.121000
2003:09	1.159700	0.129100	0.009029	0.578000	1.667100	0.346000	0.341500	0.121000
2003:10	1.163800	0.128900	0.009199	0.575700	1.696300	0.349400	0.351200	0.121000
2003:11	1.198900	0.128800	0.009122	0.579900	1.722800	0.340500	0.339400	0.121000
2003:12	1.255700	0.128800	0.009341	0.587100	1.778500	0.341100	0.344700	0.121000
2004:01	1.247000	0.128700	0.009441	0.587200	1.816800	0.347800	0.341300	0.121000
2004:02	1.249300	0.128500	0.009162	0.589100	1.868700	0.345800	0.344200	0.121000
2004:03	1.217800	0.128300	0.009469	0.594100	1.826200	0.350300	0.344000	0.121000
2004:04	1.198300	0.128200	0.009110	0.587300	1.774400	0.350300	0.337300	0.121000
2004:05	1.224300	0.128300	0.009064	0.588800	1.834500	0.341100	0.323800	0.121000
2004:06	1.208500	0.128200	0.009231	0.582800	1.807400	0.337800	0.321900	0.121000
2004:07	1.202700	0.128200	0.008994	0.582100	1.821400	0.336400	0.329400	0.121000
2004:08	1.205300	0.128200	0.009100	0.583500	1.796400	0.336700	0.339800	0.121000
2004:09	1.233100	0.128200	0.009018	0.591400	1.799400	0.338900	0.350500	0.121000
2004:10	1.279400	0.128500	0.009455	0.600800	1.843300	0.336200	0.350000	0.121000
2004:11	1.327400	0.128600	0.009726	0.610800	1.893800	0.339600	0.364200	0.121000
2004:12	1.364400	0.128600	0.009704	0.610800	1.926600	0.336600	0.376400	0.121000
2005:01	1.303500	0.128200	0.009666	0.612200	1.887600	0.356800	0.377900	0.121000
2005:02	1.324400	0.128200	0.009505	0.612800	1.918900	0.340800	0.379400	0.121000
2005:03	1.291600	0.128200	0.009301	0.605700	1.879000	0.342700	0.373900	0.121000
2005:04	1.287000	0.128300	0.009537	0.610700	1.907500	0.344400	0.395800	0.121000
2005:05	1.247400	0.128600	0.009264	0.602100	1.823400	0.346900	0.422300	0.121000
2005:06	1.206600	0.128700	0.009047	0.593300	1.804800	0.345700	0.425100	0.121000
2005:07	1.212900	0.128600	0.008893	0.601500	1.758300	0.349700	0.420300	0.123500
2005:08	1.222500	0.128700	0.008988	0.593900	1.786600	0.343600	0.419600	0.123700
2005:09	1.204800	0.128900	0.008851	0.592200	1.762800	0.343100	0.452300	0.123800
2005:10	1.206300	0.129000	0.008647	0.591000	1.774500	0.331900	0.441700	0.123800
2005:11	1.172200	0.129000	0.008356	0.590000	1.713000	0.334900	0.455800	0.123900
2005:12	1.184500	0.129000	0.008486	0.600500	1.720800	0.329500	0.429600	0.124000
2006:01	1.209500	0.128900	0.008516	0.613800	1.767500	0.327200	0.452600	0.124000
2006:02	1.185800	0.128900	0.008601	0.616100	1.741700	0.325500	0.467500	0.124400
2006:03	1.207600	0.128900	0.008506	0.617400	1.739800	0.331700	0.455000	0.124800
2006:04	1.263800	0.129000	0.008789	0.632600	1.826300	0.329000	0.476200	0.124900
2006:05	1.282600	0.128900	0.008917	0.634000	1.872100	0.324700	0.436300	0.124700
2006:06	1.255100	0.128700	0.008599	0.626100	1.816300	0.324300	0.452600	0.125200
2006:07	1.275900	0.128700	0.008723	0.633700	1.863600	0.325400	0.459400	0.125600
2006:08	1.283100	0.128600	0.008553	0.635700	1.901200	0.325300	0.471200	0.125800
2006:09	1.268800	0.128400	0.008481	0.630400	1.872600	0.322600	0.461500	0.126600
2006:10	1.272600	0.128600	0.008517	0.640900	1.899300	0.323600	0.467700	0.127100
2006:11	1.317700	0.128600	0.008617	0.647000	1.950800	0.325400	0.459600	0.127800
2006:12	1.320300	0.128600	0.008402	0.652100	1.959100	0.326400	0.468900	0.128200
2007:01	1.296100	0.128000	0.008213	0.650100	1.963000	0.322300	0.469400	0.128800
2007:02	1.320600	0.128000	0.008350	0.655000	1.964200	0.322700	0.477000	0.129300
2007:03	1.333500	0.128000	0.008481	0.659200	1.962500	0.323100	0.486600	0.129500
2007:04	1.365800	0.127900	0.008363	0.660000	1.998300	0.323900	0.493000	0.129700

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	GE	HK	JP	SI	UK	AR	BR	CH
Date	DEM2USD*	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD
2007:05	1.343800	0.128000	0.008226	0.653900	1.978300	0.324800	0.513600	0.131000
2007:06	1.347500	0.127900	0.008110	0.652900	2.003900	0.323900	0.520300	0.131500
2007:07	1.365700	0.127800	0.008439	0.660300	2.024300	0.320900	0.530100	0.132300
2007:08	1.364700	0.128200	0.008642	0.656500	2.013900	0.316400	0.508400	0.132700
2007:09	1.427200	0.128600	0.008710	0.673500	2.047700	0.318200	0.544900	0.133400
2007:10	1.441100	0.129000	0.008722	0.689000	2.063600	0.317400	0.570700	0.134000
2007:11	1.479100	0.128400	0.009094	0.691300	2.070500	0.318000	0.560500	0.135700
2007:12	1.472800	0.128200	0.008909	0.691700	1.997300	0.318100	0.565400	0.137100
2008:01	1.478400	0.128200	0.009349	0.704200	1.990000	0.317700	0.562600	0.139200
2008:02	1.512700	0.128500	0.009419	0.716700	1.984500	0.317100	0.598200	0.140800
2008:03	1.580000	0.128500	0.010082	0.724500	1.995100	0.317300	0.575900	0.142800
2008:04	1.560900	0.128300	0.009612	0.735000	1.982000	0.315500	0.590800	0.143400
2008:05	1.552600	0.128100	0.009482	0.733000	1.976200	0.322600	0.613200	0.144200
2008:06	1.579900	0.128200	0.009428	0.734000	1.995400	0.331300	0.624600	0.145900
2008:07	1.558300	0.128200	0.009256	0.731000	1.980500	0.331000	0.639100	0.146600
2008:08	1.467900	0.128100	0.009194	0.706500	1.821500	0.331600	0.614600	0.146500
2008:09	1.444900	0.128700	0.009446	0.699200	1.817500	0.321800	0.527400	0.146300
2008:10	1.305500	0.129000	0.010184	0.679400	1.648000	0.298600	0.473400	0.146500
2008:11	1.269700	0.129000	0.010473	0.661100	1.537700	0.300700	0.435800	0.146700
2008:12	1.409700	0.129000	0.011067	0.693500	1.447900	0.290200	0.427000	0.146700
2009:01	1.287300	0.128900	0.011153	0.662900	1.430700	0.287100	0.435000	0.146400
2009:02	1.269500	0.129000	0.010230	0.647600	1.426100	0.281200	0.423200	0.146400
2009:03	1.320800	0.129000	0.010281	0.657800	1.421300	0.269500	0.433200	0.146500
2009:04	1.321600	0.129000	0.010324	0.671000	1.471800	0.269400	0.459300	0.146700
2009:05	1.415400	0.129000	0.010494	0.692700	1.619400	0.267300	0.503300	0.146700
2009:06	1.404800	0.129000	0.010468	0.687800	1.652000	0.263900	0.515500	0.146500
2009:07	1.406100	0.129000	0.010500	0.692300	1.645000	0.261900	0.530900	0.146600
2009:08	1.430800	0.129000	0.010698	0.693800	1.627500	0.262900	0.546000	0.146600
2009:09	1.459200	0.129000	0.011115	0.705200	1.592200	0.261100	0.559800	0.146700
2009:10	1.480600	0.129000	0.010996	0.715400	1.652600	0.262000	0.575200	0.146700
2009:11	1.499600	0.129100	0.011553	0.720700	1.651400	0.267800	0.573900	0.146500
2009:12	1.433300	0.129000	0.010843	0.711700	1.592800	0.262200	0.576600	0.146700
2010:01	1.386700	0.128800	0.011084	0.710700	1.599200	0.261800	0.540900	0.146700
2010:02	1.363400	0.128800	0.011250	0.711300	1.524200	0.262000	0.560900	0.146700
2010:03	1.345500	0.128800	0.010791	0.715000	1.507200	0.258600	0.558500	0.146700
2010:04	1.323900	0.128800	0.010634	0.730200	1.525600	0.258100	0.575500	0.146700
2010:05	1.227600	0.128400	0.010989	0.710500	1.445300	0.255400	0.550400	0.146400
2010:06	1.220800	0.128500	0.011282	0.715300	1.507100	0.254500	0.558100	0.147300
2010:07	1.304400	0.128800	0.011575	0.734900	1.564400	0.254100	0.569100	0.147800
2010:08	1.270300	0.128600	0.011790	0.738600	1.551400	0.254100	0.571200	0.147200
2010:09	1.361200	0.128900	0.011955	0.759900	1.580900	0.252000	0.587100	0.149700
2010:10	1.395200	0.129000	0.012448	0.773400	1.604400	0.253900	0.588500	0.149900
2010:11	1.319300	0.128800	0.011885	0.758400	1.558700	0.251500	0.579900	0.150300
2010:12	1.325300	0.128500	0.012264	0.774800	1.547100	0.251800	0.600200	0.151700
2011:01	1.361300	0.128400	0.012186	0.778600	1.585800	0.250400	0.594800	0.151900
2011:02	1.375800	0.128300	0.012249	0.785900	1.612100	0.248500	0.602400	0.152400
2011:03	1.409900	0.128400	0.012069	0.792500	1.603400	0.247500	0.608600	0.152700
2011:04	1.484000	0.128700	0.012285	0.816100	1.666700	0.245600	0.633500	0.154000
2011:05	1.428400	0.128500	0.012368	0.810200	1.647500	0.245000	0.627200	0.154400
2011:06	1.439100	0.128500	0.012349	0.809300	1.602000	0.243700	0.638000	0.154700
2011:07	1.440100	0.128300	0.013037	0.830900	1.643100	0.242000	0.645900	0.156100
2011:08	1.446900	0.128300	0.013024	0.829300	1.635200	0.239100	0.628900	0.157000
2011:09	1.359800	0.128300	0.013052	0.772000	1.562800	0.237500	0.547600	0.156500
2011:10	1.415200	0.128800	0.013203	0.805600	1.613300	0.236100	0.592000	0.158100
2011:11	1.333700	0.128300	0.012830	0.770400	1.556000	0.234600	0.540900	0.157000
2011:12	1.295000	0.128700	0.012920	0.770100	1.545600	0.232500	0.536800	0.157400
2012:01	1.315300	0.128900	0.013056	0.795900	1.569700	0.230900	0.573500	0.159100
2012:02	1.343200	0.129000	0.012427	0.798000	1.585000	0.229900	0.587200	0.158800
2012:03	1.333900	0.128800	0.012155	0.795600	1.599000	0.228800	0.549000	0.158400
2012:04	1.325700	0.128900	0.012464	0.809200	1.626900	0.226500	0.530500	0.159100
2012:05	1.244100	0.128800	0.012619	0.779800	1.557800	0.223900	0.500400	0.157800
2012:06	1.257800	0.128900	0.012575	0.786500	1.561700	0.221400	0.481600	0.158500
2012:07	1.227500	0.128900	0.012772	0.801800	1.571000	0.219800	0.494000	0.158400

APPENDIX C1
DATA FOR CHAPTER 1

	ID	MA	ME
Date	IDR2USD	MYR2USD	MXN2USD
1997:07	0.000385	0.379700	0.128000
1997:08	0.000345	0.342100	0.128200
1997:09	0.000307	0.309500	0.128800
1997:10	0.000277	0.293000	0.119800
1997:11	0.000274	0.285700	0.121700
1997:12	0.000184	0.258400	0.124100
1998:01	0.000102	0.238900	0.118100
1998:02	0.000113	0.270600	0.117400
1998:03	0.000117	0.274700	0.117400
1998:04	0.000124	0.268100	0.117800
1998:05	0.000090	0.258600	0.113300
1998:06	0.000068	0.241000	0.111400
1998:07	0.000076	0.242000	0.112200
1998:08	0.000092	0.238700	0.100400
1998:09	0.000094	0.263200	0.098090
1998:10	0.000133	0.263200	0.099700
1998:11	0.000135	0.263200	0.100100
1998:12	0.000127	0.263200	0.101100
1999:01	0.000114	0.263200	0.098430
1999:02	0.000114	0.263200	0.101200
1999:03	0.000116	0.263200	0.105200
1999:04	0.000122	0.263200	0.108000
1999:05	0.000124	0.263200	0.103300
1999:06	0.000146	0.263200	0.105600
1999:07	0.000146	0.263200	0.106400
1999:08	0.000132	0.263200	0.106400
1999:09	0.000120	0.263200	0.107000
1999:10	0.000147	0.263200	0.104200
1999:11	0.000138	0.263200	0.107500
1999:12	0.000142	0.263200	0.105400
2000:01	0.000135	0.263200	0.104200
2000:02	0.000134	0.263200	0.106600
2000:03	0.000133	0.263200	0.107500
2000:04	0.000127	0.263200	0.106500
2000:05	0.000116	0.263200	0.105200
2000:06	0.000115	0.263200	0.101100
2000:07	0.000112	0.263200	0.107100
2000:08	0.000120	0.263200	0.108800
2000:09	0.000113	0.263200	0.105900
2000:10	0.000106	0.263200	0.104200
2000:11	0.000106	0.263200	0.106600
2000:12	0.000104	0.263200	0.103800
2001:01	0.000107	0.263200	0.103400
2001:02	0.000102	0.263200	0.103300
2001:03	0.000096	0.263200	0.105800
2001:04	0.000085	0.263200	0.107900
2001:05	0.000088	0.263200	0.108900
2001:06	0.000088	0.263200	0.110900
2001:07	0.000104	0.263200	0.109200
2001:08	0.000112	0.263200	0.108800
2001:09	0.000104	0.263500	0.105200
2001:10	0.000096	0.263300	0.108400
2001:11	0.000096	0.263300	0.108000
2001:12	0.000096	0.263300	0.109400
2002:01	0.000097	0.263400	0.109600
2002:02	0.000098	0.263300	0.110200
2002:03	0.000102	0.263300	0.111000
2002:04	0.000107	0.263300	0.107000
2002:05	0.000113	0.263300	0.103200
2002:06	0.000117	0.263900	0.100600
2002:07	0.000111	0.263200	0.102900

APPENDIX C1
DATA FOR CHAPTER 1

	ID	MA	ME
Date	IDR2USD	MYR2USD	MXN2USD
2002:08	0.000113	0.263300	0.100900
2002:09	0.000111	0.263300	0.098210
2002:10	0.000110	0.263300	0.098340
2002:11	0.000112	0.263500	0.098580
2002:12	0.000112	0.263300	0.095900
2003:01	0.000113	0.263300	0.091610
2003:02	0.000112	0.263300	0.090880
2003:03	0.000113	0.264200	0.093900
2003:04	0.000117	0.265000	0.097320
2003:05	0.000121	0.263700	0.096990
2003:06	0.000121	0.263600	0.096140
2003:07	0.000117	0.262700	0.095620
2003:08	0.000118	0.263200	0.090410
2003:09	0.000119	0.263600	0.091190
2003:10	0.000117	0.262000	0.090510
2003:11	0.000118	0.263200	0.088010
2003:12	0.000118	0.263800	0.089110
2004:01	0.000119	0.263800	0.090090
2004:02	0.000119	0.264400	0.090460
2004:03	0.000116	0.262900	0.089480
2004:04	0.000115	0.263700	0.087730
2004:05	0.000108	0.263600	0.087750
2004:06	0.000106	0.263400	0.087090
2004:07	0.000110	0.263400	0.087670
2004:08	0.000107	0.263200	0.087700
2004:09	0.000109	0.263300	0.087670
2004:10	0.000111	0.263300	0.086660
2004:11	0.000111	0.263200	0.088990
2004:12	0.000108	0.263700	0.089650
2005:01	0.000109	0.263200	0.089020
2005:02	0.000108	0.263200	0.090290
2005:03	0.000105	0.263200	0.089200
2005:04	0.000105	0.263200	0.090460
2005:05	0.000106	0.263200	0.092040
2005:06	0.000103	0.263200	0.093340
2005:07	0.000102	0.266700	0.094370
2005:08	0.000097	0.265700	0.092410
2005:09	0.000097	0.265400	0.092630
2005:10	0.000100	0.265300	0.092510
2005:11	0.000100	0.264700	0.094480
2005:12	0.000102	0.264400	0.093020
2006:01	0.000107	0.266700	0.095850
2006:02	0.000108	0.270100	0.095560
2006:03	0.000110	0.271300	0.091460
2006:04	0.000114	0.276200	0.090580
2006:05	0.000109	0.276500	0.089230
2006:06	0.000107	0.271800	0.087780
2006:07	0.000111	0.272900	0.092230
2006:08	0.000110	0.272100	0.092050
2006:09	0.000109	0.271300	0.090970
2006:10	0.000110	0.274600	0.093110
2006:11	0.000109	0.276900	0.090780
2006:12	0.000111	0.283500	0.092760
2007:01	0.000110	0.285700	0.090270
2007:02	0.000111	0.286300	0.090080
2007:03	0.000110	0.289400	0.090760
2007:04	0.000111	0.292600	0.091730

APPENDIX C1
DATA FOR CHAPTER 1

	ID	MA	ME
Date	IDR2USD	MYR2USD	MXN2USD
2007:05	0.000114	0.294100	0.092480
2007:06	0.000110	0.289400	0.092630
2007:07	0.000110	0.289800	0.091120
2007:08	0.000106	0.285400	0.090260
2007:09	0.000110	0.293800	0.091610
2007:10	0.000110	0.299200	0.093330
2007:11	0.000107	0.296800	0.091510
2007:12	0.000107	0.301900	0.091880
2008:01	0.000108	0.309400	0.092240
2008:02	0.000111	0.312500	0.093550
2008:03	0.000109	0.317100	0.093680
2008:04	0.000108	0.317200	0.095330
2008:05	0.000107	0.308800	0.096880
2008:06	0.000109	0.307300	0.097360
2008:07	0.000110	0.306800	0.099580
2008:08	0.000109	0.295800	0.097380
2008:09	0.000105	0.291100	0.092220
2008:10	0.000094	0.283900	0.078440
2008:11	0.000078	0.277600	0.074500
2008:12	0.000091	0.287600	0.073300
2009:01	0.000087	0.277500	0.070180
2009:02	0.000083	0.270400	0.066540
2009:03	0.000087	0.274300	0.069470
2009:04	0.000094	0.278700	0.072770
2009:05	0.000098	0.287200	0.076150
2009:06	0.000097	0.282900	0.075750
2009:07	0.000101	0.283400	0.075590
2009:08	0.000100	0.287700	0.075600
2009:09	0.000103	0.287200	0.073880
2009:10	0.000104	0.293100	0.076510
2009:11	0.000106	0.300900	0.077390
2009:12	0.000106	0.292100	0.076830
2010:01	0.000108	0.293400	0.076480
2010:02	0.000107	0.297200	0.078410
2010:03	0.000110	0.306300	0.080590
2010:04	0.000111	0.313300	0.081490
2010:05	0.000108	0.303600	0.077260
2010:06	0.000110	0.308100	0.077960
2010:07	0.000112	0.314500	0.078790
2010:08	0.000111	0.318600	0.076560
2010:09	0.000113	0.324400	0.080120
2010:10	0.000112	0.323000	0.081140
2010:11	0.000113	0.317600	0.080110
2010:12	0.000113	0.324800	0.080870
2011:01	0.000112	0.327900	0.082080
2011:02	0.000113	0.328000	0.082630
2011:03	0.000115	0.330800	0.083840
2011:04	0.000118	0.338300	0.086740
2011:05	0.000118	0.331300	0.086210
2011:06	0.000116	0.329200	0.084860
2011:07	0.000118	0.337700	0.085380
2011:08	0.000118	0.335600	0.080230
2011:09	0.000112	0.314200	0.073950
2011:10	0.000114	0.326500	0.077030
2011:11	0.000110	0.315900	0.071580
2011:12	0.000112	0.315300	0.071560
2012:01	0.000112	0.328000	0.077120
2012:02	0.000111	0.332400	0.077810
2012:03	0.000109	0.326600	0.078250
2012:04	0.000109	0.328700	0.077230
2012:05	0.000106	0.316800	0.071550
2012:06	0.000106	0.313300	0.074240
2012:07	0.000106	0.319400	0.075460

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2000-01-06	675.440	3030.100	1192.890	5421.530	16107.000	5917.370	6662.900	6750.760
2000-01-13	644.860	3095.800	1201.930	5444.820	17298.000	5539.610	6504.800	6780.960
2000-01-20	655.600	3137.100	1160.600	5355.800	17177.000	5787.440	6658.200	7173.220
2000-01-27	641.470	3083.400	1149.170	5369.100	17081.000	5681.320	6346.300	6992.750
2000-02-03	632.460	3135.100	1102.160	5340.190	17457.000	5731.050	6375.600	7066.600
2000-02-10	660.950	3172.500	1098.330	5789.040	18604.000	6275.720	6185.000	7444.610
2000-02-17	662.680	3144.900	1105.080	5835.150	17979.000	6287.010	6193.300	7611.550
2000-02-24	655.170	3106.900	1085.490	5810.170	17776.000	6062.720	6165.000	7573.780
2000-03-02	662.560	3220.000	1086.470	5528.310	18016.000	6188.640	6198.000	7738.680
2000-03-09	680.510	3196.600	1056.570	5328.790	18650.000	6514.110	6487.500	7960.030
2000-03-16	676.610	3180.200	1112.330	5102.410	17642.000	6510.280	6568.700	7975.950
2000-03-23	672.180	3243.500	1106.100	5115.020	18331.000	6304.280	6558.000	7710.920
2000-03-30	683.480	3194.800	1115.280	5041.080	17647.000	6364.260	6738.500	7932.420
2000-04-06	662.290	3142.400	1114.420	4866.730	17146.000	6286.050	6540.200	7599.390
2000-04-13	671.340	3084.700	1121.580	5172.130	15501.000	6308.040	6569.900	7522.200
2000-04-20	650.540	3041.500	1123.560	4657.420	15203.000	6065.710	6178.100	7214.830
2000-04-27	659.310	3073.100	1142.130	4679.630	15440.000	6320.290	6283.000	7280.510
2000-05-04	661.380	3025.900	1128.010	4553.920	14970.000	6419.720	6327.400	7414.680
2000-05-11	670.270	2966.800	1149.030	4251.360	14499.000	6545.760	6238.800	7530.820
2000-05-18	668.300	3011.900	1138.530	4192.440	14627.000	6449.270	6283.500	7269.280
2000-05-25	652.450	2979.800	1138.800	3999.030	14186.000	6196.050	6045.400	6989.030
2000-06-01	645.910	3047.800	1131.070	4325.470	15450.000	6129.150	6216.900	6839.330
2000-06-08	677.920	3083.400	1165.720	4728.810	16399.000	6673.520	6626.400	7438.950
2000-06-15	673.740	3089.800	1145.020	4653.220	16561.000	6549.050	6443.800	7246.790
2000-06-22	682.450	3123.600	1130.930	4794.160	17254.000	6456.260	6526.000	7252.580
2000-06-29	682.720	3205.500	1126.350	4785.630	16407.000	6545.350	6391.500	6980.410
2000-07-06	672.140	3262.000	1106.310	4885.600	17348.000	6446.540	6312.700	6882.440
2000-07-13	674.980	3265.500	1097.730	4880.800	16444.000	6565.970	6497.500	7044.770
2000-07-20	687.360	3259.400	1108.440	4575.670	17204.000	6619.250	6475.400	7321.940
2000-07-27	678.970	3223.600	1142.590	4281.130	16949.000	6464.120	6378.400	7378.860
2000-08-03	663.720	3235.800	1158.280	4207.630	16721.000	6415.720	6335.700	7128.300
2000-08-10	673.450	3275.000	1178.250	4253.230	16835.000	6461.350	6363.500	7016.590
2000-08-17	684.000	3297.000	1177.050	4294.180	17703.000	6553.000	6384.500	7322.980
2000-08-24	693.750	3330.400	1175.250	4459.070	17311.000	6594.350	6543.700	7232.420
2000-08-31	691.350	3261.700	1163.000	4477.310	17347.000	6595.110	6563.700	7307.170
2000-09-07	695.180	3266.400	1186.810	4628.930	17590.000	6813.660	6795.000	7344.670
2000-09-14	686.480	3294.100	1181.430	4671.920	16769.000	6703.360	6600.700	7261.040
2000-09-21	676.420	3204.900	1166.260	4257.200	16146.000	6614.650	6417.300	6999.540
2000-09-28	652.960	3236.800	1159.440	4067.380	16014.000	6258.580	6205.900	6740.250
2000-10-05	661.520	3260.300	1162.990	4116.250	16362.000	6266.630	6294.200	6798.120
2000-10-12	665.090	3180.400	1112.900	3847.580	15526.000	6258.410	6391.200	6776.390
2000-10-19	642.000	3147.500	1083.420	3702.830	14845.000	6064.210	6209.600	6661.300
2000-10-26	656.120	3190.300	1101.880	3743.610	14223.000	6149.440	6276.300	6615.900
2000-11-02	673.470	3236.000	1126.790	3875.790	14791.000	6268.930	6366.500	6924.680
2000-11-09	687.140	3279.900	1125.730	4022.500	14524.000	6398.920	6385.400	7128.270
2000-11-16	674.500	3251.500	1109.900	3901.900	14490.000	6147.490	6400.200	6851.690
2000-11-23	680.160	3229.700	1099.610	3852.400	14314.000	6161.920	6440.100	6752.290
2000-11-30	660.320	3222.000	1065.810	3997.990	13287.000	6145.650	6327.600	6664.180
2000-12-07	660.330	3252.000	1084.060	4124.910	14460.000	5928.500	6170.400	6512.910
2000-12-14	657.240	3223.100	1074.120	4270.450	15259.000	5939.320	6288.300	6691.250
2000-12-21	624.490	3133.700	1048.370	4034.230	14505.000	5839.540	6175.800	6331.300
2000-12-28	626.870	3180.200	1073.300	3932.780	15259.000	5783.730	6097.500	6251.400
2001-01-04	637.600	3234.300	1063.980	4115.370	16675.000	5926.420	6222.500	6433.610
2001-01-11	635.800	3172.400	1080.980	4027.130	17024.000	5758.020	6198.100	6382.310
2001-01-18	639.860	3232.500	1093.300	4113.210	17521.000	5834.340	6165.500	6490.030
2001-01-25	628.880	3268.200	1086.450	4330.220	17772.000	5845.730	6209.300	6651.530
2001-02-01	632.570	3312.100	1140.380	4286.110	17039.000	5925.620	6294.300	6695.200
2001-02-08	630.980	3277.800	1164.690	4381.190	17243.000	5826.370	6256.400	6638.200
2001-02-15	622.650	3272.200	1171.970	4437.990	16937.000	5712.360	6164.300	6497.070
2001-02-22	617.890	3240.300	1204.710	4262.550	15910.000	5595.130	6088.300	6439.260

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2001-03-01	585.290	3294.900	1196.920	4271.650	16417.000	5322.840	5943.700	6075.340
2001-03-08	590.270	3289.400	1214.680	4056.940	16227.000	5291.920	5858.600	6159.020
2001-03-15	594.890	3188.400	1178.160	3819.860	15061.000	5368.890	5917.300	6204.420
2001-03-22	553.500	3135.800	1124.250	3713.970	14067.000	5104.770	5562.800	5734.490
2001-03-29	529.420	3125.300	1172.370	3751.560	14282.000	4951.130	5402.300	5544.670
2001-04-05	558.360	3164.100	1197.810	3565.650	14443.000	5180.450	5633.700	5829.950
2001-04-12	551.950	3216.100	1191.100	3183.770	14969.000	5139.710	5601.500	5698.880
2001-04-19	569.340	3263.600	1201.510	3574.080	14431.000	5340.980	5761.100	5935.580
2001-04-26	575.340	3253.900	1210.010	3557.190	14757.000	5449.340	5879.800	6127.970
2001-05-03	593.090	3288.800	1202.620	3494.480	15142.000	5575.970	5951.400	6175.240
2001-05-10	579.630	3325.100	1211.980	3568.270	14993.000	5455.550	5870.300	6138.280
2001-05-17	592.260	3344.800	1219.040	3669.760	14794.000	5567.250	5896.800	6141.020
2001-05-24	600.050	3350.500	1197.610	3683.200	14523.000	5638.240	5915.000	6186.870
2001-05-31	589.620	3317.200	1194.810	3631.910	14650.000	5581.940	5889.800	6223.570
2001-06-07	579.910	3367.200	1234.420	3457.240	15464.000	5432.710	5809.600	6125.170
2001-06-14	588.640	3346.200	1244.860	3453.770	15403.000	5439.930	5950.600	6187.210
2001-06-21	557.720	3347.200	1221.760	3405.640	14823.000	5243.840	5723.000	5915.180
2001-06-28	563.540	3358.200	1214.520	3404.860	14391.000	5183.670	5665.700	5941.770
2001-07-05	573.500	3325.300	1209.280	3317.630	14048.000	5225.330	5642.500	6058.380
2001-07-12	562.920	3337.800	1216.220	3452.750	13916.000	4999.360	5479.200	5862.100
2001-07-19	552.530	3339.000	1232.490	3370.930	13762.000	5025.240	5537.000	5928.010
2001-07-26	537.420	3231.900	1235.310	3259.030	13810.000	4880.700	5387.100	5764.060
2001-08-02	535.430	3346.100	1224.540	3298.780	13823.000	4967.150	5403.100	5754.860
2001-08-09	542.750	3358.200	1207.560	3319.610	13834.000	5031.290	5547.600	5735.880
2001-08-16	530.090	3273.500	1214.030	3337.910	13509.000	4846.020	5427.200	5433.490
2001-08-23	522.620	3264.200	1209.650	3308.790	12751.000	4777.370	5342.100	5222.120
2001-08-30	538.770	3264.900	1200.060	3286.870	12892.000	4916.560	5471.900	5387.500
2001-09-06	523.630	3208.400	1194.630	3202.550	12255.000	4689.340	5345.000	5188.170
2001-09-13	486.040	3069.400	1146.860	2987.500	10306.000	4413.510	5070.300	4730.670
2001-09-20	426.500	2924.900	1094.540	2761.660	10543.000	3909.490	4755.700	4115.980
2001-09-27	396.230	2941.600	1084.550	2715.500	10405.000	3652.870	4433.700	3787.230
2001-10-04	453.870	3067.500	1096.970	2788.970	10062.000	4079.020	4903.400	4308.150
2001-10-11	457.090	3133.100	1065.810	2943.690	10785.000	4164.760	5036.000	4487.690
2001-10-18	473.120	3134.100	1093.310	2981.330	10995.000	4336.880	5145.500	4625.130
2001-10-25	445.560	3189.100	1028.650	3022.160	11724.000	4264.890	5017.700	4513.530
2001-11-01	472.810	3185.700	1033.790	3049.800	11388.000	4478.630	5188.600	4820.260
2001-11-08	468.150	3205.300	1052.880	3059.970	12554.000	4369.400	5129.500	4583.310
2001-11-15	488.860	3276.000	1079.200	3180.230	12826.000	4514.280	5244.200	4910.070
2001-11-22	504.650	3262.400	1091.790	3258.130	13019.000	4587.300	5291.000	5062.640
2001-11-29	506.610	3267.500	1103.650	3287.560	12736.000	4573.820	5293.200	5150.970
2001-12-06	492.670	3293.100	1131.020	3431.570	13539.000	4476.060	5203.600	4989.910
2001-12-13	504.780	3259.000	1137.080	3388.590	13148.000	4642.940	5264.700	5199.030
2001-12-20	475.570	3286.100	1108.520	3271.640	12918.000	4340.020	5061.000	4909.420
2001-12-27	495.840	3354.700	1146.530	3131.780	13756.000	4499.340	5159.200	5019.010
2002-01-03	506.780	3358.500	1142.810	3308.020	14265.000	4624.580	5242.400	5160.100
2002-01-10	499.560	3351.800	1118.020	3381.960	13570.000	4682.790	5323.800	5318.730
2002-01-17	498.520	3336.200	1136.820	3401.150	13337.000	4554.690	5198.600	5209.970
2002-01-24	493.500	3371.900	1159.480	3357.790	13162.000	4448.850	5126.800	5122.230
2002-01-31	503.360	3404.000	1165.900	3311.030	12721.000	4484.310	5193.000	5156.630
2002-02-07	501.370	3358.800	1204.390	3436.940	12684.000	4455.560	5189.700	5097.060
2002-02-14	481.950	3424.400	1228.500	3557.060	13245.000	4299.040	5128.100	4835.950
2002-02-21	498.100	3379.700	1238.460	3570.460	13530.000	4377.000	5182.500	4862.600
2002-02-28	478.340	3358.600	1211.880	3562.310	14033.000	4245.200	5050.800	4745.580
2002-03-07	499.000	3440.000	1225.520	3690.270	13726.000	4486.420	5169.000	5097.410
2002-03-14	519.070	3398.000	1228.520	3580.830	14117.000	4629.110	5285.700	5359.550
2002-03-21	517.570	3383.900	1238.100	3536.260	13717.000	4588.330	5292.700	5401.110
2002-03-28	523.350	3363.300	1289.160	3469.350	13255.000	4601.570	5250.500	5366.130
2002-04-04	528.600	3322.900	1287.850	3512.550	13360.000	4627.330	5251.400	5311.080
2002-04-11	517.150	3319.800	1315.770	3497.670	13411.000	4515.700	5233.600	5260.530
2002-04-18	511.650	3356.000	1332.420	3420.940	13573.000	4468.290	5161.000	5189.650

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2002-04-25	528.230	3324.100	1314.500	3359.640	13273.000	4606.420	5243.600	5284.550
2002-05-02	509.260	3311.300	1357.160	3372.560	12538.000	4453.080	5159.000	5000.380
2002-05-09	495.740	3285.500	1342.010	3462.010	12102.000	4354.920	5203.100	4882.770
2002-05-16	490.520	3343.200	1331.570	3355.610	12660.000	4329.840	5171.200	4871.700
2002-05-23	498.160	3324.800	1327.630	3114.050	12556.000	4442.940	5218.000	5036.410
2002-05-30	492.160	3338.500	1318.890	3135.890	12985.000	4337.430	5169.100	4899.130
2002-06-06	484.550	3298.800	1296.550	3259.310	12113.000	4274.640	5085.100	4818.300
2002-06-13	454.140	3264.700	1263.440	3311.160	11962.000	4020.270	4920.400	4610.180
2002-06-20	429.950	3230.700	1241.500	3264.020	10909.000	3843.070	4630.800	4303.850
2002-06-27	423.160	3160.900	1245.570	3217.150	11013.000	3799.530	4605.300	4232.400
2002-07-04	439.660	3156.600	1227.370	3316.770	10655.000	3897.990	4656.400	4382.560
2002-07-11	437.360	3142.100	1217.320	3290.560	10806.000	3863.280	4615.600	4483.030
2002-07-18	391.010	3099.500	1221.410	3245.740	10813.000	3513.340	4224.100	4130.800
2002-07-25	368.310	2990.600	1145.050	3094.960	9666.000	3324.040	4098.300	3891.880
2002-08-01	336.070	3024.100	1138.460	2975.810	9760.000	3172.560	4016.600	3579.000
2002-08-08	336.210	3024.200	1127.160	2950.090	10316.000	3245.370	4075.500	3532.490
2002-08-15	361.630	3076.800	1131.830	3020.700	9183.000	3447.940	4322.400	3760.860
2002-08-22	369.110	3143.000	1132.860	3080.700	9703.000	3374.090	4330.000	3684.690
2002-08-29	390.320	3082.800	1114.270	3114.160	10455.000	3526.090	4389.800	3828.260
2002-09-05	371.590	3065.800	1116.510	3181.470	9723.000	3366.210	4227.300	3712.940
2002-09-12	356.110	3090.900	1115.980	3131.340	10173.000	3246.670	4107.200	3485.680
2002-09-19	339.450	3044.100	1082.430	3040.300	9372.000	3156.170	4008.000	3361.280
2002-09-26	308.020	2945.800	1067.420	3014.690	9199.000	2890.820	3860.100	3065.730
2002-10-03	315.740	2951.800	1065.280	2938.060	9140.000	2950.520	3907.200	2918.900
2002-10-10	305.880	2855.500	1003.720	2969.490	8866.000	2765.900	3813.800	2714.620
2002-10-17	317.750	2946.600	1052.310	3006.140	8902.000	2902.270	3953.400	2930.740
2002-10-24	345.340	2978.800	1055.850	2908.050	9799.000	3156.990	4130.500	3163.670
2002-10-31	330.530	2995.000	1082.800	2949.320	10168.000	3056.880	4051.100	3102.010
2002-11-07	339.110	3001.900	1098.070	2975.260	9799.000	3109.510	3997.000	3165.160
2002-11-14	330.230	2922.200	1096.560	2986.560	9884.000	3058.180	4034.600	3079.100
2002-11-21	338.170	2984.800	1097.160	3101.360	10289.000	3162.390	4091.600	3191.760
2002-11-28	357.560	3007.200	1101.060	3220.750	10239.000	3305.780	4175.200	3320.880
2002-12-05	361.990	3004.000	1126.920	3229.730	10413.000	3326.650	4169.400	3320.320
2002-12-12	338.470	2955.700	1130.440	3324.480	10587.000	3185.770	4013.500	3207.530
2002-12-19	322.750	2959.200	1130.720	3333.860	11208.000	3076.850	3878.100	3077.060
2002-12-24	325.240	2998.800	1158.780	3382.640	11318.000	3082.850	3889.900	3024.220
2003-01-02	317.860	2996.200	1148.710	3365.060	11603.000	3011.830	3829.400	2840.000
2003-01-09	335.340	3035.600	1161.080	3384.200	11912.000	3187.880	4004.900	3092.940
2003-01-16	333.130	3030.300	1181.450	3373.520	11952.000	3160.130	3974.100	3037.330
2003-01-23	318.590	2997.800	1167.080	3328.180	11162.000	3056.930	3820.600	2918.820
2003-01-30	295.840	2943.000	1147.620	3219.880	10751.000	2898.600	3603.700	2717.820
2003-02-06	294.940	2868.200	1175.760	3305.440	10566.000	2937.880	3567.400	2747.830
2003-02-13	279.220	2820.500	1147.130	3247.510	10108.000	2796.660	3599.200	2569.340
2003-02-20	284.330	2806.500	1146.010	3303.220	10217.000	2827.750	3611.900	2674.460
2003-02-27	282.900	2774.700	1153.690	3277.340	10126.000	2829.830	3727.100	2648.870
2003-03-06	266.210	2747.000	1159.720	3190.350	10615.000	2754.070	3655.600	2547.050
2003-03-13	236.200	2673.300	1128.170	3108.240	10783.000	2574.910	3491.600	2431.660
2003-03-20	257.330	2835.800	1143.930	3192.930	11159.000	2740.010	3601.800	2403.190
2003-03-27	278.090	2855.000	1166.620	3116.790	11233.000	2890.680	3861.100	2715.060
2003-04-03	262.120	2874.100	1183.090	3151.160	12006.000	2733.000	3708.500	2520.840
2003-04-10	270.530	2904.700	1197.590	3035.330	11591.000	2837.960	3814.400	2654.070
2003-04-17	276.220	2917.000	1177.540	2984.500	12395.000	2838.140	3808.100	2733.950
2003-04-24	287.660	2961.700	1204.110	2937.230	12120.000	2914.600	3917.700	2960.960
2003-05-01	278.300	2965.600	1229.160	2959.790	12557.000	2866.740	3870.200	2838.230
2003-05-08	279.330	2927.500	1288.610	2961.600	12921.000	2963.120	3952.600	2986.000
2003-05-15	282.040	2931.000	1324.900	3012.970	13130.000	2967.890	3969.400	2956.590
2003-05-22	287.830	2935.700	1310.610	3040.790	13101.000	2994.870	4049.000	2989.080
2003-05-29	270.420	2983.600	1284.970	3164.250	13405.000	2897.160	3979.800	2822.830
2003-06-05	280.570	3008.000	1294.570	3262.200	13780.000	2991.750	4048.100	2982.680
2003-06-12	299.590	3050.200	1288.810	3337.300	13983.000	3093.210	4150.800	3127.460

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2003-06-19	296.180	3070.900	1306.460	3454.600	13511.000	3108.940	4134.100	3168.710
2003-06-26	303.400	2997.000	1306.360	3552.400	13112.000	3190.110	4160.100	3238.980
2003-07-03	298.020	3017.100	1324.190	3639.890	13134.000	3109.020	4067.800	3224.660
2003-07-10	292.630	3022.700	1321.300	3679.630	13501.000	3072.400	4021.500	3239.610
2003-07-17	303.210	3067.500	1342.390	3668.910	13622.000	3138.270	4058.100	3326.510
2003-07-24	309.410	3073.000	1332.050	3668.070	13761.000	3129.210	4073.200	3366.710
2003-07-31	308.040	3106.700	1321.260	3792.610	13572.000	3109.320	4131.200	3356.890
2003-08-07	314.740	3124.500	1320.330	3806.830	13328.000	3169.630	4098.400	3438.890
2003-08-14	312.350	3143.200	1328.570	3921.200	13812.000	3165.490	4147.800	3332.240
2003-08-21	322.990	3169.900	1351.590	4095.390	14670.000	3279.210	4247.300	3443.930
2003-08-28	334.150	3196.900	1358.660	4212.290	15065.000	3328.990	4225.900	3549.050
2003-09-04	329.410	3233.800	1370.080	4310.510	15705.000	3311.420	4161.100	3484.580
2003-09-11	339.230	3197.100	1382.380	4393.130	16292.000	3392.750	4257.200	3607.710
2003-09-18	328.270	3225.000	1360.010	4134.150	16889.000	3322.560	4237.800	3508.060
2003-09-25	334.820	3180.200	1340.090	4297.150	15806.000	3373.640	4257.000	3578.700
2003-10-02	313.980	3203.400	1353.230	4455.080	16894.000	3216.760	4157.100	3324.850
2003-10-09	323.510	3256.900	1376.410	4698.680	17708.000	3296.360	4274.000	3419.000
2003-10-16	323.130	3302.300	1410.230	4887.320	17955.000	3306.120	4311.000	3471.250
2003-10-23	330.060	3274.100	1386.310	4648.410	17690.000	3353.720	4344.000	3516.670
2003-10-30	316.430	3284.600	1418.920	4780.520	18094.000	3266.270	4239.000	3452.640
2003-11-06	330.220	3257.900	1431.940	5047.540	18613.000	3373.200	4287.600	3655.990
2003-11-13	342.990	3230.300	1445.860	4949.160	18755.000	3453.130	4376.900	3782.560
2003-11-20	338.840	3192.700	1446.030	4771.230	19199.000	3448.600	4397.000	3797.400
2003-11-27	325.100	3194.300	1479.720	4989.040	19961.000	3366.120	4319.000	3642.250
2003-12-04	332.190	3231.900	1507.420	5225.900	20414.000	3424.790	4342.600	3745.950
2003-12-11	334.640	3193.700	1501.050	5299.960	21296.000	3457.140	4367.000	3841.730
2003-12-18	329.920	3229.500	1509.250	5455.000	21489.000	3470.600	4347.600	3860.130
2003-12-24	331.650	3271.000	1546.160	5641.920	21688.000	3502.040	4412.300	3898.420
2003-12-31	334.530	3306.000	1545.150	5838.960	22236.000	3520.790	4457.500	3952.720
2004-01-08	342.760	3304.600	1631.790	6108.540	23717.000	3596.800	4510.200	4018.500
2004-01-15	343.520	3312.600	1690.700	6063.910	22962.000	3574.800	4466.300	4016.180
2004-01-22	357.550	3339.400	1729.880	5593.740	22969.000	3671.800	4487.900	4111.640
2004-01-29	357.130	3276.600	1726.260	5802.750	22386.000	3693.360	4460.800	4151.830
2004-02-05	353.310	3274.900	1740.930	5720.630	21092.000	3638.440	4390.700	4058.600
2004-02-12	351.350	3339.900	1778.660	5936.960	23063.000	3624.720	4402.700	4044.990
2004-02-19	355.640	3366.900	1791.840	5855.100	20951.000	3649.340	4412.000	4057.050
2004-02-26	362.370	3358.100	1792.730	5567.120	21450.000	3733.280	4515.000	4073.350
2004-03-04	356.590	3399.700	1846.550	5815.870	22393.000	3725.440	4492.200	4018.160
2004-03-11	359.930	3411.900	1819.440	5649.860	20763.000	3761.110	4547.100	4126.140
2004-03-18	345.990	3424.600	1812.310	5414.940	22370.000	3661.780	4467.400	3915.380
2004-03-25	336.240	3395.700	1850.050	5414.440	21000.000	3613.280	4417.700	3819.150
2004-04-01	335.240	3443.900	1897.210	5740.850	22647.000	3592.390	4357.500	3822.330
2004-04-08	350.520	3456.600	1966.300	5838.450	22725.000	3739.910	4465.600	4007.600
2004-04-15	353.340	3425.700	1960.440	5843.970	21739.000	3774.690	4515.800	4071.420
2004-04-22	352.760	3441.900	1946.680	5924.180	21142.000	3751.590	4537.300	4033.980
2004-04-29	356.620	3407.800	1941.220	5668.430	19865.000	3811.430	4570.000	4103.620
2004-05-06	341.410	3406.500	1916.950	5757.300	19190.000	3674.280	4489.700	3985.210
2004-05-13	337.970	3376.200	1847.560	5399.470	18402.000	3653.180	4498.400	3895.640
2004-05-20	327.390	3378.900	1833.220	4932.110	18240.000	3603.260	4441.800	3803.100
2004-05-27	330.490	3441.200	1855.650	5058.550	19734.000	3607.020	4431.400	3831.840
2004-06-03	336.950	3465.600	1849.750	4817.990	19400.000	3652.030	4430.700	3902.720
2004-06-10	339.080	3469.100	1869.800	4944.640	19865.000	3698.870	4454.400	3961.930
2004-06-17	341.360	3506.800	1937.530	4839.880	20335.000	3699.380	4484.000	4014.560
2004-06-24	343.380	3524.800	1964.130	4708.550	20708.000	3740.900	4505.800	3999.790
2004-06-30	343.430	3534.000	1992.560	4874.050	21349.000	3742.380	4494.100	4013.350
2004-07-08	341.830	3562.800	2005.710	4843.840	20887.000	3685.060	4407.400	3998.770
2004-07-15	335.940	3527.700	2003.110	4888.190	22065.000	3668.480	4393.200	3924.490
2004-07-22	328.770	3505.500	1972.380	5054.290	21730.000	3610.400	4339.200	3845.930
2004-07-29	324.680	3512.600	2026.150	5120.450	22228.000	3567.290	4326.300	3797.330
2004-08-05	329.910	3546.200	2031.760	5252.780	21330.000	3647.100	4413.100	3895.610

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2004-08-12	315.740	3495.700	2006.290	5139.770	21570.000	3528.640	4337.900	3727.740
2004-08-19	310.680	3498.300	1960.480	5123.650	22935.000	3484.840	4301.500	3646.990
2004-08-26	316.500	3537.900	1988.400	5135.450	22582.000	3538.020	4369.200	3712.610
2004-09-02	326.310	3594.700	2009.430	5198.720	22688.000	3649.240	4490.100	3851.180
2004-09-09	328.750	3598.400	2008.820	5298.230	22286.000	3665.940	4550.800	3866.990
2004-09-16	329.720	3636.700	1995.990	5477.680	22876.000	3677.610	4545.000	3886.030
2004-09-23	334.900	3645.900	2039.340	5539.480	22944.000	3726.220	4591.000	3988.070
2004-09-30	325.910	3674.700	2042.870	5583.610	23245.000	3673.510	4578.100	3910.300
2004-10-07	330.870	3710.500	2117.360	5773.660	24104.000	3730.160	4659.600	3994.960
2004-10-14	334.910	3719.900	2084.720	5713.100	22959.000	3737.870	4698.900	4015.540
2004-10-21	327.940	3715.700	2099.900	5641.060	23059.000	3670.760	4622.700	3922.110
2004-10-28	327.030	3784.000	2114.180	5715.620	22929.000	3687.170	4615.400	3935.140
2004-11-04	330.480	3849.800	2180.120	5832.880	23880.000	3706.820	4624.200	3960.250
2004-11-10	336.360	3873.600	2210.300	5954.310	23521.000	3780.990	4739.800	4063.580
2004-11-18	343.610	3893.400	2240.380	6025.470	24143.000	3835.110	4793.900	4143.350
2004-11-25	339.440	3914.800	2279.240	6035.030	24867.000	3798.780	4760.800	4134.890
2004-12-02	340.200	3955.100	2338.530	6328.430	25200.000	3782.200	4741.500	4154.270
2004-12-09	343.480	3898.900	2338.810	6304.270	24526.000	3783.510	4747.900	4208.870
2004-12-16	341.800	3982.300	2389.970	6420.380	25831.000	3768.420	4694.000	4174.550
2004-12-23	343.490	4029.400	2416.300	6441.850	25878.000	3744.920	4696.800	4182.270
2004-12-30	348.070	4057.000	2431.380	6522.540	26196.000	3822.760	4798.100	4235.360
2005-01-06	348.080	4033.300	2446.960	6367.390	24367.000	3821.160	4814.300	4291.530
2005-01-13	354.460	4069.100	2415.010	6221.060	24806.000	3877.960	4854.100	4316.400
2005-01-20	352.730	4038.500	2429.170	6183.240	23610.000	3854.600	4820.800	4232.360
2005-01-27	353.550	4101.200	2506.920	6239.430	24030.000	3854.190	4803.300	4213.700
2005-02-03	357.020	4146.300	2527.500	6619.970	24874.000	3870.350	4832.800	4201.810
2005-02-10	367.320	4160.000	2569.830	6577.830	26416.000	3958.010	4941.500	4339.280
2005-02-17	371.050	4155.000	2638.690	6589.290	27091.000	4016.750	5044.200	4387.800
2005-02-24	375.470	4086.700	2619.540	6574.210	28436.000	4029.020	5057.200	4359.470
2005-03-03	374.560	4185.800	2723.980	6784.720	28668.000	4034.570	5006.800	4348.640
2005-03-10	378.650	4199.200	2714.010	6907.650	28567.000	4091.580	5036.300	4423.520
2005-03-17	372.150	4217.300	2655.570	6669.520	28086.000	4049.180	4982.000	4360.490
2005-03-24	369.840	4131.600	2615.440	6442.870	26702.000	4050.770	4923.300	4327.180
2005-03-31	371.470	4100.600	2632.900	6492.820	26611.000	4081.650	4919.000	4351.890
2005-04-07	368.200	4112.400	2700.800	6545.640	26308.000	4080.080	4914.000	4373.530
2005-04-14	373.610	4063.300	2705.330	6467.920	24984.000	4124.290	4983.600	4400.680
2005-04-21	364.260	3988.600	2614.160	6299.200	25062.000	4032.280	4891.600	4312.250
2005-04-28	356.180	3975.300	2577.080	6284.200	24440.000	3980.180	4849.300	4223.040
2005-05-05	348.200	3915.000	2550.830	6359.650	25436.000	3911.710	4801.700	4184.840
2005-05-12	356.650	3979.200	2603.750	6456.820	24117.000	4033.460	4918.900	4311.060
2005-05-19	355.510	3993.700	2632.330	6478.940	24829.000	4017.890	4886.500	4275.700
2005-05-26	363.880	4050.400	2692.540	6670.780	24478.000	4096.180	4971.800	4360.680
2005-06-02	366.940	4136.400	2832.260	6655.560	26640.000	4131.830	4986.300	4444.710
2005-06-09	371.520	4168.900	2870.840	6832.530	24484.000	4162.470	4999.400	4510.390
2005-06-16	376.090	4221.300	2985.850	6900.410	25751.000	4184.100	5030.400	4586.100
2005-06-23	380.270	4225.600	2993.660	7119.760	24816.000	4220.910	5077.600	4604.570
2005-06-30	379.970	4229.900	3049.910	7193.850	25051.000	4199.870	5079.000	4566.480
2005-07-07	388.260	4197.600	3065.250	7145.130	24450.000	4269.620	5161.000	4617.070
2005-07-14	388.600	4257.700	3092.430	7187.700	25920.000	4300.310	5232.200	4597.970
2005-07-21	393.680	4302.700	3056.370	7304.320	25842.000	4373.770	5230.800	4712.900
2005-07-28	394.300	4329.100	3106.150	7605.030	26068.000	4415.520	5241.800	4836.900
2005-08-04	395.770	4328.500	3203.680	7797.080	26470.000	4451.740	5282.300	4886.500
2005-08-11	391.310	4423.900	3238.770	7816.510	26633.000	4421.700	5314.700	4827.180
2005-08-18	396.060	4410.200	3154.650	7811.330	26900.000	4476.480	5345.800	4937.330
2005-08-25	393.970	4393.600	3236.560	7660.420	27402.000	4487.900	5312.600	4929.910
2005-09-01	385.150	4460.100	3311.130	7876.150	27962.000	4342.700	5228.100	4783.800
2005-09-08	389.310	4439.800	3335.210	8052.560	28828.000	4404.950	5326.800	4837.810
2005-09-15	394.910	4466.400	3398.410	8283.760	29366.000	4491.680	5359.300	5005.930
2005-09-22	398.100	4511.500	3387.880	8221.640	30678.000	4509.490	5407.900	4986.500
2005-09-29	394.330	4617.400	3423.850	8650.170	31209.000	4477.200	5413.600	4882.580

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2005-10-06	402.990	4401.800	3353.110	8528.700	29227.000	4600.020	5477.700	5044.120
2005-10-13	398.660	4394.900	3242.160	8376.900	29880.000	4528.790	5362.300	5007.770
2005-10-20	394.310	4345.100	3153.980	7935.120	28344.000	4482.130	5275.000	4975.560
2005-10-27	386.080	4389.200	3190.780	7798.490	29133.000	4366.520	5142.100	4838.400
2005-11-03	385.950	4460.900	3333.920	8072.750	31100.000	4326.710	5213.400	4825.640
2005-11-10	399.530	4492.300	3331.970	8308.930	30725.000	4498.700	5423.600	4995.240
2005-11-17	410.820	4570.100	3392.850	8649.520	31087.000	4536.490	5465.100	5090.750
2005-11-24	416.240	4594.900	3474.450	8744.040	31945.000	4556.230	5498.900	5123.500
2005-12-01	418.300	4532.300	3547.110	8944.780	32617.000	4600.480	5523.800	5194.270
2005-12-08	429.480	4531.600	3617.440	8906.310	32480.000	4662.500	5528.100	5307.990
2005-12-15	431.130	4575.400	3577.870	9170.400	33193.000	4661.010	5517.400	5282.130
2005-12-22	436.170	4652.000	3625.150	9372.300	33513.000	4704.410	5531.600	5353.660
2005-12-29	439.160	4715.200	3667.030	9323.250	33456.000	4757.740	5595.400	5419.050
2006-01-05	436.780	4757.900	3772.480	9617.740	34936.000	4715.230	5618.800	5408.260
2006-01-12	446.110	4781.700	3830.250	9380.880	35779.000	4867.150	5731.800	5536.320
2006-01-19	441.370	4790.900	3832.030	9449.840	36858.000	4850.530	5711.000	5483.090
2006-01-26	432.200	4812.000	3896.130	9685.740	38014.000	4773.480	5672.400	5349.020
2006-02-02	449.670	4855.400	3982.260	9843.870	37304.000	4956.600	5786.800	5647.420
2006-02-09	451.270	4820.200	4032.570	10044.820	36882.000	4937.560	5759.300	5657.120
2006-02-16	456.260	4766.900	4064.140	10124.300	38256.000	4910.820	5764.100	5701.470
2006-02-23	463.600	4867.300	4146.620	10244.050	38405.000	5000.000	5846.200	5795.480
2006-03-02	464.570	4864.400	4009.720	10626.780	39126.000	5073.950	5860.500	5870.790
2006-03-09	455.250	4855.400	3935.440	10573.540	36312.000	4989.150	5858.700	5721.460
2006-03-16	458.590	4936.700	4046.670	10878.740	38157.000	5069.270	5907.900	5804.920
2006-03-23	464.050	4995.600	4093.330	10840.590	37474.000	5141.080	5999.400	5882.380
2006-03-30	472.070	5071.600	4105.500	11307.040	37777.000	5218.710	6036.300	5973.140
2006-04-06	468.690	5190.300	4153.780	11746.900	39285.000	5220.850	5964.600	5970.080
2006-04-13	468.680	5132.300	4129.960	11237.230	38082.000	5174.960	6026.100	5952.920
2006-04-20	462.730	5225.800	4249.120	12039.550	39775.000	5095.970	6044.100	5902.580
2006-04-27	478.000	5246.900	4226.780	11835.020	39751.000	5252.380	6132.700	6094.750
2006-05-04	469.400	5146.700	4264.680	12347.630	40976.000	5188.400	6023.100	6009.890
2006-05-11	471.720	5318.200	4319.110	12435.410	40847.000	5286.400	6091.700	6113.290
2006-05-18	455.090	5076.200	3830.190	11391.430	37807.000	5150.450	5912.100	5916.280
2006-05-25	438.980	4939.400	3655.130	10666.320	37569.000	4944.570	5657.400	5672.280
2006-06-01	446.280	5026.100	3794.270	10071.420	37748.000	5045.090	5791.000	5788.360
2006-06-08	438.900	4878.500	3520.250	9295.810	35438.000	4959.700	5764.600	5687.040
2006-06-15	426.470	4835.500	3365.290	9545.060	32941.000	4768.180	5655.200	5464.080
2006-06-22	420.520	4968.100	3532.980	10275.880	34317.000	4694.890	5597.400	5376.010
2006-06-29	429.140	4957.900	3619.630	10162.160	36487.000	4817.630	5692.100	5529.740
2006-07-06	440.250	5078.100	3845.500	10767.970	36533.000	4965.960	5833.400	5683.310
2006-07-13	440.700	5054.700	3711.300	10858.500	35354.000	4953.710	5888.900	5681.850
2006-07-20	428.330	4967.400	3639.950	10352.940	35847.000	4780.790	5707.600	5422.220
2006-07-27	436.300	4976.500	3700.480	10741.590	36888.000	4818.550	5719.700	5451.010
2006-08-03	456.220	4966.200	3710.560	10923.160	37451.000	5028.510	5974.900	5705.420
2006-08-10	455.800	4922.200	3706.470	11149.170	37354.000	5040.950	5889.400	5723.030
2006-08-17	451.760	5017.200	3760.930	11477.480	37559.000	4985.520	5820.100	5628.370
2006-08-24	463.920	4963.000	3694.960	11531.950	35797.000	5135.690	5903.400	5817.020
2006-08-31	465.140	5079.800	3735.640	11699.050	36232.000	5111.130	5878.600	5811.470
2006-09-07	470.930	5075.800	3684.760	11853.850	36710.000	5183.450	5949.100	5876.540
2006-09-14	464.470	5029.000	3729.290	11973.020	36154.000	5073.570	5879.300	5795.260
2006-09-21	474.850	4959.400	3717.310	12274.270	34830.000	5144.880	5877.000	5937.870
2006-09-28	472.990	5075.500	3859.140	12380.740	36486.000	5141.950	5822.300	5883.320
2006-10-05	483.620	5174.800	3836.710	12389.410	37977.000	5250.010	5960.800	6004.330
2006-10-12	486.210	5223.900	3951.890	12537.980	38322.000	5282.060	6001.200	6085.820
2006-10-19	492.680	5256.900	4029.890	12723.590	38920.000	5353.230	6157.300	6173.680
2006-10-26	489.300	5360.600	4116.960	12698.410	39645.000	5375.350	6155.200	6202.820
2006-11-02	489.990	5377.100	4090.170	13091.120	39930.000	5396.030	6160.900	6262.540
2006-11-09	487.940	5398.600	4127.390	13137.490	40815.000	5336.300	6148.100	6241.150
2006-11-16	492.960	5363.900	4150.960	13505.890	41162.000	5447.500	6208.400	6357.770
2006-11-23	492.620	5441.600	4116.220	13680.830	42070.000	5439.710	6192.000	6412.360

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2006-11-30	484.910	5461.600	4093.260	13696.310	41932.000	5389.460	6122.100	6411.960
2006-12-07	473.320	5450.600	4308.500	13972.030	42909.000	5254.050	6021.500	6241.130
2006-12-14	476.530	5550.900	4375.520	13487.160	43755.000	5384.160	6152.400	6427.410
2006-12-21	495.110	5561.700	4426.120	13384.860	43385.000	5541.620	6260.000	6588.830
2006-12-28	490.770	5634.000	4463.470	13846.340	44474.000	5453.940	6190.000	6503.130
2007-01-04	495.340	5563.900	4515.170	13871.710	44020.000	5541.760	6220.800	6596.920
2007-01-11	494.050	5542.700	4372.340	13630.710	42670.000	5517.350	6220.100	6593.090
2007-01-18	502.840	5650.800	4356.790	14217.750	42478.000	5617.620	6239.000	6705.170
2007-01-25	507.120	5753.300	4492.620	14282.720	44687.000	5614.700	6237.200	6747.170
2007-02-01	499.800	5796.800	4566.100	14267.180	44815.000	5582.300	6228.000	6690.340
2007-02-08	506.780	5872.900	4547.440	14652.090	44892.000	5677.300	6310.900	6885.760
2007-02-15	507.300	5969.100	4596.710	14355.550	45955.000	5692.450	6382.800	6911.110
2007-02-22	506.100	5991.100	4569.490	14021.310	46452.000	5713.590	6419.500	6957.070
2007-03-01	510.610	5798.300	4303.360	13159.550	43517.000	5716.380	6401.500	6992.580
2007-03-08	480.200	5799.600	4498.950	13049.350	43466.000	5424.700	6116.200	6603.320
2007-03-15	490.350	5831.800	4429.460	12543.850	43278.000	5537.840	6245.200	6716.520
2007-03-22	482.140	5935.400	4633.750	13308.030	45424.000	5382.160	6130.600	6579.870
2007-03-29	513.840	5945.700	4640.310	12979.660	45355.000	5634.750	6339.400	6899.060
2007-04-05	510.500	6063.400	4683.870	12856.080	46647.000	5634.160	6308.000	6917.030
2007-04-12	524.090	6142.800	4672.630	13113.810	47347.000	5766.270	6417.800	7166.670
2007-04-19	523.680	6148.300	4669.310	13619.700	48762.000	5789.340	6462.400	7212.070
2007-04-26	536.360	6197.800	4823.740	14228.880	49068.000	5938.900	6486.800	7342.540
2007-05-03	530.490	6236.900	4732.260	14078.210	50218.000	5930.770	6418.700	7378.120
2007-05-10	539.640	6351.800	4679.090	13771.230	50235.000	6068.830	6603.700	7516.760
2007-05-17	531.200	6370.100	4767.250	14299.710	51631.000	6050.630	6565.700	7479.340
2007-05-24	536.690	6298.600	4867.770	14218.110	50531.000	6101.140	6640.900	7607.540
2007-05-31	535.480	6341.800	4885.380	14544.460	52268.000	6057.490	6570.500	7739.200
2007-06-07	543.930	6338.200	4780.610	14186.180	52049.000	6168.150	6676.700	7987.850
2007-06-14	534.690	6288.400	4907.400	14203.720	53713.000	5883.290	6505.100	7590.500
2007-06-21	551.910	6411.900	4903.170	14499.240	54657.000	6105.280	6732.400	8030.640
2007-06-28	548.750	6297.400	4817.050	14504.570	54147.000	6023.250	6567.400	7949.630
2007-07-05	548.210	6392.200	4933.570	14861.890	55932.000	6054.930	6607.900	8007.320
2007-07-12	555.000	6400.100	4918.180	15092.040	57613.000	6102.690	6690.100	8048.320
2007-07-19	560.930	6419.000	4888.060	15550.130	58125.000	6117.960	6716.700	8092.770
2007-07-26	555.020	6301.400	4628.000	15776.310	53893.000	5957.160	6585.200	7874.850
2007-08-02	526.690	6050.300	4674.630	14985.700	54691.000	5643.960	6215.200	7451.680
2007-08-09	521.520	6187.700	4591.480	15100.150	53431.000	5597.890	6224.300	7435.670
2007-08-16	502.040	5712.200	4297.280	14358.210	48016.000	5448.630	6038.300	7343.260
2007-08-23	499.000	6149.700	4484.260	14163.980	51848.000	5363.630	6064.200	7378.290
2007-08-30	518.100	6138.000	4513.480	15121.740	52858.000	5569.380	6220.100	7507.270
2007-09-06	522.730	6265.300	4567.910	15616.310	54569.000	5662.700	6303.300	7638.170
2007-09-13	517.430	6244.600	4512.380	15614.440	54908.000	5430.100	6191.200	7436.630
2007-09-20	528.360	6400.900	4592.540	16347.950	56906.000	5538.920	6289.300	7497.740
2007-09-27	544.650	6548.000	4545.890	17150.560	61052.000	5700.650	6456.700	7794.430
2007-10-04	540.980	6579.900	4753.290	17777.140	60407.000	5715.690	6466.800	7861.510
2007-10-11	546.600	6779.600	4832.620	18814.070	62456.000	5843.240	6595.800	8002.180
2007-10-18	559.140	6781.000	4789.080	17998.390	63261.000	5843.950	6730.700	8041.260
2007-10-25	551.050	6644.800	4786.050	18770.890	62341.000	5740.480	6527.900	7884.120
2007-11-01	547.160	6853.600	4871.710	19724.350	64050.000	5794.870	6661.300	7949.170
2007-11-08	537.250	6568.500	4659.510	19058.930	63562.000	5720.420	6530.600	7849.490
2007-11-15	510.650	6594.400	4433.540	19784.890	64631.000	5524.180	6304.900	7812.400
2007-11-22	500.080	6395.100	4178.830	18526.320	60653.000	5523.630	6291.200	7612.260
2007-11-29	492.470	6507.200	4403.980	19003.260	62156.000	5521.170	6262.100	7608.960
2007-12-06	507.580	6660.500	4479.020	19795.870	65791.000	5670.570	6432.500	7870.520
2007-12-13	513.590	6661.100	4392.950	20104.390	62861.000	5718.750	6554.900	7994.070
2007-12-20	511.280	6244.800	4423.900	19162.570	61716.000	5605.360	6397.000	7948.360
2007-12-27	513.710	6426.400	4522.640	20216.720	63774.000	5602.770	6434.100	8002.670
2008-01-03	515.690	6372.600	4466.470	20345.200	62892.000	5627.250	6476.900	8067.320
2008-01-10	500.600	6147.300	4162.180	20582.080	63515.000	5446.790	6348.500	7808.690
2008-01-17	481.830	5857.000	3887.170	19700.820	57037.000	5371.410	6202.000	7717.950

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2008-01-24	450.080	5605.800	3888.080	17221.740	57463.000	5092.400	5901.700	7314.170
2008-01-31	438.690	5697.000	3841.960	17648.710	59490.000	4878.120	5869.000	6816.740
2008-02-07	451.610	5668.300	3764.530	17526.930	58965.000	4978.060	6029.200	6968.670
2008-02-14	432.100	5748.200	3918.230	17766.630	61819.000	4709.650	5784.000	6767.280
2008-02-21	434.810	5663.000	3936.980	17734.680	63792.000	4771.790	5787.600	6832.430
2008-02-28	451.630	5746.100	3897.290	17824.480	65555.000	4824.550	5888.500	6806.290
2008-03-06	446.530	5531.900	3747.050	16542.080	62975.000	4790.660	5884.300	6748.130
2008-03-13	435.090	5215.700	3738.740	15357.350	62280.000	4618.960	5699.900	6513.990
2008-03-20	432.300	5182.400	3569.320	14994.830	58987.000	4592.150	5631.700	6451.900
2008-03-27	437.000	5418.500	3760.480	16015.560	60762.000	4692.000	5689.100	6524.710
2008-04-03	440.990	5645.800	3903.100	15832.550	64175.000	4695.920	5692.900	6559.900
2008-04-10	460.810	5515.500	3889.370	15695.100	63527.000	4900.880	5947.100	6763.390
2008-04-17	453.430	5587.300	3982.310	16481.200	64552.000	4797.930	5895.500	6603.570
2008-04-24	474.750	5658.700	4071.840	16721.080	64576.000	4961.690	6056.500	6843.080
2008-05-01	467.840	5652.700	4264.790	17287.310	67868.000	4978.210	6091.400	6896.580
2008-05-08	481.210	5800.900	4294.890	17080.650	69722.000	5069.710	6215.500	7043.230
2008-05-15	480.400	5964.900	4410.700	17353.540	71492.000	4960.560	6204.700	7003.170
2008-05-22	490.780	5920.000	4422.470	16907.110	72295.000	5078.040	6304.300	7156.550
2008-05-29	478.390	5817.200	4390.990	16316.260	71798.000	4933.770	6087.300	6944.050
2008-06-05	485.520	5633.800	4325.590	15769.720	71235.000	5014.280	6053.500	7096.790
2008-06-12	471.230	5433.200	4196.150	15250.200	67322.000	4795.320	5906.800	6803.810
2008-06-19	459.960	5484.300	4152.700	15087.990	66590.000	4682.300	5802.800	6765.320
2008-06-26	437.330	5421.500	3933.240	14421.820	63947.000	4509.270	5620.800	6578.440
2008-07-03	425.920	5094.000	3865.120	13094.110	59273.000	4397.320	5529.900	6421.910
2008-07-10	403.360	5020.500	3676.860	13926.240	60253.000	4266.000	5412.800	6272.210
2008-07-17	391.980	4977.400	3527.250	13111.850	60109.000	4100.640	5261.600	6153.300
2008-07-24	395.940	5188.400	3620.140	14777.010	57434.000	4299.360	5376.400	6382.650
2008-07-31	395.770	5052.600	3659.740	14355.750	59505.000	4377.180	5352.600	6436.710
2008-08-07	394.530	5030.000	3668.320	15117.250	57018.000	4314.340	5354.700	6396.460
2008-08-14	408.520	5039.000	3515.920	14724.180	55138.000	4491.850	5489.200	6561.650
2008-08-21	409.860	4949.600	3481.180	14243.730	55935.000	4453.620	5454.800	6446.020
2008-08-28	408.190	5143.300	3570.810	14048.340	56382.000	4400.450	5505.600	6342.420
2008-09-04	412.840	5050.900	3437.220	14899.100	51409.000	4482.600	5636.600	6422.300
2008-09-11	389.220	4871.500	3255.550	14324.290	51270.000	4196.660	5240.700	6127.440
2008-09-18	399.570	4651.900	2881.470	13315.600	48423.000	4332.660	5416.700	6234.890
2008-09-25	381.830	4960.800	3104.610	13547.180	51828.000	4324.870	5311.300	6143.420
2008-10-02	354.580	4774.100	2644.840	13055.670	46145.000	4163.380	5088.500	6063.500
2008-10-09	344.020	4291.300	2161.360	11328.360	37080.000	4080.750	4980.300	5797.030
2008-10-16	258.050	3988.100	2080.620	10581.490	36442.000	3176.490	3932.100	4544.310
2008-10-23	252.260	3939.300	1924.680	9771.700	33818.000	3329.920	4063.000	4781.330
2008-10-30	245.920	3957.300	1909.300	9044.510	37449.000	3193.790	3883.400	4295.670
2008-11-06	267.690	4106.500	2001.450	9734.220	36362.000	3487.070	4377.300	4987.970
2008-11-13	265.720	3672.400	1778.930	9536.330	35993.000	3469.120	4365.000	4938.460
2008-11-20	252.470	3332.600	1562.470	8451.010	33405.000	3291.470	4233.000	4710.240
2008-11-27	222.930	3528.200	1822.310	9026.720	36213.000	2881.260	3781.000	4127.410
2008-12-04	252.550	3468.100	1762.970	9229.750	35128.000	3262.680	4288.000	4669.440
2008-12-11	229.440	3534.200	1761.760	9645.460	38519.000	2988.010	4049.400	4381.470
2008-12-18	247.750	3521.700	1716.090	10076.430	39536.000	3213.600	4280.400	4663.370
2008-12-24	249.540	3515.000	1725.890	9568.720	36471.000	3225.900	4286.900	4696.700
2008-12-31	240.810	3659.300	1750.830	9647.310	37550.000	3130.720	4319.400	4629.380
2009-01-08	258.230	3643.600	1869.520	9586.880	41991.000	3349.690	4561.800	4973.070
2009-01-15	266.180	3476.800	1694.820	9046.740	39151.000	3299.500	4448.500	4783.890
2009-01-22	248.550	3431.900	1591.880	8813.840	37894.000	3016.750	4147.100	4366.280
2009-01-29	234.140	3461.300	1703.190	9236.280	39638.000	2849.140	4052.500	4178.940
2009-02-05	248.600	3372.600	1691.380	9090.880	41109.000	2973.920	4149.600	4338.350
2009-02-12	261.350	3458.500	1666.040	9465.830	40501.000	3122.790	4291.900	4644.630
2009-02-19	251.120	3398.000	1512.940	9042.630	39730.000	2997.860	4189.600	4413.390
2009-02-26	229.130	3297.400	1482.710	8954.860	38180.000	2750.550	3889.100	4014.660
2009-03-05	219.810	3148.800	1446.070	8197.920	37369.000	2702.480	3830.100	3843.740
2009-03-12	199.500	3190.400	1467.260	8343.750	39152.000	2534.450	3530.700	3666.410

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2009-03-19	211.740	3416.800	1611.370	9001.750	40453.000	2705.630	3753.700	3953.600
2009-03-26	212.710	3586.300	1730.830	10003.100	42589.000	2791.140	3842.900	4068.740
2009-04-02	221.730	3622.200	1792.540	10348.830	43736.000	2840.620	3898.900	4203.550
2009-04-09	230.760	3617.500	1836.690	10803.860	45539.000	2958.740	4029.700	4384.990
2009-04-16	235.450	3725.600	1860.680	10947.400	46025.000	3000.220	3989.000	4491.120
2009-04-23	243.810	3695.800	1795.480	11134.990	45801.000	3091.960	4092.800	4676.840
2009-04-30	239.340	3744.700	1863.010	11403.250	47290.000	3102.850	4156.000	4674.320
2009-05-07	251.470	3912.100	2068.710	12116.940	50058.000	3237.970	4243.200	4769.450
2009-05-14	261.350	3710.800	1942.370	11872.910	49446.000	3312.590	4462.100	4913.900
2009-05-21	252.920	3804.700	2106.880	13736.540	50087.000	3169.050	4348.100	4737.500
2009-05-28	260.140	3753.900	2028.580	14296.010	53041.000	3227.970	4365.300	4918.750
2009-06-04	259.450	3932.500	2122.590	15008.680	53464.000	3277.650	4417.900	4940.820
2009-06-11	266.930	4047.300	2189.120	15411.470	53411.000	3339.050	4438.600	5077.030
2009-06-18	265.480	3887.400	2027.850	14265.530	50903.000	3326.140	4442.000	5069.240
2009-06-25	257.160	3851.500	2045.490	14345.620	51515.000	3221.270	4345.900	4839.460
2009-07-02	254.430	3875.200	2099.380	14658.490	51025.000	3129.730	4241.000	4776.470
2009-07-09	253.700	3761.400	1975.390	13757.460	49178.000	3119.510	4236.300	4708.210
2009-07-16	243.200	3987.800	2124.840	14250.250	51918.000	2983.100	4127.200	4576.310
2009-07-23	266.400	4072.600	2177.970	15231.040	54249.000	3218.460	4388.800	4978.400
2009-07-30	276.150	4195.900	2248.100	15387.960	54478.000	3366.450	4576.600	5229.360
2009-08-06	283.170	4331.000	2350.700	15514.030	55755.000	3426.270	4608.400	5332.140
2009-08-13	290.500	4436.700	2404.420	15518.490	57048.000	3521.140	4731.600	5458.960
2009-08-20	288.020	4391.400	2389.910	15012.320	56831.000	3495.270	4714.000	5309.110
2009-08-27	294.490	4458.100	2499.070	15781.070	57704.000	3615.810	4850.900	5462.740
2009-09-03	300.200	4432.900	2427.490	15398.330	55707.000	3693.140	4908.900	5517.350
2009-09-10	293.160	4573.500	2521.260	16216.860	58536.000	3598.760	4851.700	5384.430
2009-09-17	308.000	4714.000	2613.390	16711.110	60236.000	3734.890	5011.500	5624.020
2009-09-24	313.630	4707.900	2548.310	16781.430	60046.000	3827.840	5172.900	5703.830
2009-10-01	305.630	4702.000	2578.270	17134.550	60459.000	3739.140	5082.200	5581.410
2009-10-08	299.300	4763.300	2656.710	16843.540	63760.000	3649.900	4988.700	5467.900
2009-10-15	315.550	4862.500	2738.000	17195.200	66703.000	3799.610	5161.900	5711.880
2009-10-22	322.310	4818.800	2670.310	16789.740	66135.000	3827.600	5190.200	5743.390
2009-10-29	320.140	4575.200	2516.150	16052.720	63721.000	3808.240	5242.600	5740.250
2009-11-05	302.360	4519.200	2561.740	16063.900	64816.000	3607.690	5044.500	5414.960
2009-11-12	307.140	4758.200	2623.630	16696.030	64448.000	3707.290	5142.700	5488.250
2009-11-19	317.370	4767.800	2605.270	16785.650	66327.000	3806.010	5296.400	5686.830
2009-11-26	310.030	4727.600	2508.840	16854.930	66392.000	3729.360	5251.400	5663.150
2009-12-03	309.520	4789.300	2551.910	17185.680	68315.000	3721.450	5245.700	5685.610
2009-12-10	321.130	4622.900	2491.720	17189.310	68728.000	3846.620	5322.400	5817.650
2009-12-17	320.140	4689.600	2451.520	16894.250	67068.000	3803.720	5261.600	5756.290
2009-12-24	324.630	4803.300	2463.090	17360.610	67589.000	3794.440	5196.800	5831.210
2009-12-31	336.110	4882.700	2495.560	17464.810	68588.000	3947.150	5437.600	6002.920
2010-01-07	343.030	4930.500	2590.620	17615.720	70451.000	4013.970	5500.300	6048.300
2010-01-14	341.940	4929.400	2702.490	17584.870	69801.000	4045.140	5534.200	6037.610
2010-01-21	337.990	4849.600	2606.360	17051.140	66270.000	3954.380	5455.400	5875.970
2010-01-28	329.480	4697.700	2473.260	16306.870	65588.000	3820.780	5303.000	5695.320
2010-02-04	327.900	4644.100	2474.850	16224.950	63934.000	3739.460	5188.500	5608.790
2010-02-11	315.040	4575.800	2469.410	16152.590	66129.000	3563.760	5060.900	5434.340
2010-02-18	315.740	4673.900	2562.000	16327.840	67836.000	3599.070	5142.500	5500.390
2010-02-25	325.600	4614.900	2440.580	16254.200	66121.000	3769.540	5358.200	5722.050
2010-03-04	317.740	4757.600	2409.540	16971.700	67815.000	3708.800	5354.500	5598.460
2010-03-11	338.680	4825.500	2518.320	17167.960	69885.000	3910.420	5599.800	5877.360
2010-03-18	339.570	4877.700	2583.630	17519.260	69697.000	3927.400	5625.600	5945.110
2010-03-25	338.650	4896.300	2628.860	17558.850	68442.000	3925.440	5650.100	5982.430
2010-04-01	343.810	4925.900	2658.300	17692.620	71136.000	3988.930	5703.000	6120.050
2010-04-08	355.610	4960.300	2721.140	17714.400	71785.000	4053.940	5780.400	6235.560
2010-04-15	355.890	5024.100	2790.540	17639.260	70524.000	4050.540	5771.000	6249.700
2010-04-22	349.750	4936.800	2701.100	17573.990	69386.000	3986.630	5744.000	6180.900
2010-04-29	353.380	4816.100	2643.900	17503.470	67978.000	3951.300	5723.600	6259.530
2010-05-06	345.910	4598.600	2391.470	16987.530	63414.000	3816.990	5553.300	6135.700

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Date	Netherland AEX	Australia AO	Austria ATX	India BSE	Brazil IBOVESPA	France CAC40	England FTSE100	Germany DAX
2010-05-13	312.350	4679.500	2555.290	17265.870	64788.000	3392.590	5123.000	5715.090
2010-05-20	327.240	4342.400	2384.680	16519.680	58192.000	3560.360	5262.900	6056.710
2010-05-27	313.410	4399.100	2422.340	16666.400	62092.000	3430.740	5062.900	5829.250
2010-06-03	320.640	4506.300	2364.800	17022.330	62943.000	3515.060	5188.400	5946.180
2010-06-10	321.220	4448.400	2338.710	16922.080	63049.000	3455.610	5126.000	5938.880
2010-06-17	325.560	4547.000	2399.900	17616.690	64541.000	3555.520	5163.700	6047.830
2010-06-24	336.060	4504.100	2375.090	17730.240	63937.000	3687.210	5250.800	6216.980
2010-06-30	325.990	4262.700	2227.470	17509.330	61236.000	3519.730	5046.500	6070.600
2010-07-08	308.200	4374.100	2331.550	17651.730	63476.000	3348.370	4838.100	5834.150
2010-07-15	324.420	4456.700	2371.740	17909.460	63489.000	3554.480	5132.900	6065.240
2010-07-22	323.990	4394.800	2413.190	18113.150	65748.000	3500.160	5158.900	6040.270
2010-07-29	337.140	4536.200	2506.570	17992.000	66954.000	3607.050	5312.600	6166.340
2010-08-05	330.640	4584.900	2540.310	18172.830	68412.000	3643.140	5258.000	6147.970
2010-08-12	331.190	4422.400	2401.430	18073.900	65966.000	3716.050	5332.400	6259.630
2010-08-19	323.920	4509.600	2452.510	18454.940	66887.000	3610.910	5275.400	6110.410
2010-08-26	318.020	4389.400	2399.060	18226.350	63867.000	3526.120	5195.300	6005.160
2010-09-02	317.040	4563.000	2465.420	18238.310	66808.000	3507.440	5201.600	5951.170
2010-09-09	329.350	4621.300	2501.430	18799.660	66624.000	3672.200	5428.100	6134.620
2010-09-16	334.960	4650.000	2510.430	19417.490	67663.000	3725.820	5501.600	6214.770
2010-09-23	334.540	4680.000	2496.460	19861.010	68794.000	3722.020	5508.500	6209.760
2010-09-30	337.850	4636.900	2541.630	20069.120	69430.000	3782.480	5598.500	6298.300
2010-10-07	333.780	4746.200	2636.390	20315.320	69918.000	3692.090	5592.900	6211.340
2010-10-14	336.530	4765.900	2683.840	20497.640	71692.000	3763.180	5657.600	6291.670
2010-10-21	341.450	4696.400	2691.780	20260.580	69652.000	3827.370	5703.400	6492.300
2010-10-28	341.070	4752.800	2699.580	19941.040	70320.000	3868.540	5741.400	6605.840
2010-11-04	337.230	4817.500	2721.310	20893.570	72996.000	3833.500	5675.200	6601.370
2010-11-10	346.900	4810.300	2656.650	20589.090	71195.000	3916.730	5875.400	6754.200
2010-11-18	343.200	4722.800	2727.410	19930.640	70781.000	3831.120	5796.900	6734.610
2010-11-25	344.580	4683.300	2684.070	19318.160	69362.000	3860.160	5732.800	6843.550
2010-12-02	336.260	4761.800	2764.840	19992.700	69527.000	3728.650	5668.700	6848.980
2010-12-09	342.190	4827.500	2836.830	19242.360	67879.000	3750.550	5745.300	6947.720
2010-12-16	350.210	4868.800	2813.650	19864.850	67306.000	3857.350	5813.000	7006.170
2010-12-23	352.050	4888.200	2884.890	19982.880	68486.000	3867.350	5871.800	6982.450
2010-12-30	355.920	4886.700	2904.470	20389.070	69305.000	3900.390	6008.900	6970.730

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2000-01-06	1469.250	8413.750	17369.630	700.220	833.890	1059.040	551.830	7077.710
2000-01-13	1441.470	8429.420	15405.630	696.000	846.740	948.650	522.120	7047.090
2000-01-20	1465.150	8357.460	15542.230	690.890	928.240	948.030	566.080	7381.490
2000-01-27	1441.360	8634.910	15108.410	664.690	953.960	925.160	570.000	6890.780
2000-02-03	1360.160	8390.400	16185.940	634.670	935.570	941.670	568.750	6648.480
2000-02-10	1424.370	9209.200	16228.730	635.000	979.050	973.130	599.130	7236.540
2000-02-17	1387.120	9156.700	17380.300	635.080	999.810	953.220	637.030	7623.470
2000-02-24	1346.090	9295.510	16599.160	599.570	1013.270	897.520	618.700	7345.570
2000-03-02	1333.360	9141.170	17200.980	568.550	1002.620	864.760	636.390	7304.350
2000-03-09	1409.170	9128.990	17285.240	548.550	948.310	894.830	645.290	8131.270
2000-03-16	1395.070	9487.140	17831.860	596.180	948.090	891.360	609.980	8177.420
2000-03-23	1464.470	9528.810	17082.990	590.850	934.780	855.570	606.170	7985.340
2000-03-30	1527.460	10052.680	17784.570	581.470	970.270	889.240	607.990	8093.580
2000-04-06	1498.580	9462.390	17406.540	570.900	974.380	860.940	569.240	7473.250
2000-04-13	1516.350	9465.190	16941.680	570.820	949.850	837.380	575.590	7540.090
2000-04-20	1356.560	8473.510	16142.760	556.790	931.210	800.890	509.280	6315.910
2000-04-27	1429.860	8959.690	15380.010	530.850	898.980	767.160	505.610	6444.130
2000-05-04	1452.430	9347.610	15519.300	526.740	898.350	725.390	509.510	6640.680
2000-05-11	1432.630	9597.320	15268.640	545.610	925.450	770.240	487.440	6324.420
2000-05-18	1420.960	9211.800	15111.940	526.880	912.660	740.300	460.130	6255.350
2000-05-25	1406.950	9293.140	14478.260	509.400	950.620	730.680	425.630	5863.680
2000-06-01	1378.020	9020.880	13722.700	482.070	884.570	656.660	457.670	5652.290
2000-06-08	1477.260	9747.670	15284.100	444.450	881.390	794.210	501.370	6554.890
2000-06-15	1456.950	9728.840	16120.260	477.930	858.900	845.810	490.070	6405.000
2000-06-22	1464.460	10035.660	16434.380	484.020	836.190	759.040	485.400	6452.900
2000-06-29	1441.480	10091.090	15738.080	503.140	812.250	778.940	476.030	6425.570
2000-07-06	1454.600	10195.450	16155.780	515.110	833.370	821.220	496.900	6948.330
2000-07-13	1478.900	10380.280	16829.960	508.110	820.470	841.740	534.510	7370.380
2000-07-20	1509.980	10778.800	17586.160	504.110	856.240	827.950	545.680	7435.990
2000-07-27	1480.190	10842.080	17920.860	508.790	831.080	783.060	519.970	6718.730
2000-08-03	1419.890	10342.980	17183.930	498.800	799.090	692.650	497.000	6344.030
2000-08-10	1462.930	10413.680	17425.700	494.160	814.990	710.000	486.260	6582.670
2000-08-17	1471.840	10788.790	17214.420	505.790	802.530	722.210	491.990	6501.300
2000-08-24	1491.720	11133.810	17440.000	494.190	819.590	728.320	463.260	6386.660
2000-08-31	1506.450	11246.040	17236.740	486.910	799.260	729.800	475.240	6181.150
2000-09-07	1520.770	11388.820	17333.610	470.420	767.020	692.190	496.410	6722.410
2000-09-14	1494.500	10819.790	17275.450	470.920	739.810	653.680	488.430	6903.480
2000-09-21	1465.810	11063.580	16249.530	411.030	752.610	628.200	487.900	6835.430
2000-09-28	1448.720	10565.960	14612.880	406.920	739.570	553.250	483.520	6549.620
2000-10-05	1436.510	10377.920	15648.980	421.340	713.510	613.220	475.420	6334.560
2000-10-12	1408.990	10432.540	15693.500	422.000	709.550	608.850	464.980	6166.880
2000-10-19	1374.170	10320.760	14680.500	408.200	750.040	524.600	436.900	5853.950
2000-10-26	1396.930	10231.630	15044.530	420.330	778.990	545.970	425.130	5943.330
2000-11-02	1379.580	9321.890	14902.460	411.840	791.080	515.340	436.770	6206.370
2000-11-09	1426.690	9720.400	15594.120	409.830	760.300	560.410	427.810	6319.580
2000-11-16	1365.980	9199.060	15389.390	426.970	752.440	565.180	434.500	6107.750
2000-11-23	1367.720	8953.010	15180.850	421.140	735.090	551.260	424.400	6303.470
2000-11-30	1341.770	9024.430	14376.900	434.210	713.630	530.840	418.070	6062.740
2000-12-07	1315.230	8941.170	14441.430	427.550	725.690	514.460	402.330	5532.640
2000-12-14	1369.890	9548.730	15189.330	431.810	733.490	534.810	417.100	5795.090
2000-12-21	1312.150	9020.040	14975.530	423.680	700.440	534.000	405.150	5531.390
2000-12-28	1305.950	8769.920	14738.210	416.320	696.390	500.600	420.370	5492.310
2001-01-04	1320.280	8933.680	15095.530	410.200	666.630	520.950	418.700	5652.190
2001-01-11	1298.350	8690.230	15447.610	418.820	670.180	580.850	464.080	5924.330
2001-01-18	1318.550	8716.400	15295.420	407.360	678.900	587.870	499.550	5966.600
2001-01-25	1342.540	9161.070	15933.550	411.560	694.500	619.780	526.800	6267.490
2001-02-01	1354.950	9158.190	16099.820	416.790	715.060	591.730	525.190	6418.640
2001-02-08	1349.470	9224.050	16071.290	451.980	736.340	608.480	517.790	6522.230
2001-02-15	1314.760	8957.610	15873.280	427.910	724.810	595.470	504.460	6344.160
2001-02-22	1301.530	8393.230	15630.310	432.080	714.660	604.920	483.150	6368.490

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2001-03-01	1245.860	8028.810	15280.560	438.650	712.760	583.520	460.410	5998.690
2001-03-08	1234.180	8006.850	13966.430	426.130	703.070	559.440	448.810	6133.340
2001-03-15	1233.420	8135.510	14194.350	414.110	695.260	565.760	477.290	6270.960
2001-03-22	1150.530	7752.210	13522.040	380.520	672.010	538.670	442.990	5878.570
2001-03-29	1139.830	7639.840	12583.360	371.470	669.270	537.970	429.250	5618.670
2001-04-05	1160.330	7608.000	12760.640	381.050	647.480	523.220	443.810	5727.890
2001-04-12	1128.430	7474.750	12386.610	364.340	577.440	506.220	452.940	5695.260
2001-04-19	1179.680	7835.220	12606.450	363.210	581.370	516.100	444.270	5951.700
2001-04-26	1242.980	8099.440	13448.130	342.860	575.670	556.290	420.160	5950.790
2001-05-03	1253.050	7967.340	13386.040	351.560	585.870	556.630	449.360	6008.030
2001-05-10	1266.610	7981.680	13390.990	375.560	576.990	585.600	442.280	6129.510
2001-05-17	1245.670	8023.670	13636.610	370.360	571.020	583.060	419.430	6110.360
2001-05-24	1291.960	8228.990	13459.180	376.800	557.660	600.540	428.050	6527.600
2001-05-31	1277.890	8292.840	13753.990	390.120	563.720	624.110	436.680	6711.340
2001-06-07	1260.670	8250.940	13141.380	396.510	571.260	607.070	435.800	6619.660
2001-06-14	1264.960	8128.370	13808.890	398.810	575.710	621.780	451.400	6783.720
2001-06-21	1214.360	7816.080	13102.500	417.560	589.420	618.960	438.220	6670.720
2001-06-28	1225.350	7739.660	13174.020	437.600	587.890	599.080	415.670	6539.650
2001-07-05	1224.380	7736.350	13042.530	437.620	592.990	595.130	402.250	6666.170
2001-07-12	1190.590	7594.120	12690.680	432.880	626.810	578.540	369.810	6715.810
2001-07-19	1215.680	7765.630	12612.790	446.130	621.030	548.490	329.080	6452.120
2001-07-26	1210.850	7647.950	12301.680	460.910	648.780	537.710	334.110	6389.270
2001-08-02	1205.820	7682.160	12182.170	447.381	646.330	541.130	322.800	6522.200
2001-08-09	1214.350	7744.210	12269.080	435.150	659.250	568.690	312.440	6702.930
2001-08-16	1190.160	7644.720	11765.810	435.674	648.060	555.340	331.510	6628.490
2001-08-23	1161.970	7502.750	11754.810	437.869	655.760	580.990	314.500	6218.460
2001-08-30	1184.930	7629.960	11110.300	441.219	682.870	569.310	316.590	6416.770
2001-09-06	1133.580	7399.220	11090.480	435.552	690.450	545.110	319.890	6310.700
2001-09-13	1085.780	7368.770	10384.200	443.810	696.650	555.080	300.100	5844.600
2001-09-20	1038.770	6890.850	9655.450	425.650	644.530	482.290	266.030	5316.770
2001-09-27	965.800	6513.130	8934.200	414.430	607.910	472.310	239.500	5087.940
2001-10-04	1040.940	6838.560	9950.700	392.480	615.340	479.680	243.550	5403.530
2001-10-11	1071.380	6894.240	10277.380	381.590	609.000	501.920	214.870	5528.550
2001-10-18	1091.650	7031.030	10274.130	378.600	611.320	516.400	232.970	5671.100
2001-10-25	1073.480	6910.960	9825.840	387.850	615.020	528.040	253.170	5588.230
2001-11-01	1104.610	7004.920	10404.740	387.820	612.410	543.410	240.390	5693.120
2001-11-08	1087.200	7023.970	10186.060	380.650	596.650	550.570	222.500	5632.760
2001-11-15	1120.310	7209.690	10609.250	377.340	599.450	576.750	228.360	5596.380
2001-11-22	1138.650	7315.300	11287.370	378.670	635.310	610.880	219.640	5712.460
2001-11-29	1150.340	7432.430	11322.360	382.700	639.530	645.180	213.230	5734.900
2001-12-06	1139.450	7425.650	11279.250	380.310	638.020	643.890	202.450	5832.830
2001-12-13	1158.310	7616.800	11832.180	377.210	661.520	704.500	254.420	6141.190
2001-12-20	1123.090	7425.680	11466.110	375.070	664.120	665.200	252.670	6139.070
2001-12-27	1144.890	7528.300	11158.100	378.250	665.050	644.710	320.460	6380.600
2002-01-03	1161.020	7674.970	11431.590	392.040	691.640	693.700	295.390	6467.090
2002-01-10	1172.510	7833.240	11702.150	385.200	693.470	747.720	343.220	6612.080
2002-01-17	1145.600	7701.930	11166.460	411.770	703.040	727.360	371.200	6420.150
2002-01-24	1127.580	7604.790	10972.960	426.410	698.530	708.470	414.860	6600.730
2002-01-31	1133.280	7659.290	10772.960	452.460	693.580	774.680	406.500	6831.430
2002-02-07	1122.200	7690.510	10691.250	454.280	723.540	730.210	444.920	6865.130
2002-02-14	1096.220	7535.360	10518.990	436.980	710.920	739.660	457.540	6681.450
2002-02-21	1104.180	7515.300	10961.880	449.380	721.980	783.590	376.150	6697.670
2002-02-28	1089.840	7426.640	10664.940	449.320	710.610	792.000	367.940	6473.120
2002-03-07	1131.780	7710.800	10425.310	452.160	717.570	834.210	405.870	6898.000
2002-03-14	1164.310	7910.260	11233.230	475.110	747.630	825.270	389.620	7192.220
2002-03-21	1166.160	7871.680	11210.250	469.680	757.440	860.360	390.670	7273.080
2002-03-28	1148.700	7856.130	10863.070	484.730	752.630	895.980	432.290	7439.500
2002-04-04	1146.540	7851.470	10878.040	486.670	756.100	895.580	435.090	7371.890
2002-04-11	1122.730	7782.110	10723.680	508.990	761.420	900.690	401.060	7335.760
2002-04-18	1111.010	7730.980	10710.480	549.840	776.210	875.690	386.590	7391.250

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2002-04-25	1125.170	7899.620	11252.180	532.780	798.350	923.940	419.680	7509.220
2002-05-02	1076.320	7629.620	11385.080	539.960	801.370	869.650	389.370	7491.780
2002-05-09	1073.430	7663.850	11797.220	544.080	794.660	856.720	405.840	7521.950
2002-05-16	1054.990	7596.060	11645.900	543.910	788.540	817.930	387.540	7303.570
2002-05-23	1106.590	7727.030	11974.610	531.580	787.850	875.030	372.710	7537.820
2002-05-30	1083.820	7667.750	11626.780	506.950	765.860	854.570	330.420	7366.430
2002-06-06	1067.140	7656.130	11301.940	530.790	741.760	796.400	317.550	7031.640
2002-06-13	1027.530	7498.850	11284.710	514.030	755.210	795.160	294.610	6857.420
2002-06-20	1007.270	7249.020	10955.520	545.000	748.510	822.010	267.730	6720.370
2002-06-27	989.140	7139.430	10591.860	525.860	743.350	778.530	313.110	6502.970
2002-07-04	989.820	7145.610	10598.550	505.010	725.440	742.720	350.650	6460.950
2002-07-11	989.030	7112.460	10806.160	492.780	744.620	787.830	382.750	6462.830
2002-07-18	921.390	6819.760	10648.300	479.610	739.850	792.930	371.030	6400.420
2002-07-25	847.750	6535.440	10325.460	484.850	726.480	754.620	379.480	6336.950
2002-08-01	852.840	6309.940	9773.120	441.880	717.710	697.840	355.850	5900.440
2002-08-08	864.240	6536.470	9991.720	456.320	719.530	700.680	357.430	5644.700
2002-08-15	908.640	6645.920	10014.060	450.240	723.180	692.450	375.520	5913.210
2002-08-22	928.770	6571.720	10265.040	450.980	736.600	718.290	382.390	6190.600
2002-08-29	940.860	6614.340	10245.690	458.270	729.990	740.510	387.090	6148.890
2002-09-05	916.070	6611.950	10043.870	443.670	711.360	736.400	375.160	6216.430
2002-09-12	893.920	6479.750	9720.860	427.800	694.090	708.730	371.880	6113.320
2002-09-19	889.810	6495.260	9650.970	421.000	688.290	718.170	387.390	6190.520
2002-09-26	845.390	6392.260	9328.220	408.800	672.640	679.430	376.790	5788.780
2002-10-03	827.370	6111.110	9294.460	412.970	647.360	663.720	393.570	5801.120
2002-10-10	800.580	5935.330	9051.370	401.840	644.090	650.920	410.820	5869.220
2002-10-17	835.320	5978.660	8965.730	376.470	637.780	587.510	419.120	5845.330
2002-10-24	884.390	6326.610	9613.070	360.900	652.250	670.790	449.170	5973.210
2002-10-31	897.650	6405.870	9722.540	353.650	655.680	655.880	444.110	5905.580
2002-11-07	900.960	6321.400	9407.680	371.140	657.380	647.650	430.470	6045.160
2002-11-14	894.740	6390.010	9770.680	365.700	656.680	674.850	439.640	5988.530
2002-11-21	909.830	6457.420	9865.650	374.150	647.880	672.950	452.080	5819.090
2002-11-28	930.550	6553.890	10065.320	381.450	639.120	692.870	486.510	5818.430
2002-12-05	936.310	6570.420	10069.870	390.420	629.220	724.800	497.790	6156.830
2002-12-12	912.230	6577.200	9973.750	391.740	637.770	718.090	517.030	6126.230
2002-12-19	889.480	6664.260	9728.430	391.220	632.200	708.130	469.690	6114.200
2002-12-24	895.760	6560.620	9628.690	425.120	638.030	709.440	503.900	6130.830
2003-01-02	875.400	6595.830	9445.260	424.950	650.390	656.920	517.930	6126.240
2003-01-09	908.590	6772.660	9583.850	407.510	633.500	661.100	530.640	6253.340
2003-01-16	927.570	6801.770	9721.500	399.670	635.820	628.360	575.800	6353.030
2003-01-23	901.780	6755.920	9614.590	401.650	670.530	636.460	577.200	6204.460
2003-01-30	861.400	6664.900	9460.600	405.340	668.810	609.430	557.810	6012.560
2003-02-06	855.700	6569.490	9252.710	388.440	668.180	600.410	549.850	5954.350
2003-02-13	829.690	6477.740	9150.950	394.630	661.250	577.480	564.890	5866.030
2003-02-20	834.890	6487.130	9201.760	399.520	656.950	575.240	580.510	5774.390
2003-02-27	848.170	6558.630	9250.860	402.240	654.490	603.600	590.200	5956.970
2003-03-06	841.150	6555.120	9122.660	399.220	646.800	575.430	593.820	5927.060
2003-03-13	828.890	6359.860	8907.100	389.790	635.660	546.020	581.510	5907.930
2003-03-20	833.270	6304.490	8956.170	387.880	628.550	537.650	560.180	5993.010
2003-03-27	895.790	6535.900	9179.190	394.040	632.170	575.770	585.350	5924.340
2003-04-03	863.500	6379.480	8863.360	404.430	634.960	556.330	566.460	5947.480
2003-04-10	878.850	6394.980	8822.450	405.680	631.020	558.010	569.090	6158.970
2003-04-17	868.300	6432.080	8645.650	438.550	629.690	582.970	567.810	6175.220
2003-04-24	892.010	6525.680	8571.910	447.940	635.610	624.770	640.870	6326.650
2003-05-01	898.810	6521.690	8409.010	435.040	627.730	566.630	665.970	6333.000
2003-05-08	930.080	6618.110	8808.180	447.820	627.260	597.440	658.250	6608.180
2003-05-15	933.410	6650.030	9084.160	469.630	630.140	619.110	637.580	6488.490
2003-05-22	944.300	6742.030	9093.180	459.210	636.260	610.810	646.150	6556.910
2003-05-29	933.220	6782.900	9303.730	472.110	650.880	611.510	653.260	6586.920
2003-06-05	963.590	6859.800	9487.380	505.720	671.460	633.420	678.310	6699.180
2003-06-12	987.760	7046.880	9694.630	510.690	681.570	650.350	718.700	6870.600

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2003-06-19	988.610	7010.550	9855.640	510.480	689.940	665.240	768.390	6984.630
2003-06-26	995.690	7070.910	9930.310	511.450	682.440	686.220	801.170	7080.690
2003-07-03	976.220	6979.120	9657.210	506.780	691.450	677.280	733.850	7083.450
2003-07-10	1004.420	7001.880	9636.810	504.100	725.110	693.250	727.280	7142.850
2003-07-17	998.140	7077.560	9911.500	524.690	723.900	704.150	710.500	7083.820
2003-07-24	993.320	7114.650	10140.840	525.500	716.520	699.350	743.240	7030.760
2003-07-31	998.680	7262.620	9939.200	510.080	710.530	705.090	733.760	7349.960
2003-08-07	980.150	7218.580	10248.600	508.700	723.030	727.260	748.780	7320.410
2003-08-14	977.590	7251.960	9945.220	505.360	722.210	704.140	740.250	7316.690
2003-08-21	990.670	7390.550	10424.560	516.650	728.510	730.100	713.660	7418.430
2003-08-28	993.060	7467.180	10760.730	528.940	743.350	754.720	683.870	7493.730
2003-09-04	1008.010	7510.320	10908.990	529.670	743.300	759.470	713.330	7591.420
2003-09-11	1021.390	7612.500	11170.610	582.320	756.480	761.550	750.870	7775.340
2003-09-18	1018.630	7580.070	10992.730	578.380	740.940	753.610	764.650	7712.750
2003-09-25	1036.300	7602.210	10968.420	585.670	744.170	748.250	781.690	7891.670
2003-10-02	996.850	7433.080	11290.150	599.840	742.220	697.400	810.260	7786.220
2003-10-09	1029.850	7541.420	11608.720	621.860	740.200	723.130	830.160	7838.770
2003-10-16	1038.060	7633.610	11935.830	644.820	790.660	757.890	863.440	7949.030
2003-10-23	1039.320	7717.470	12044.490	649.650	781.050	767.750	877.840	7859.820
2003-10-30	1028.910	7614.400	11736.370	634.570	803.520	748.170	923.730	7842.860
2003-11-06	1050.710	7772.700	12190.100	625.550	817.120	782.360	929.890	8064.830
2003-11-13	1053.210	7860.440	12215.170	626.740	806.780	804.050	963.060	8430.600
2003-11-20	1050.350	7752.390	12203.530	610.340	792.230	809.890	932.210	8606.030
2003-11-27	1035.280	7783.590	11839.800	617.080	784.470	770.780	945.020	8335.120
2003-12-04	1058.200	7859.390	12317.470	629.940	779.280	796.180	996.560	8554.480
2003-12-11	1061.500	7990.280	12314.730	638.040	786.980	789.410	1027.270	8489.540
2003-12-18	1074.140	7979.200	12594.420	656.740	791.940	806.080	994.980	8337.970
2003-12-24	1088.660	8113.820	12371.750	672.290	769.750	811.200	999.690	8564.900
2003-12-31	1095.890	8136.780	12464.290	693.030	780.020	788.850	1044.700	8632.130
2004-01-08	1108.480	8293.700	12801.480	704.500	788.490	821.260	1101.510	8818.190
2004-01-15	1121.860	8352.190	13385.800	753.690	825.420	845.270	1195.400	9102.820
2004-01-22	1139.830	8522.260	13167.760	770.330	817.270	847.950	1208.180	9193.810
2004-01-29	1141.550	8604.730	13727.270	785.880	827.870	869.040	1163.600	9480.240
2004-02-05	1131.130	8521.390	13289.370	752.930	818.940	848.500	1140.810	9428.770
2004-02-12	1142.760	8638.610	13309.600	758.920	815.420	850.230	1053.260	9810.770
2004-02-19	1145.810	8694.460	13739.800	773.140	825.910	882.180	1089.990	9982.870
2004-02-26	1144.110	8641.930	13868.370	794.470	861.720	877.490	1145.940	9888.730
2004-03-04	1144.940	8788.490	13907.030	761.080	879.240	883.420	1183.140	9991.800
2004-03-11	1156.860	8845.040	13454.760	778.010	886.150	905.380	1157.560	10195.030
2004-03-18	1120.570	8592.040	12932.230	738.150	884.550	848.800	1258.740	9837.330
2004-03-25	1109.780	8583.810	12790.580	742.910	904.450	883.330	1275.200	10039.680
2004-04-01	1108.060	8509.560	12483.240	714.130	895.120	863.950	1211.030	10432.000
2004-04-08	1141.810	8798.750	12731.760	750.650	887.340	883.690	1197.540	10713.540
2004-04-15	1145.200	8833.480	13031.810	767.810	883.090	905.440	1177.800	10844.030
2004-04-22	1134.610	8695.350	12458.380	776.570	861.810	898.880	1162.800	10677.140
2004-04-29	1140.600	8667.870	12383.940	815.440	875.500	936.060	1142.960	10721.620
2004-05-06	1107.300	8243.970	11942.960	783.410	838.210	862.840	1077.930	9948.130
2004-05-13	1098.700	8274.790	11910.760	743.640	835.370	838.740	1005.870	9790.990
2004-05-20	1095.700	8188.080	11276.860	722.710	793.970	768.460	900.430	9786.320
2004-05-27	1093.560	8210.480	11576.010	724.930	791.530	786.360	920.790	9822.390
2004-06-03	1120.680	8347.080	12116.870	733.990	808.440	816.510	970.420	10028.420
2004-06-10	1122.500	8348.740	12022.640	697.940	802.820	780.740	928.680	10057.590
2004-06-17	1125.290	8366.630	12396.390	704.120	824.320	751.530	885.410	10214.510
2004-06-24	1135.020	8468.010	11855.550	692.720	821.930	741.730	951.170	10224.390
2004-06-30	1134.430	8497.770	12185.520	720.230	824.230	779.030	931.760	10128.790
2004-07-08	1125.380	8487.310	12220.130	745.030	830.680	755.420	967.680	10240.840
2004-07-15	1112.810	8473.180	12202.260	761.140	854.060	747.460	986.540	10042.340
2004-07-22	1101.390	8350.460	12059.200	756.090	842.650	739.390	961.610	9923.920
2004-07-29	1086.200	8383.310	12352.990	766.370	838.200	737.510	975.420	9907.670
2004-08-05	1101.720	8458.070	12238.030	756.980	833.980	735.340	966.100	10116.390

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2004-08-12	1063.970	8176.680	12478.680	753.930	820.100	733.950	964.110	9866.130
2004-08-19	1064.800	8172.630	12359.830	755.920	815.620	776.020	934.030	9790.620
2004-08-26	1098.350	8335.620	12376.900	750.470	808.470	787.640	937.260	10143.430
2004-09-02	1107.770	8334.290	12818.420	746.760	821.490	810.300	950.550	10225.060
2004-09-09	1113.630	8344.420	12948.100	786.490	841.900	820.690	986.550	10335.010
2004-09-16	1123.920	8368.620	13003.990	797.780	850.290	836.340	1002.550	10661.530
2004-09-23	1128.550	8529.890	13224.930	814.630	859.660	848.110	1056.900	10790.530
2004-09-30	1110.110	8588.400	13066.840	819.820	855.320	832.100	1098.980	10856.440
2004-10-07	1131.500	8747.090	13359.250	835.910	853.930	846.010	1160.120	11078.260
2004-10-14	1122.140	8814.890	13241.460	855.720	861.080	881.380	1128.740	10920.970
2004-10-21	1108.200	8788.930	13059.430	857.590	851.290	841.940	1228.850	10991.430
2004-10-28	1095.740	8780.800	12818.100	850.770	853.880	828.170	1204.460	11226.080
2004-11-04	1130.200	8870.970	13054.660	860.490	861.140	834.840	1287.140	11564.350
2004-11-10	1166.170	8868.740	13494.950	893.640	871.480	860.680	1325.170	11793.870
2004-11-18	1184.170	8896.370	13784.460	934.030	901.660	876.670	1257.600	11957.320
2004-11-25	1170.340	8959.400	13787.680	934.030	897.030	867.030	1254.450	11839.210
2004-12-02	1182.650	9057.970	13895.030	965.220	908.780	858.120	1183.160	12076.080
2004-12-09	1191.170	9055.660	14211.840	981.410	917.170	882.550	1218.750	12109.470
2004-12-16	1188.000	8965.270	13901.810	945.230	894.230	844.850	1234.300	12260.860
2004-12-23	1194.200	9122.620	13992.440	973.350	903.000	875.130	1255.840	12519.790
2004-12-30	1204.920	9287.400	14194.900	997.520	907.200	879.920	1366.690	12802.770
2005-01-06	1211.920	9246.650	14230.140	1000.880	907.430	893.710	1375.370	12917.880
2005-01-13	1186.190	9006.220	13574.860	1032.530	916.280	870.840	1309.450	12453.330
2005-01-20	1184.520	9057.160	13494.780	1021.340	929.740	905.100	1344.700	12694.740
2005-01-27	1167.870	9086.830	13481.020	1030.720	923.330	919.610	1325.740	12673.620
2005-02-03	1171.360	9141.780	13650.060	1046.480	917.230	921.590	1381.920	13040.530
2005-02-10	1203.030	9358.280	13585.170	1048.390	907.520	933.550	1428.540	13446.950
2005-02-17	1205.300	9558.500	14017.230	1045.870	920.310	947.230	1496.910	13714.630
2005-02-24	1201.590	9658.750	14087.870	1092.490	907.750	984.100	1557.770	13580.260
2005-03-03	1211.370	9741.370	14157.090	1083.380	903.510	996.950	1600.320	13870.200
2005-03-10	1222.120	9927.200	13730.780	1103.010	885.330	1012.960	1581.360	13862.760
2005-03-17	1200.080	9691.440	13890.930	1123.480	901.450	1022.790	1435.950	13532.350
2005-03-24	1189.650	9754.690	13828.370	1147.870	894.000	979.720	1458.190	13094.400
2005-03-31	1174.280	9533.100	13411.880	1100.240	883.400	965.300	1347.990	12828.910
2005-04-07	1172.920	9638.630	13491.350	1095.070	875.920	981.900	1424.310	12714.190
2005-04-14	1181.200	9623.720	13666.720	1111.230	864.020	992.170	1415.330	12531.630
2005-04-21	1142.620	9277.120	13638.750	1096.520	874.250	947.220	1276.480	11942.700
2005-04-28	1152.120	9367.490	13693.550	1019.880	877.780	940.790	1354.680	11995.320
2005-05-05	1156.850	9370.970	13908.970	1029.610	878.960	911.300	1348.350	12322.990
2005-05-12	1171.350	9522.740	14033.960	1068.280	901.220	940.850	1429.370	12615.830
2005-05-19	1154.050	9278.450	13866.810	1059.270	891.360	923.190	1439.610	12347.720
2005-05-26	1189.280	9452.190	13717.420	1048.110	883.170	952.190	1435.080	12883.460
2005-06-02	1198.780	9619.360	13714.780	1061.490	869.110	960.910	1460.720	13131.390
2005-06-09	1196.020	9671.170	13818.450	1092.500	865.880	976.090	1506.120	13204.390
2005-06-16	1198.110	9790.090	13934.760	1096.930	890.020	990.790	1435.300	13214.600
2005-06-23	1216.960	9947.570	13912.030	1141.820	897.060	1003.680	1443.990	13645.960
2005-06-30	1191.570	9996.170	14230.290	1135.670	898.080	1002.430	1444.610	13299.280
2005-07-07	1194.440	9941.790	14177.870	1138.990	894.020	1018.020	1361.320	13509.130
2005-07-14	1211.860	10177.860	13964.470	1110.560	903.610	1021.950	1386.770	13871.260
2005-07-21	1227.920	10148.950	14504.290	1131.460	916.840	1059.600	1462.940	13952.600
2005-07-28	1233.680	10374.790	14786.460	1172.240	939.690	1074.220	1481.790	14318.470
2005-08-04	1234.180	10422.930	14880.980	1182.300	937.390	1111.290	1507.590	14409.660
2005-08-11	1226.420	10550.510	15051.320	1174.090	943.410	1089.360	1517.900	14463.140
2005-08-18	1230.390	10683.100	15450.950	1153.970	937.040	1130.220	1479.330	14673.220
2005-08-25	1219.710	10502.110	15038.610	1087.950	925.540	1089.880	1495.420	14678.160
2005-09-01	1205.100	10484.070	14982.890	1048.870	918.380	1086.550	1564.760	14444.840
2005-09-08	1218.020	10771.880	15221.890	1035.890	909.180	1115.830	1592.680	14772.700
2005-09-15	1241.480	10898.200	15165.770	1098.460	917.920	1152.500	1611.470	15212.880
2005-09-22	1237.910	10990.590	14983.200	1056.730	921.990	1174.130	1628.130	15656.840
2005-09-29	1215.290	10904.310	15143.970	1012.850	921.890	1175.880	1658.840	15649.330

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2005-10-06	1228.810	11011.830	15428.520	1079.280	927.540	1221.010	1694.830	16120.080
2005-10-13	1195.900	10612.150	14847.790	1094.650	925.210	1201.010	1655.900	15447.590
2005-10-20	1186.570	10553.440	14485.880	1096.700	925.590	1190.170	1603.710	14892.880
2005-10-27	1179.590	10290.870	14487.850	1075.960	909.580	1183.480	1593.110	14903.360
2005-11-03	1198.410	10312.300	14215.830	1058.260	905.790	1140.720	1602.630	15579.680
2005-11-10	1220.140	10678.650	14585.790	1052.820	911.530	1221.980	1672.010	15900.530
2005-11-17	1234.720	10669.400	14740.600	1028.980	898.350	1256.120	1592.510	16137.070
2005-11-24	1248.270	10722.100	14883.320	1054.980	901.720	1272.250	1603.750	16545.440
2005-12-01	1268.250	11002.570	15081.470	1074.400	904.280	1293.220	1629.630	16879.370
2005-12-08	1265.080	11005.240	15200.380	1119.420	885.140	1310.120	1543.680	17150.990
2005-12-15	1259.370	11132.010	14910.510	1160.070	898.300	1317.420	1535.280	17554.480
2005-12-22	1267.320	11136.580	15029.810	1143.430	893.370	1321.040	1524.500	17737.590
2005-12-29	1268.660	11255.390	15183.580	1158.340	892.130	1359.530	1529.120	17802.280
2006-01-05	1248.290	11272.260	14876.430	1171.710	899.790	1389.270	1555.670	17802.710
2006-01-12	1285.450	11620.460	15344.440	1222.250	911.670	1412.780	1616.290	18736.780
2006-01-19	1287.610	11604.820	15787.970	1250.430	911.900	1416.280	1645.240	18889.200
2006-01-26	1261.490	11605.670	15662.080	1222.890	905.410	1324.780	1701.880	18346.230
2006-02-02	1283.720	11947.470	15753.140	1229.710	914.010	1384.560	1739.830	18956.500
2006-02-09	1264.030	11937.620	15429.730	1244.130	927.850	1333.500	1703.330	18862.180
2006-02-16	1266.990	11651.690	15425.950	1253.100	920.310	1335.230	1695.480	18298.580
2006-02-23	1287.240	11758.040	15475.690	1243.470	926.470	1332.730	1699.490	18480.780
2006-03-02	1289.430	11810.550	15856.050	1216.140	924.910	1365.820	1726.650	19100.890
2006-03-09	1287.230	11978.680	15802.000	1261.270	916.930	1328.950	1823.560	19189.250
2006-03-16	1281.420	11906.650	15445.050	1247.420	921.960	1320.070	1762.560	18420.170
2006-03-23	1307.250	12000.730	15801.660	1305.180	922.620	1341.120	1810.630	19345.800
2006-03-30	1302.950	12078.520	15716.460	1311.370	926.090	1321.230	1816.440	19339.300
2006-04-06	1294.870	12110.610	15805.040	1322.970	926.630	1359.600	1800.580	19272.630
2006-04-13	1295.500	12241.210	16471.780	1363.300	943.710	1402.360	1830.620	19472.360
2006-04-20	1285.330	12309.020	16637.530	1386.790	938.320	1432.720	1898.470	19632.340
2006-04-27	1311.280	12437.220	16912.150	1459.290	948.190	1451.310	1918.730	20174.640
2006-05-04	1310.610	12204.170	16661.300	1464.410	949.230	1419.730	1908.610	20646.190
2006-05-11	1325.760	12270.110	17301.790	1483.060	961.380	1452.230	1894.480	21237.450
2006-05-18	1291.240	12038.070	16901.850	1525.780	966.050	1445.200	1806.680	21154.900
2006-05-25	1267.030	11545.770	16313.360	1392.990	944.400	1372.290	1655.510	20182.140
2006-06-01	1280.160	11762.750	15895.100	1333.880	930.750	1322.430	1677.860	19585.210
2006-06-08	1288.220	11898.690	15912.710	1347.690	930.720	1309.040	1693.500	19421.730
2006-06-15	1252.300	11390.700	15628.690	1274.750	915.400	1235.650	1584.390	17748.740
2006-06-22	1251.540	11207.950	15842.650	1309.530	893.500	1262.190	1578.490	18041.790
2006-06-29	1244.500	11249.020	15808.810	1290.160	906.340	1228.620	1589.120	18545.730
2006-07-06	1270.200	11612.870	16267.620	1310.260	914.690	1295.150	1711.090	19147.170
2006-07-13	1265.480	11631.910	16459.780	1347.910	925.560	1273.930	1704.680	19829.600
2006-07-20	1236.200	11630.010	16135.710	1303.580	913.630	1255.130	1654.460	18328.660
2006-07-27	1240.290	11418.330	16464.180	1314.580	924.720	1271.330	1620.450	19527.370
2006-08-03	1278.550	11823.680	16955.040	1337.410	934.720	1297.070	1689.650	20252.330
2006-08-10	1279.360	11936.680	16887.800	1389.350	937.990	1304.510	1683.900	20354.990
2006-08-17	1266.740	11944.900	17249.950	1402.190	942.270	1292.100	1618.880	20273.860
2006-08-24	1302.300	12044.830	17330.700	1435.030	942.000	1331.100	1655.870	21046.630
2006-08-31	1295.090	12119.830	16955.450	1416.930	950.520	1329.350	1676.810	20994.940
2006-09-07	1311.010	12145.100	17423.720	1444.490	960.690	1356.670	1677.850	21192.260
2006-09-14	1298.920	11869.590	17145.760	1466.580	956.700	1354.890	1632.680	20795.820
2006-09-21	1319.660	11656.040	17237.650	1465.700	958.990	1361.100	1627.750	21548.870
2006-09-28	1314.780	11581.610	17600.650	1510.820	965.230	1348.380	1638.450	21390.430
2006-10-05	1335.850	11761.270	17543.050	1534.610	967.550	1371.410	1637.270	21937.110
2006-10-12	1349.590	11690.890	17903.390	1549.630	970.980	1319.400	1644.930	22350.050
2006-10-19	1365.620	11908.570	17988.860	1572.200	983.540	1348.600	1664.570	22848.320
2006-10-26	1368.600	12035.570	18113.550	1572.850	979.190	1364.240	1701.600	23233.480
2006-11-02	1377.340	12268.860	18297.550	1572.850	989.900	1369.090	1784.600	22762.860
2006-11-09	1364.300	12239.040	18749.690	1612.920	998.020	1383.880	1841.960	23169.870
2006-11-16	1380.900	12340.470	18891.140	1664.840	1022.300	1395.730	1885.550	23951.630
2006-11-23	1401.200	12372.870	19182.710	1672.110	1040.790	1412.220	1886.920	24196.050

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2006-11-30	1400.950	12631.080	19260.300	1717.730	1060.430	1421.730	1943.630	24792.890
2006-12-07	1396.710	12754.750	18690.820	1734.750	1080.110	1434.360	1929.460	25207.480
2006-12-14	1409.840	12899.580	18739.990	1775.290	1098.590	1390.430	1972.730	25756.810
2006-12-21	1427.090	12866.270	19110.650	1792.160	1089.320	1421.870	2049.650	25757.680
2006-12-28	1410.760	12718.170	19320.520	1785.760	1079.720	1437.490	2057.510	25432.640
2007-01-04	1418.300	12908.390	19964.720	1805.520	1096.240	1435.260	2139.140	26448.320
2007-01-11	1409.710	12477.970	20211.280	1832.550	1120.400	1385.760	2063.880	26135.600
2007-01-18	1430.730	12678.810	19613.410	1678.040	1119.330	1388.370	2072.620	26324.380
2007-01-25	1430.500	12718.990	20327.720	1795.560	1147.760	1360.560	2037.320	26213.380
2007-02-01	1422.180	12979.260	20281.130	1759.210	1169.890	1371.330	2039.460	27045.710
2007-02-08	1448.390	13111.570	20563.680	1780.380	1209.480	1413.140	2081.270	27933.070
2007-02-15	1438.060	13083.950	20677.660	1740.320	1240.870	1427.680	2100.240	27906.890
2007-02-22	1455.540	13311.950	20567.910	1794.360	1262.090	1448.810	2145.490	28491.070
2007-03-01	1451.190	13343.530	20711.650	1791.550	1283.470	1469.880	2202.450	28505.720
2007-03-08	1387.170	12863.270	19442.010	1760.020	1164.680	1414.470	1997.640	26321.120
2007-03-15	1402.840	13057.370	19134.880	1764.580	1188.830	1423.580	2036.460	27106.530
2007-03-22	1386.950	12829.680	18953.500	1777.890	1182.200	1427.880	1985.790	26901.420
2007-03-29	1436.110	13237.660	19692.640	1805.960	1235.650	1447.380	2085.510	28272.030
2007-04-05	1420.860	13165.500	19800.930	1830.920	1246.870	1452.550	2102.780	28747.690
2007-04-12	1444.610	13482.330	20347.870	1913.730	1278.920	1484.150	2131.940	29632.200
2007-04-19	1452.850	13578.620	20340.970	1941.150	1308.200	1520.780	2212.980	29762.220
2007-04-26	1484.350	13664.710	20566.590	1968.730	1315.370	1533.080	2216.600	29832.480
2007-05-03	1494.070	13632.010	20526.500	2019.680	1324.770	1542.520	2197.770	29372.930
2007-05-10	1505.620	13769.890	20841.080	2033.370	1363.400	1567.740	2163.730	30013.850
2007-05-17	1505.850	14003.820	20468.210	2022.300	1351.450	1603.560	2128.250	30058.750
2007-05-24	1522.750	14105.340	20904.840	2063.760	1356.840	1612.250	2186.390	30676.340
2007-05-31	1515.730	14024.070	20520.660	2060.430	1339.080	1644.560	2192.940	30700.010
2007-06-07	1536.340	14119.370	20602.870	2111.750	1360.070	1716.240	2249.360	31946.400
2007-06-14	1507.670	13798.500	20509.150	2054.450	1352.390	1727.280	2169.280	31466.600
2007-06-21	1532.910	14137.410	21017.050	2120.640	1360.650	1772.260	2216.580	32128.970
2007-06-28	1502.560	13986.030	21999.910	2152.320	1391.570	1770.980	2229.900	31642.260
2007-07-05	1503.350	13906.570	21772.730	2139.280	1354.380	1743.600	2190.870	31151.050
2007-07-12	1530.440	14118.700	22531.740	2227.050	1373.840	1861.010	2249.010	32411.840
2007-07-19	1552.500	14496.500	23099.290	2301.600	1384.720	1962.930	2287.820	32386.510
2007-07-26	1534.100	14582.870	23291.900	2366.400	1382.360	1983.540	2277.470	31922.620
2007-08-02	1458.950	13748.530	22570.410	2298.410	1355.380	1883.220	2149.890	30235.170
2007-08-09	1433.060	13565.240	22538.440	2269.790	1335.420	1876.800	2148.420	29671.770
2007-08-16	1453.640	13466.280	21792.710	2207.400	1287.700	1828.490	2053.130	29420.470
2007-08-23	1445.940	13049.580	20387.130	2041.580	1191.550	1638.070	1929.120	28510.660
2007-08-30	1479.370	13520.330	22921.890	2143.110	1273.520	1791.330	2081.450	30041.540
2007-09-06	1473.990	13660.480	23984.140	2194.340	1273.930	1873.240	2062.080	30347.860
2007-09-13	1453.550	13651.210	23982.610	2239.900	1304.900	1884.900	2041.040	30252.770
2007-09-20	1484.250	13846.410	24898.110	2225.610	1289.500	1870.020	2048.910	30096.030
2007-09-27	1525.750	13940.070	25843.780	2335.490	1305.940	1919.260	2121.710	30583.070
2007-10-04	1526.750	14098.890	27142.470	2359.210	1336.300	1946.480	2187.970	30296.190
2007-10-11	1557.590	14233.340	27831.520	2500.580	1372.390	1996.030	2277.750	31540.940
2007-10-18	1561.800	14295.860	28838.370	2638.210	1375.250	2026.440	2262.110	32473.470
2007-10-25	1500.630	14001.660	29465.050	2563.750	1370.170	1970.100	2236.870	31823.400
2007-11-01	1535.280	14296.430	30405.220	2624.430	1398.350	2028.060	2327.150	32136.760
2007-11-08	1509.650	14363.880	30468.340	2710.620	1397.480	2019.340	2336.700	30157.690
2007-11-15	1453.700	13869.820	28783.410	2707.670	1402.250	1990.470	2314.230	29158.860
2007-11-22	1458.740	13530.360	27614.430	2668.700	1386.640	1926.200	2281.160	29631.570
2007-11-29	1440.700	13467.200	26541.090	2584.350	1353.550	1772.880	2212.040	28710.870
2007-12-06	1481.140	13689.120	28643.610	2688.330	1396.980	1906.000	2207.160	29770.520
2007-12-13	1504.660	13862.970	28842.470	2778.950	1434.040	1934.320	2238.860	31268.360
2007-12-20	1467.950	13674.230	27563.640	2740.060	1403.410	1895.050	2184.490	29994.900
2007-12-27	1484.460	13596.090	27626.920	2657.980	1403.560	1878.320	2145.250	29638.400
2008-01-03	1478.490	13821.340	27370.600	2745.830	1447.040	1897.130	2151.730	29700.190
2008-01-10	1411.630	13778.580	27519.690	2765.190	1466.670	1863.900	2128.940	28317.920
2008-01-17	1401.020	13632.570	26867.010	2810.370	1516.220	1782.270	2082.930	28723.820

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2008-01-24	1325.190	12737.120	25201.870	2611.130	1439.490	1734.720	2002.460	26713.830
2008-01-31	1330.610	12894.830	25122.370	2620.490	1405.400	1692.410	1982.730	27379.920
2008-02-07	1395.420	13318.370	24123.580	2646.820	1393.250	1634.530	2045.140	29429.930
2008-02-14	1331.290	12989.340	22616.110	2589.380	1415.940	1640.670	1992.620	28185.260
2008-02-21	1349.990	13226.760	24148.430	2688.190	1427.190	1694.770	2039.090	28744.810
2008-02-28	1353.110	13585.930	23305.040	2741.180	1369.480	1686.450	2088.360	29528.790
2008-03-06	1330.630	13582.690	24331.670	2721.940	1357.400	1711.620	2162.200	28918.520
2008-03-13	1293.370	13281.720	22501.330	2656.460	1296.330	1663.970	2129.840	28612.750
2008-03-20	1288.140	13252.840	22237.110	2383.420	1194.840	1600.260	2117.100	29048.510
2008-03-27	1349.880	13322.220	21108.220	2339.290	1189.060	1645.690	2068.220	29634.160
2008-04-03	1315.220	13233.790	23285.950	2477.590	1258.410	1701.830	2089.710	30089.900
2008-04-10	1370.400	13668.190	24264.630	2277.080	1221.980	1766.490	2152.030	31545.370
2008-04-17	1332.830	13683.030	24667.790	2303.930	1246.790	1779.710	2115.120	31302.570
2008-04-24	1390.330	14237.060	24197.780	2349.270	1267.650	1771.900	2186.470	31795.680
2008-05-01	1397.840	14103.870	25516.780	2240.580	1288.080	1824.680	2101.400	31009.020
2008-05-08	1413.900	14280.280	26241.020	2342.760	1271.480	1848.270	2107.630	30551.470
2008-05-15	1388.280	14521.190	25063.170	2375.030	1285.270	1823.700	2114.440	30674.360
2008-05-22	1425.350	14984.200	25618.860	2468.840	1300.670	1888.880	2137.010	31486.950
2008-05-29	1375.930	14723.360	24714.070	2465.960	1274.780	1827.940	2235.330	31068.700
2008-06-05	1400.380	14714.730	24533.120	2444.350	1276.100	1852.020	2205.720	31975.470
2008-06-12	1360.680	14969.550	24402.180	2402.240	1248.570	1808.960	2179.720	31149.060
2008-06-19	1360.030	14778.460	22592.300	2398.420	1229.350	1747.350	2066.440	30413.480
2008-06-26	1317.930	14580.670	22745.600	2371.780	1206.670	1731.000	2066.280	29533.440
2008-07-03	1278.380	14355.210	22042.350	2332.110	1190.540	1684.450	2093.010	29295.000
2008-07-10	1252.310	14010.390	21423.820	2314.750	1134.140	1577.940	2006.440	28338.120
2008-07-17	1239.490	13709.100	22184.550	2276.850	1150.390	1567.510	1906.520	27614.540
2008-07-24	1260.680	13515.960	21874.190	2141.140	1105.040	1509.990	1907.110	28169.770
2008-07-31	1257.760	13378.810	22740.710	2245.340	1141.750	1597.930	1910.230	27084.770
2008-08-07	1260.310	13496.530	22862.600	2248.750	1159.100	1573.770	1884.060	26959.180
2008-08-14	1296.320	13341.740	21885.210	2195.930	1120.310	1568.720	1776.660	27132.790
2008-08-21	1298.200	13096.700	21160.580	2085.150	1095.050	1567.710	1733.790	27340.830
2008-08-28	1292.200	13447.290	20392.060	2120.490	1085.600	1496.910	1760.980	26875.450
2008-09-04	1282.830	13771.250	21261.890	2165.940	1100.500	1474.240	1777.140	26290.990
2008-09-11	1242.310	12816.420	19933.280	2022.560	1070.540	1404.380	1678.740	25904.180
2008-09-18	1251.700	12769.580	19352.900	1804.060	1044.030	1477.920	1647.650	25588.410
2008-09-25	1255.080	12912.990	19327.730	1891.730	1025.700	1455.780	1662.520	25701.030
2008-10-02	1213.270	12126.000	18682.090	1846.090	1020.530	1476.330	1692.400	25593.770
2008-10-09	1099.230	10803.350	17682.400	1648.740	1016.700	1358.750	1512.710	22989.500
2008-10-16	899.220	9065.160	14796.870	1451.670	934.010	1241.470	1215.990	19905.270
2008-10-23	940.550	9562.490	14554.210	1399.420	905.230	1180.670	1216.020	20312.830
2008-10-30	876.770	9294.090	12618.380	1244.860	859.110	938.750	890.270	16978.840
2008-11-06	968.750	9762.760	13968.670	1256.700	863.610	1113.060	1010.790	20445.320
2008-11-13	930.990	9596.210	14243.430	1338.360	893.950	1134.490	1096.600	19865.220
2008-11-20	873.290	9055.960	13542.660	1264.380	881.650	1088.260	1022.810	19562.140
2008-11-27	800.030	8155.390	12659.200	1146.280	866.880	1003.730	828.990	18251.410
2008-12-04	896.240	9270.620	13888.240	1241.540	866.140	1076.070	993.990	20534.720
2008-12-11	876.070	8117.030	13846.090	1202.340	838.280	1028.130	1005.340	20081.830
2008-12-18	879.730	8515.450	14758.390	1262.970	852.270	1103.820	1098.200	21050.550
2008-12-24	887.880	8552.000	15127.510	1348.290	876.400	1180.970	1095.930	22221.640
2008-12-31	872.800	8637.290	14184.140	1340.890	867.350	1117.860	1058.570	22515.340
2009-01-08	931.800	9234.110	15042.810	1437.340	894.360	1157.400	1143.330	23250.960
2009-01-15	890.350	9085.180	14377.440	1416.670	919.070	1180.960	1179.550	21741.290
2009-01-22	850.120	8920.400	13255.510	1363.880	896.470	1135.200	1097.960	20325.390
2009-01-29	831.950	8627.970	12578.600	1315.580	872.690	1093.400	1066.510	19348.810
2009-02-05	825.880	8694.900	13278.210	1332.670	884.450	1162.110	1077.090	19565.140
2009-02-12	868.600	9008.020	13655.040	1350.640	896.640	1210.260	1143.820	20438.130
2009-02-19	826.840	8678.100	13554.670	1338.740	909.840	1192.440	1134.890	19368.100
2009-02-26	770.050	7949.990	12699.170	1296.940	889.710	1065.950	1048.630	18324.230
2009-03-05	735.090	8123.020	12811.570	1285.480	890.670	1063.030	1019.290	17752.180
2009-03-12	683.380	7591.470	11921.520	1286.690	858.220	1055.030	965.020	17043.440

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2009-03-19	756.550	8303.390	12525.800	1327.440	843.450	1126.030	1043.330	19437.010
2009-03-26	768.540	8506.350	12833.510	1360.890	856.820	1170.940	1069.530	19363.300
2009-04-02	815.940	8821.060	14119.500	1462.740	885.430	1237.510	1165.270	20315.170
2009-04-09	842.500	9065.760	14545.690	1500.360	907.010	1283.750	1196.970	20933.780
2009-04-16	858.730	9285.620	14901.410	1540.400	941.380	1336.040	1224.600	21838.960
2009-04-23	869.600	9437.650	15601.270	1634.790	965.170	1329.000	1258.470	22234.840
2009-04-30	866.230	9549.480	15258.850	1591.340	992.680	1354.100	1259.230	22582.170
2009-05-07	877.520	9496.960	15520.990	1729.580	990.740	1397.920	1352.880	23014.050
2009-05-14	929.230	10237.990	17389.870	1862.530	1026.780	1412.130	1500.060	24085.580
2009-05-21	882.880	9762.850	16790.700	1750.910	1014.210	1391.730	1438.640	23341.720
2009-05-28	887.000	9993.420	17062.520	1881.710	1045.260	1403.750	1562.400	24093.240
2009-06-04	919.140	10370.070	18171.000	1916.830	1044.110	1395.890	1587.210	24331.710
2009-06-11	940.090	10569.290	18679.530	2078.930	1075.500	1394.710	1638.100	24913.010
2009-06-18	946.210	10644.960	18889.680	2090.940	1090.150	1428.590	1654.560	25460.020
2009-06-25	921.230	10287.950	17920.930	1990.470	1059.500	1383.340	1559.460	24274.720
2009-07-02	918.900	10389.760	18600.260	2040.190	1075.770	1394.530	1579.990	24458.230
2009-07-09	898.720	10283.100	18203.400	2075.300	1072.690	1420.040	1579.120	24045.390
2009-07-16	879.130	9747.130	17708.420	2063.090	1067.760	1428.620	1548.430	23656.260
2009-07-23	940.380	10369.420	18805.660	2106.350	1120.900	1440.100	1622.670	25741.960
2009-07-30	979.260	10687.900	19982.790	2185.650	1155.880	1502.590	1675.100	26646.370
2009-08-06	987.480	10787.150	20573.330	2323.240	1174.900	1557.290	1719.870	27043.500
2009-08-13	1010.480	10885.330	20375.370	2349.130	1184.880	1576.000	1799.530	28179.550
2009-08-20	1004.090	10848.010	20893.330	2386.860	1188.570	1591.410	1761.610	27855.430
2009-08-27	1026.130	10831.180	20199.020	2333.900	1163.790	1580.980	1797.330	28308.960
2009-09-03	1028.930	10977.970	20098.620	2377.250	1174.270	1607.940	1797.020	28599.920
2009-09-10	1016.400	11017.470	20318.620	2322.740	1178.740	1608.900	1779.250	28309.550
2009-09-17	1042.730	11253.230	21161.420	2415.950	1208.280	1651.700	1900.180	29448.790
2009-09-24	1068.300	11445.950	21623.450	2468.900	1221.200	1699.710	2007.600	29942.000
2009-10-01	1044.380	11212.390	21024.400	2444.580	1217.390	1691.480	2015.830	28759.980
2009-10-08	1025.210	10958.330	20375.490	2479.850	1206.250	1606.900	2024.800	28678.660
2009-10-15	1071.490	11436.920	21499.440	2474.400	1233.820	1646.790	2169.040	30039.710
2009-10-22	1087.680	11504.760	21929.900	2515.810	1256.770	1640.360	2207.280	30726.300
2009-10-29	1079.600	11382.130	22589.730	2467.950	1267.100	1640.170	2295.880	30617.680
2009-11-05	1036.190	10910.750	21752.870	2367.700	1243.230	1580.690	2115.760	28646.030
2009-11-12	1069.300	11250.420	21829.720	2395.110	1260.760	1572.460	2288.650	29868.620
2009-11-19	1093.480	11407.680	22553.630	2426.800	1270.960	1571.990	2233.430	31002.090
2009-11-26	1091.380	11579.330	22455.840	2487.360	1274.360	1620.600	2231.500	30666.510
2009-12-03	1091.490	11464.410	21134.500	2415.840	1259.110	1524.500	2188.580	30775.450
2009-12-10	1105.980	11510.800	22498.150	2511.540	1270.200	1624.760	2174.470	32105.390
2009-12-17	1106.410	11423.930	21902.110	2519.100	1260.000	1656.900	2177.630	31901.690
2009-12-24	1102.470	11463.400	21175.880	2431.390	1255.660	1647.040	2215.450	31834.070
2009-12-31	1127.780	11701.810	21480.220	2509.690	1272.730	1685.590	2282.580	32610.510
2010-01-07	1132.990	11866.900	21823.280	2575.410	1275.750	1696.140	2384.490	32758.530
2010-01-14	1144.980	11953.830	22296.750	2614.370	1292.980	1695.260	2352.760	32892.040
2010-01-21	1136.030	11685.370	21654.160	2647.090	1298.580	1701.800	2371.110	32262.300
2010-01-28	1091.760	11343.430	20726.180	2610.340	1300.450	1684.350	2331.600	30830.910
2010-02-04	1073.870	11094.310	20121.990	2610.800	1259.160	1602.430	2298.550	30391.610
2010-02-11	1066.190	11223.120	19665.080	2518.980	1247.900	1567.120	2165.150	30630.730
2010-02-18	1075.510	11469.810	20268.690	2534.140	1253.390	1593.660	2273.410	31005.740
2010-02-25	1109.170	11709.290	19894.020	2554.380	1257.670	1593.900	2334.990	32172.110
2010-03-04	1104.490	11629.630	20608.700	2554.670	1283.400	1594.580	2221.380	31634.540
2010-03-11	1138.700	11975.140	20787.970	2578.770	1299.780	1634.570	2298.740	32436.530
2010-03-18	1149.990	12013.820	21209.740	2666.510	1311.200	1662.740	2359.970	32578.050
2010-03-25	1159.900	11947.980	21370.820	2742.970	1296.600	1686.110	2381.100	33022.840
2010-04-01	1166.590	11957.370	21053.110	2813.080	1315.140	1697.720	2402.450	33147.810
2010-04-08	1187.440	12186.350	21537.000	2887.250	1335.940	1723.490	2449.530	33648.890
2010-04-15	1194.370	12176.840	22208.500	2845.010	1333.980	1724.470	2487.760	33840.850
2010-04-22	1192.130	12070.660	21865.260	2878.670	1332.770	1734.490	2398.940	33621.390
2010-04-29	1217.280	12239.640	21244.490	2924.730	1336.780	1737.030	2447.030	33853.690
2010-05-06	1186.690	12210.700	21108.590	2971.250	1346.380	1741.560	2396.270	32687.320

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Date	United States S&P500	Canada TSX	Hong Kong HSI	Indonesia IDX	Malaysia KLSE	Korea KOSPI	Argentina MERV	Mexico IPC
2010-05-13	1110.880	11692.430	19920.290	2739.330	1332.890	1647.500	2160.200	31488.820
2010-05-20	1135.680	12014.970	20145.430	2858.390	1339.300	1695.630	2212.870	31812.730
2010-05-27	1087.690	11521.350	19667.760	2623.220	1285.730	1604.930	2123.620	30629.150
2010-06-03	1089.410	11762.990	19766.710	2796.960	1285.010	1622.780	2168.570	31547.550
2010-06-10	1064.880	11569.610	19780.070	2823.250	1294.390	1664.130	2181.210	30992.650
2010-06-17	1091.600	11666.920	19872.380	2801.900	1294.670	1675.340	2281.230	32124.280
2010-06-24	1117.510	11927.590	20286.710	2929.590	1317.690	1711.950	2320.360	32814.620
2010-06-30	1076.760	11707.850	20690.790	2947.020	1326.450	1729.840	2318.140	32607.130
2010-07-08	1022.580	11196.060	19905.320	2871.550	1307.440	1671.820	2217.080	31379.670
2010-07-15	1077.960	11570.450	20378.660	2943.900	1324.310	1723.010	2288.590	32004.310
2010-07-22	1064.880	11569.650	20250.160	2992.450	1336.650	1738.450	2283.070	31783.390
2010-07-29	1102.660	11714.210	20815.330	3042.020	1345.680	1758.060	2375.200	32806.030
2010-08-05	1101.600	11713.430	21029.810	3069.280	1360.920	1759.330	2394.160	32308.740
2010-08-12	1121.640	11799.970	21678.800	3060.590	1360.450	1783.830	2425.330	32917.920
2010-08-19	1079.250	11528.250	21071.570	3053.010	1360.150	1746.240	2367.980	32099.750
2010-08-26	1071.690	11722.070	20981.820	3117.720	1395.020	1775.540	2438.970	32291.670
2010-09-02	1064.590	11879.720	20597.350	3104.730	1411.050	1729.560	2349.070	31755.350
2010-09-09	1104.510	12144.920	20971.500	3164.280	1435.670	1780.020	2423.220	32592.870
2010-09-16	1109.550	12097.090	21257.390	3357.030	1456.960	1802.580	2436.770	32626.870
2010-09-23	1125.590	12164.560	21970.860	3384.650	1466.970	1827.350	2473.430	33273.530
2010-09-30	1148.670	12204.860	22119.430	3397.630	1451.190	1846.600	2577.740	33280.750
2010-10-07	1146.240	12363.080	22618.660	3547.110	1466.320	1876.730	2652.290	33807.480
2010-10-14	1165.150	12535.590	22944.180	3546.950	1481.410	1897.070	2699.490	34464.820
2010-10-21	1176.190	12609.070	23757.630	3597.030	1489.860	1902.290	2735.470	34741.540
2010-10-28	1183.080	12601.180	23517.540	3597.750	1490.640	1897.310	2851.910	35120.880
2010-11-04	1183.260	12676.240	23096.320	3635.320	1505.660	1882.950	3007.410	35568.220
2010-11-10	1225.850	12925.110	24876.820	3655.300	1519.840	1938.960	3352.330	36317.510
2010-11-18	1199.210	12749.240	24222.580	3665.850	1499.810	1913.120	3215.480	36057.390
2010-11-25	1199.730	12956.330	23605.710	3725.050	1506.050	1940.960	3260.800	36601.400
2010-12-02	1189.400	12892.710	22877.250	3642.500	1492.050	1901.800	3302.880	36904.530
2010-12-09	1224.710	13276.010	23320.520	3696.260	1500.980	1957.260	3422.430	37385.910
2010-12-16	1240.400	13239.470	23162.910	3747.710	1507.280	1986.140	3390.870	37677.780
2010-12-23	1243.910	13201.460	22714.850	3581.560	1499.880	2026.300	3403.080	37997.340
2010-12-30	1257.540	13383.160	22833.800	3625.270	1511.580	2029.600	3477.510	38081.070

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2000-01-06	19002.860	1406.370	7268.100	2582.940	504.660	8756.550	1.000	1.496
2000-01-13	18193.410	1516.600	7448.000	2406.040	498.230	8849.870	1.000	1.501
2000-01-20	18956.550	1408.850	7513.900	2392.530	519.130	9023.240	1.000	1.526
2000-01-27	18878.090	1465.090	7236.000	2278.480	527.200	9255.940	1.000	1.565
2000-02-03	19434.780	1535.000	7029.600	2284.910	490.950	9696.910	1.000	1.582
2000-02-10	19763.130	1535.000	7148.700	2258.910	534.110	10008.900	1.000	1.582
2000-02-17	19556.460	1535.000	6973.400	2234.920	539.230	10128.700	1.000	1.627
2000-02-24	19789.030	1668.090	7047.000	2177.360	547.990	10096.380	1.000	1.644
2000-03-02	19817.880	1631.580	6989.100	2140.400	555.770	9432.490	1.000	1.624
2000-03-09	19927.540	1738.020	7025.300	2117.030	578.270	9588.030	1.000	1.638
2000-03-16	19750.400	1705.050	6907.900	2096.240	554.930	9429.600	1.000	1.655
2000-03-23	19566.320	1658.600	7100.600	2094.470	552.840	8763.270	1.000	1.633
2000-03-30	19958.080	1730.500	7440.400	2146.200	535.200	9482.640	1.000	1.660
2000-04-06	20337.320	1800.230	7428.100	2132.590	493.850	9854.950	1.000	1.676
2000-04-13	20252.810	1819.900	7450.800	2150.510	516.990	9921.030	0.999	1.686
2000-04-20	20434.680	1833.670	7494.400	2189.760	466.300	9374.610	1.000	1.702
2000-04-27	18252.680	1841.060	7433.200	2049.780	481.370	9120.480	1.000	1.690
2000-05-04	17973.700	1836.320	7427.800	2164.110	492.120	8824.360	1.000	1.727
2000-05-11	18199.960	1836.320	7499.400	2118.360	508.090	8698.530	1.000	1.751
2000-05-18	17357.860	1720.610	7736.700	2026.650	514.730	8560.440	1.000	1.755
2000-05-25	16858.170	1777.830	7718.700	1992.420	519.350	9119.770	1.000	1.747
2000-06-01	16008.140	1879.620	7821.700	1820.630	521.150	8559.460	1.000	1.701
2000-06-08	16800.060	1916.250	7841.600	1910.400	539.850	8958.210	1.000	1.661
2000-06-15	16861.910	1900.790	7796.800	2042.610	551.250	8955.440	1.000	1.667
2000-06-22	16318.310	1926.940	7845.600	2012.200	536.880	8832.150	1.000	1.658
2000-06-29	16963.210	1939.630	7677.000	2034.310	543.800	8684.930	1.000	1.692
2000-07-06	17411.050	1928.110	7761.600	2037.970	553.460	8265.090	1.000	1.707
2000-07-13	17398.240	1932.790	7903.700	2092.630	544.430	8173.080	1.000	1.718
2000-07-20	17142.900	1987.190	7938.900	2079.890	552.910	8497.130	1.000	1.698
2000-07-27	16811.490	1996.340	7900.400	2126.700	539.660	8167.370	1.000	1.711
2000-08-03	15838.570	2012.790	7997.800	2039.020	525.450	8122.110	0.998	1.718
2000-08-10	15667.360	2026.360	8119.600	2052.730	535.340	7925.200	1.000	1.684
2000-08-17	16117.500	2062.670	8236.200	2101.000	540.950	7974.650	1.000	1.747
2000-08-24	16280.490	2090.180	8251.900	2185.520	551.610	8176.820	1.000	1.734
2000-08-31	16911.330	2086.700	8311.700	2166.290	572.500	8026.320	1.000	1.792
2000-09-07	16739.780	1999.860	8234.900	2160.700	574.740	7420.060	1.000	1.822
2000-09-14	16501.550	1959.310	8088.100	2135.050	562.210	7367.990	1.000	1.842
2000-09-21	16061.160	1978.430	8014.400	2053.690	556.290	7155.450	1.000	1.820
2000-09-28	15818.250	1891.980	7976.600	1932.990	557.960	6612.090	1.000	1.869
2000-10-05	15747.260	1910.160	7713.300	1997.030	552.850	6432.360	1.000	1.881
2000-10-12	15994.240	1910.160	7920.200	1962.970	514.870	6353.670	1.000	1.920
2000-10-19	15330.310	1918.160	7629.400	1860.400	489.920	5876.110	1.000	1.928
2000-10-26	15198.730	1947.460	7722.700	1923.670	471.530	5404.780	1.000	1.919
2000-11-02	14582.200	1967.410	7884.500	1961.040	459.220	5805.170	1.000	1.903
2000-11-09	15371.440	1981.630	8062.100	2061.500	498.800	5796.080	1.000	1.929
2000-11-16	14988.540	2047.460	8050.000	1986.200	474.790	6088.740	0.999	1.921
2000-11-23	14544.300	2093.240	8131.000	1953.540	493.670	5351.360	1.000	1.899
2000-11-30	14315.350	2053.370	8081.500	1984.360	483.660	5419.990	0.999	1.827
2000-12-07	14835.330	2081.840	8050.500	1955.000	475.310	5342.060	1.000	1.850
2000-12-14	14696.510	2073.160	7995.800	1960.160	492.780	5252.830	1.000	1.806
2000-12-21	14552.290	2039.360	7867.000	1948.180	505.940	5224.740	0.998	1.810
2000-12-28	13427.080	2069.770	7978.300	1902.860	495.840	4811.220	1.000	1.768
2001-01-04	13785.690	2073.480	8135.400	1926.830	468.920	4743.940	1.000	1.788
2001-01-11	13867.610	2125.300	7985.600	1974.820	454.220	5295.530	1.000	1.798
2001-01-18	13347.740	2104.750	7848.200	1919.820	469.210	5339.400	1.000	1.834
2001-01-25	13989.120	2065.610	7862.400	1906.890	457.940	5680.060	1.000	1.804
2001-02-01	13696.060	2065.610	8041.400	1905.890	445.680	5680.060	1.000	1.864
2001-02-08	13703.630	2065.610	8007.500	1976.600	449.600	6049.260	0.999	1.908
2001-02-15	13422.830	1956.970	7920.100	1973.370	462.560	5809.840	1.000	1.905
2001-02-22	13175.490	1941.960	7757.400	1971.560	448.040	6045.670	1.000	1.900

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2001-03-01	13246.000	1936.350	7607.200	1946.860	451.290	5726.930	1.000	1.965
2001-03-08	12261.800	1985.110	7533.500	1907.240	438.610	5499.540	1.000	2.022
2001-03-15	12627.900	2011.660	7535.400	1898.320	419.500	5680.430	1.000	2.033
2001-03-22	12232.980	2020.240	7112.600	1772.100	402.270	5783.930	1.000	2.031
2001-03-29	13214.540	2053.540	6736.100	1715.310	396.860	5800.550	1.000	2.042
2001-04-05	12999.700	2112.780	7167.800	1674.190	378.280	5797.920	0.999	1.967
2001-04-12	13383.760	2108.610	6954.900	1670.180	381.040	5515.130	1.000	1.966
2001-04-19	13385.720	2145.400	7247.000	1593.870	396.240	5495.470	1.000	1.974
2001-04-26	13765.670	2152.340	7239.300	1656.190	406.580	5596.630	1.000	1.926
2001-05-03	13934.320	2115.110	7248.700	1686.450	418.930	5416.670	1.000	1.908
2001-05-10	14529.410	2119.180	7365.600	1714.840	423.760	5244.050	1.000	1.896
2001-05-17	14043.920	2155.410	7518.800	1703.350	411.220	5232.720	0.999	1.932
2001-05-24	13877.770	2203.370	7658.200	1662.640	418.580	5111.670	1.000	1.973
2001-05-31	13765.920	2193.580	7671.900	1687.750	424.960	5170.080	1.000	1.925
2001-06-07	13261.840	2219.590	7526.500	1649.780	410.690	5013.960	1.000	1.900
2001-06-14	13430.220	2223.070	7547.600	1707.460	411.970	5226.280	1.000	1.931
2001-06-21	12790.380	2210.970	7328.200	1706.100	404.610	5158.630	1.000	1.957
2001-06-28	13044.610	2206.070	7161.200	1716.880	401.100	4904.340	1.000	1.942
2001-07-05	12969.050	2218.030	7240.200	1726.500	421.890	4883.430	1.000	1.981
2001-07-12	12306.080	2170.520	6971.900	1660.760	412.820	4707.010	1.000	1.951
2001-07-19	12355.150	2161.340	6941.300	1656.940	427.250	4485.680	0.999	1.972
2001-07-26	11609.630	2179.620	6930.000	1638.080	428.850	4220.330	1.000	1.926
2001-08-02	11798.080	2065.730	6760.800	1640.400	436.980	4320.590	1.000	1.960
2001-08-09	12241.970	1958.690	6877.800	1649.360	439.470	4530.680	1.000	1.898
2001-08-16	11735.060	1955.040	6623.400	1641.430	437.170	4476.910	1.000	1.874
2001-08-23	11445.540	1924.000	6660.000	1636.190	421.110	4638.360	1.000	1.876
2001-08-30	11166.310	1886.800	6718.000	1624.610	423.950	4310.320	1.000	1.913
2001-09-06	10713.510	1834.140	6582.400	1619.120	405.330	4509.440	1.000	1.940
2001-09-13	10516.790	1808.840	6255.500	1576.950	395.120	4302.160	1.000	2.030
2001-09-20	10008.890	1818.380	5628.300	1400.300	362.980	3774.620	1.000	2.053
2001-09-27	9554.990	1807.020	5110.200	1241.290	361.680	3591.850	1.000	2.011
2001-10-04	9774.680	1764.930	6014.200	1319.530	355.930	3636.940	1.000	2.005
2001-10-11	10205.870	1764.930	5954.900	1385.450	370.750	3585.460	1.000	1.965
2001-10-18	10632.350	1691.330	6039.400	1416.240	370.940	3801.500	1.000	1.981
2001-10-25	10538.790	1572.450	6070.300	1388.770	379.580	3845.620	0.998	1.966
2001-11-01	10795.160	1677.880	6256.700	1411.250	375.140	4043.570	1.000	1.942
2001-11-08	10383.780	1691.350	6125.200	1341.570	377.070	3998.480	0.999	1.930
2001-11-15	10215.710	1605.870	6341.000	1362.770	376.140	4123.780	0.999	1.936
2001-11-22	10649.090	1646.760	6565.000	1422.170	387.800	4446.620	0.998	1.932
2001-11-29	11064.300	1712.560	6458.800	1458.200	397.040	4519.080	0.999	1.929
2001-12-06	10697.440	1747.990	6237.000	1478.540	386.920	4441.120	0.999	1.931
2001-12-13	10796.890	1745.410	6443.700	1628.800	399.090	5333.930	0.999	1.981
2001-12-20	10511.650	1675.510	6184.300	1558.450	397.980	5486.730	0.999	1.969
2001-12-27	10335.450	1640.140	6364.600	1577.070	422.680	5109.240	0.999	1.944
2002-01-03	10542.620	1639.480	6417.800	1625.980	446.790	5398.280	1.402	1.913
2002-01-10	10871.490	1611.390	6392.900	1678.670	468.920	5638.530	2.151	1.947
2002-01-17	10441.590	1535.590	6416.400	1704.070	452.880	5687.590	1.704	1.925
2002-01-24	10293.320	1415.440	6294.200	1661.750	439.490	5522.800	1.960	1.970
2002-01-31	10144.140	1451.480	6372.100	1730.830	427.830	5950.640	2.025	1.973
2002-02-07	9791.430	1485.770	6234.600	1781.420	442.420	5849.850	1.935	1.935
2002-02-14	9686.060	1506.620	6245.500	1736.420	414.830	5968.610	2.055	1.933
2002-02-21	10048.100	1506.620	6414.400	1768.270	409.590	5968.610	2.150	1.935
2002-02-28	10356.780	1506.620	6186.500	1690.160	403.200	5609.830	2.185	1.903
2002-03-07	10812.000	1502.540	6349.000	1721.520	409.360	5680.780	2.430	1.912
2002-03-14	11885.790	1640.260	6531.200	1798.990	403.540	6011.650	2.535	1.878
2002-03-21	11648.010	1620.980	6571.300	1778.080	415.690	5951.450	3.025	1.874
2002-03-28	11345.080	1669.690	6615.800	1800.200	407.090	6140.420	2.880	1.886
2002-04-04	11024.940	1603.910	6671.500	1789.090	375.500	6167.470	2.790	1.872
2002-04-11	11335.490	1634.640	6662.100	1779.970	374.490	6190.830	2.995	1.856
2002-04-18	10962.980	1658.980	6593.000	1751.750	375.760	6182.590	3.195	1.837

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2002-04-25	11512.010	1635.170	6676.700	1730.820	386.350	6448.120	3.115	1.864
2002-05-02	11541.390	1640.590	6530.100	1728.320	367.410	6306.930	3.255	1.844
2002-05-09	11316.040	1667.750	6598.700	1741.010	376.040	5910.320	3.285	1.820
2002-05-16	11531.110	1638.200	6533.100	1735.950	372.830	5807.300	3.450	1.791
2002-05-23	11847.320	1567.500	6642.600	1733.610	375.900	5789.840	3.660	1.771
2002-05-30	11976.280	1549.470	6576.000	1722.310	377.120	5706.400	3.710	1.739
2002-06-06	11763.700	1515.730	6574.800	1671.840	379.660	5675.650	3.510	1.758
2002-06-13	11438.530	1529.510	6250.900	1652.450	369.300	5433.020	3.660	1.751
2002-06-20	10920.630	1494.250	5980.700	1607.770	359.420	5562.120	3.880	1.773
2002-06-27	10354.350	1562.720	5791.600	1546.250	340.300	5460.530	3.610	1.798
2002-07-04	10621.840	1732.760	5979.700	1552.980	355.950	5153.710	3.590	1.787
2002-07-11	10826.090	1722.190	6024.200	1641.530	352.270	5255.230	3.590	1.813
2002-07-18	10601.450	1698.300	5604.700	1614.090	363.610	5416.500	3.630	1.846
2002-07-25	10202.360	1713.860	4976.300	1560.180	367.740	5161.920	3.660	1.856
2002-08-01	9591.030	1657.500	5023.600	1494.680	361.330	4855.340	3.630	1.875
2002-08-08	9709.660	1661.870	5036.800	1509.890	350.970	4920.890	3.620	1.837
2002-08-15	9999.790	1647.050	5324.000	1486.440	351.140	4851.440	3.575	1.851
2002-08-22	9788.130	1646.790	5401.600	1522.600	362.740	4919.020	3.615	1.812
2002-08-29	9867.450	1686.110	5493.300	1531.900	369.000	4968.850	3.635	1.845
2002-09-05	9619.300	1666.620	5230.500	1488.500	358.860	4764.940	3.625	1.814
2002-09-12	9129.070	1631.380	5104.500	1442.580	357.340	4533.270	3.645	1.815
2002-09-19	9241.930	1625.760	4959.300	1432.000	363.600	4580.170	3.705	1.836
2002-09-26	9481.080	1604.910	4737.500	1421.030	346.290	4429.250	3.775	1.829
2002-10-03	9530.440	1581.620	4909.300	1373.890	336.750	4208.800	3.715	1.827
2002-10-10	9027.550	1581.620	4677.000	1367.570	325.920	4067.790	3.585	1.816
2002-10-17	8529.610	1524.050	4769.500	1373.690	325.780	3850.040	3.615	1.801
2002-10-24	9086.130	1519.540	4967.200	1461.390	330.220	4458.170	3.525	1.802
2002-10-31	8726.290	1520.310	4939.200	1472.130	324.660	4564.060	3.545	1.766
2002-11-07	8685.720	1510.760	4894.000	1427.600	321.960	4500.550	3.565	1.779
2002-11-14	8690.770	1522.190	4845.400	1425.910	335.630	4811.010	3.555	1.779
2002-11-21	8503.590	1463.690	5027.600	1414.850	337.270	4813.530	3.575	1.785
2002-11-28	8772.560	1395.500	5160.800	1423.610	345.070	4707.610	3.575	1.782
2002-12-05	9215.560	1434.180	5117.500	1391.530	371.650	4646.690	3.525	1.769
2002-12-12	8863.260	1405.530	4934.800	1347.920	356.140	4738.980	3.515	1.769
2002-12-19	8516.070	1396.900	4847.700	1367.480	364.110	4588.140	3.455	1.776
2002-12-24	8406.880	1427.940	4774.600	1337.450	337.900	4595.670	3.375	1.775
2003-01-02	8714.050	1382.970	4573.900	1341.580	332.830	4547.320	3.335	1.734
2003-01-09	8713.330	1319.870	4899.500	1339.930	332.190	4626.320	3.275	1.703
2003-01-16	8470.450	1384.860	4854.200	1347.170	323.940	4850.800	3.155	1.692
2003-01-23	8690.250	1478.680	4753.600	1366.830	317.350	4907.780	3.265	1.704
2003-01-30	8731.650	1479.070	4477.400	1358.040	318.740	5057.320	3.175	1.692
2003-02-06	8339.940	1499.820	4422.500	1291.440	314.050	4833.580	3.135	1.678
2003-02-13	8448.160	1499.820	4222.800	1285.410	306.540	4735.370	3.245	1.671
2003-02-20	8701.920	1510.950	4273.000	1273.480	316.040	4493.990	3.205	1.653
2003-02-27	8513.540	1478.870	4228.700	1315.030	317.410	4548.350	3.195	1.628
2003-03-06	8363.040	1511.930	4148.200	1273.850	328.970	4526.690	3.135	1.683
2003-03-13	8144.120	1493.090	3880.300	1226.150	324.990	4350.590	3.055	1.685
2003-03-20	8002.690	1466.040	4015.400	1250.880	336.300	4476.170	2.865	1.666
2003-03-27	8435.070	1474.660	4453.300	1326.150	341.040	4586.920	2.915	1.667
2003-04-03	8280.160	1491.940	4207.600	1318.430	341.690	4477.010	2.905	1.649
2003-04-10	8074.120	1521.130	4386.200	1313.730	368.320	4499.180	2.935	1.626
2003-04-17	7816.490	1576.860	4448.100	1301.020	381.780	4530.400	2.865	1.611
2003-04-24	7874.510	1603.080	4531.300	1271.290	386.390	4658.300	2.825	1.583
2003-05-01	7699.500	1487.150	4475.900	1229.140	384.140	4233.540	2.775	1.557
2003-05-08	7907.190	1521.440	4516.300	1299.220	409.330	4187.820	2.845	1.555
2003-05-15	8152.160	1521.440	4510.500	1309.600	423.430	4244.180	2.855	1.518
2003-05-22	8117.290	1554.450	4594.800	1304.910	401.150	4283.770	2.884	1.543
2003-05-29	8184.760	1560.960	4574.000	1318.140	415.940	4349.520	2.835	1.498
2003-06-05	8424.510	1576.260	4630.800	1349.000	438.370	4555.900	2.836	1.504
2003-06-12	8785.870	1538.920	4786.700	1439.250	416.800	4740.450	2.791	1.494

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2003-06-19	8980.640	1566.770	4795.100	1479.300	441.080	4881.900	2.771	1.504
2003-06-26	9120.390	1529.470	4936.800	1519.160	448.190	5002.580	2.781	1.464
2003-07-03	9104.060	1497.050	4847.900	1477.730	453.400	4877.900	2.751	1.518
2003-07-10	9547.730	1502.350	4828.600	1486.240	449.180	5151.850	2.786	1.534
2003-07-17	9635.350	1528.850	4914.000	1544.840	441.110	5239.960	2.777	1.504
2003-07-24	9527.730	1507.160	4910.200	1580.960	429.350	5287.380	2.892	1.545
2003-07-31	9648.010	1477.650	4946.000	1566.930	438.850	5394.750	2.921	1.537
2003-08-07	9611.670	1476.970	5044.800	1557.080	413.910	5390.510	2.889	1.523
2003-08-14	9327.530	1471.270	5004.700	1534.540	403.730	5232.550	2.918	1.531
2003-08-21	9863.470	1450.200	5137.000	1594.320	417.830	5488.740	2.961	1.564
2003-08-28	10281.170	1438.880	5250.700	1640.190	405.980	5646.620	2.945	1.563
2003-09-04	10343.550	1421.980	5124.200	1599.250	416.290	5650.830	2.910	1.517
2003-09-11	10650.770	1431.530	5310.600	1617.840	421.330	5639.030	2.925	1.502
2003-09-18	10712.810	1409.160	5307.800	1584.270	415.940	5645.280	2.877	1.471
2003-09-25	10938.420	1391.370	5387.100	1589.860	430.360	5757.910	2.881	1.461
2003-10-02	10318.440	1370.840	5131.300	1627.540	434.240	5650.110	2.832	1.453
2003-10-09	10709.290	1367.160	5203.100	1670.300	439.860	5747.790	2.842	1.446
2003-10-16	10786.040	1404.010	5204.500	1746.040	448.040	5972.470	2.827	1.428
2003-10-23	11037.890	1370.580	5247.300	1772.180	454.530	6042.710	2.862	1.413
2003-10-30	10335.700	1381.830	5123.700	1712.620	460.340	5918.140	2.851	1.413
2003-11-06	10559.590	1348.300	5211.400	1723.710	486.000	6045.120	2.863	1.389
2003-11-13	10628.980	1335.210	5299.600	1769.090	491.550	6056.830	2.881	1.383
2003-11-20	10167.060	1331.050	5369.800	1736.720	495.150	6044.770	2.960	1.386
2003-11-27	9852.830	1361.560	5206.300	1657.250	504.310	5830.060	2.972	1.363
2003-12-04	10100.570	1397.230	5317.500	1714.000	513.130	5771.770	2.950	1.359
2003-12-11	10373.460	1451.120	5365.100	1733.000	485.820	5900.050	2.963	1.356
2003-12-18	10169.660	1470.790	5397.600	1727.730	520.390	5858.320	2.956	1.346
2003-12-24	10284.540	1446.290	5413.400	1710.810	517.250	5759.230	2.936	1.328
2003-12-31	10417.410	1514.780	5445.200	1730.230	529.260	5857.210	2.887	1.289
2004-01-08	10825.170	1517.190	5582.700	1791.350	552.610	6041.560	2.868	1.298
2004-01-15	10965.050	1581.470	5574.700	1852.530	557.960	6226.980	2.912	1.283
2004-01-22	10857.200	1600.430	5694.500	1836.870	583.510	6269.710	2.909	1.317
2004-01-29	11069.010	1600.430	5762.700	1899.980	560.260	6384.630	2.966	1.307
2004-02-05	10783.610	1590.730	5736.400	1848.360	550.650	6375.380	2.927	1.268
2004-02-12	10460.920	1679.190	5810.900	1854.410	565.750	6353.350	2.935	1.266
2004-02-19	10557.690	1658.540	5849.100	1864.070	574.410	6549.180	2.925	1.298
2004-02-26	10720.690	1721.750	5856.500	1891.780	576.870	6665.540	2.916	1.329
2004-03-04	11041.920	1675.070	5798.400	1888.630	571.330	6750.540	2.917	1.356
2004-03-11	11537.290	1662.100	5895.800	1891.540	577.640	6943.680	2.882	1.330
2004-03-18	11162.750	1694.740	5700.500	1835.080	574.550	6800.240	2.884	1.351
2004-03-25	11418.510	1747.870	5621.500	1839.120	573.680	6815.090	2.848	1.304
2004-04-01	11770.650	1734.050	5587.000	1827.110	563.550	6132.620	2.805	1.313
2004-04-08	11815.950	1768.650	5784.600	1880.450	579.770	6545.540	2.812	1.355
2004-04-15	11897.510	1727.350	5804.500	1898.270	584.240	6620.360	2.867	1.370
2004-04-22	11824.560	1693.860	5769.900	1853.990	585.130	6818.200	2.867	1.389
2004-04-29	12120.660	1635.500	5818.100	1867.640	579.350	6748.100	2.888	1.380
2004-05-06	11761.790	1595.590	5774.400	1842.030	567.600	6117.810	2.922	1.452
2004-05-13	11438.820	1595.590	5827.700	1843.720	555.840	6040.260	2.913	1.444
2004-05-20	10849.630	1562.690	5685.000	1754.960	549.200	5777.320	2.963	1.393
2004-05-27	11070.250	1558.330	5645.100	1767.230	569.450	5964.940	2.945	1.460
2004-06-03	11309.570	1548.720	5627.100	1787.180	569.870	6137.260	2.962	1.432
2004-06-10	11128.050	1542.090	5688.400	1791.700	578.080	5724.890	2.956	1.462
2004-06-17	11526.820	1472.070	5690.000	1823.140	575.930	5735.070	2.930	1.431
2004-06-24	11382.080	1427.300	5693.900	1791.620	589.060	5569.290	2.960	1.439
2004-06-30	11780.400	1401.110	5681.500	1805.540	596.950	5802.550	2.948	1.385
2004-07-08	11721.490	1441.190	5606.800	1839.330	602.460	5746.700	2.949	1.382
2004-07-15	11423.530	1430.650	5548.100	1862.030	592.590	5777.720	2.952	1.397
2004-07-22	11436.000	1456.130	5461.200	1871.470	587.640	5502.140	2.973	1.430
2004-07-29	11187.330	1407.400	5482.000	1850.260	578.990	5373.850	3.050	1.421
2004-08-05	11325.780	1386.200	5547.200	1891.710	562.970	5420.570	3.022	1.402

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2004-08-12	10972.570	1390.460	5403.100	1922.750	552.980	5399.160	3.006	1.380
2004-08-19	10757.200	1368.450	5309.800	1872.880	526.970	5389.930	2.991	1.427
2004-08-26	10889.140	1341.740	5344.200	1894.930	550.350	5622.860	2.999	1.437
2004-09-02	11209.590	1320.610	5463.900	1915.900	558.120	5797.710	3.000	1.454
2004-09-09	11022.490	1327.120	5502.500	1936.550	552.210	5761.140	2.975	1.427
2004-09-16	11083.230	1287.080	5536.800	1967.700	563.750	5846.190	2.992	1.401
2004-09-23	11082.490	1414.700	5543.100	2003.560	567.920	5818.390	2.978	1.381
2004-09-30	10895.160	1435.560	5491.300	1973.460	562.180	5892.210	2.972	1.376
2004-10-07	10985.170	1396.700	5528.900	1981.140	570.060	5945.350	2.970	1.367
2004-10-14	11349.350	1422.930	5503.700	2004.300	563.380	6102.160	2.960	1.353
2004-10-21	10982.950	1330.520	5362.400	1962.540	544.820	5820.820	2.972	1.338
2004-10-28	10857.130	1329.360	5391.100	1967.070	545.310	5774.670	2.958	1.320
2004-11-04	10771.420	1320.540	5363.400	1980.690	555.590	5705.930	2.970	1.317
2004-11-10	11061.770	1305.130	5618.300	2015.770	563.910	5931.310	2.936	1.285
2004-11-18	11019.980	1352.220	5689.200	2038.460	590.330	5917.160	2.944	1.262
2004-11-25	11082.840	1379.960	5605.000	2038.210	586.470	6026.550	2.945	1.288
2004-12-02	10833.750	1356.730	5548.500	2028.430	591.370	5778.650	2.958	1.332
2004-12-09	11074.890	1337.200	5555.200	2061.580	609.270	5893.270	2.980	1.324
2004-12-16	10756.800	1317.720	5581.800	2016.330	622.580	5911.630	2.973	1.307
2004-12-23	11078.320	1290.490	5603.400	2057.980	626.360	6009.320	2.972	1.285
2004-12-30	11365.480	1285.040	5685.500	2055.560	632.750	6019.420	2.975	1.315
2005-01-06	11517.750	1266.500	5768.700	2066.140	644.680	6139.690	2.965	1.304
2005-01-13	11433.240	1244.750	5735.200	2085.580	655.620	5935.990	2.965	1.315
2005-01-20	11438.390	1245.620	5730.100	2076.130	645.530	5889.520	2.942	1.290
2005-01-27	11238.370	1234.480	5738.100	2085.390	659.690	5848.910	2.922	1.299
2005-02-03	11320.580	1213.670	5750.700	2089.510	658.390	5879.930	2.919	1.278
2005-02-10	11360.400	1269.000	5843.100	2113.580	668.240	6112.400	2.901	1.268
2005-02-17	11632.200	1269.000	5915.300	2149.600	673.830	6112.400	2.928	1.271
2005-02-24	11660.120	1258.970	5901.700	2168.860	662.520	6115.430	2.943	1.276
2005-03-03	11658.250	1312.450	5936.200	2135.080	672.370	6207.830	2.930	1.266
2005-03-10	11873.050	1287.710	6009.300	2154.550	688.170	6193.620	2.920	1.261
2005-03-17	11923.890	1289.940	5971.900	2169.410	686.900	6204.230	2.920	1.297
2005-03-24	11879.810	1227.400	5897.000	2174.490	676.550	6043.950	2.925	1.294
2005-03-31	11761.100	1205.630	5959.800	2144.360	669.360	6065.910	2.905	1.302
2005-04-07	11723.630	1223.570	5950.900	2143.750	656.340	6028.750	2.905	1.297
2005-04-14	11874.750	1248.520	6016.600	2181.940	680.150	6024.070	2.903	1.287
2005-04-21	11370.690	1216.960	6019.000	2150.230	672.570	5888.370	2.908	1.283
2005-04-28	11045.950	1169.190	5912.900	2136.910	675.100	5747.090	2.898	1.281
2005-05-05	11002.110	1159.150	5870.800	2125.250	688.570	5818.070	2.902	1.303
2005-05-12	11192.170	1159.150	6027.100	2161.220	696.600	5967.960	2.890	1.318
2005-05-19	11049.110	1107.630	5943.000	2171.670	697.410	5981.480	2.894	1.315
2005-05-26	11037.290	1099.270	6023.100	2173.770	680.730	5954.690	2.886	1.327
2005-06-02	11192.330	1051.950	6160.800	2154.700	699.470	5991.550	2.896	1.303
2005-06-09	11300.050	1013.640	6210.300	2192.670	701.950	6107.950	2.889	1.295
2005-06-16	11304.230	1108.290	6239.400	2220.430	700.410	6192.350	2.871	1.293
2005-06-23	11514.030	1085.610	6263.500	2209.150	662.040	6293.560	2.879	1.313
2005-06-30	11537.030	1101.880	6223.200	2223.720	650.470	6340.690	2.869	1.351
2005-07-07	11630.130	1055.590	6279.800	2209.950	662.360	6272.140	2.874	1.330
2005-07-14	11565.990	1017.980	6312.200	2215.990	669.940	6201.400	2.869	1.311
2005-07-21	11758.680	1026.120	6459.900	2250.290	671.680	6410.590	2.871	1.320
2005-07-28	11695.050	1046.320	6492.500	2319.340	695.280	6380.730	2.851	1.292
2005-08-04	11899.600	1083.030	6600.900	2352.560	691.470	6311.980	2.864	1.293
2005-08-11	11766.480	1128.740	6607.700	2338.870	695.460	6380.030	2.879	1.327
2005-08-18	12261.680	1167.920	6647.500	2303.200	708.980	6350.900	2.901	1.318
2005-08-25	12291.730	1150.180	6636.600	2286.360	725.540	6158.940	2.899	1.313
2005-09-01	12439.480	1171.860	6445.400	2286.550	709.380	6136.550	2.889	1.297
2005-09-08	12600.000	1188.850	6532.100	2300.890	733.840	6116.050	2.901	1.304
2005-09-15	12692.040	1189.630	6703.600	2301.280	740.630	6119.060	2.909	1.310
2005-09-22	12958.680	1212.950	6810.300	2306.380	739.860	6031.240	2.909	1.317
2005-09-29	13392.630	1151.980	6785.500	2293.040	729.930	5925.540	2.921	1.320

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2005-10-06	13574.300	1155.610	6898.900	2305.140	757.580	6118.610	2.951	1.339
2005-10-13	13227.740	1155.610	6947.000	2305.240	765.550	6081.840	2.972	1.327
2005-10-20	13420.540	1139.550	6871.200	2303.240	736.400	5969.070	3.019	1.320
2005-10-27	13199.950	1141.320	6851.600	2239.360	760.210	5738.760	2.987	1.351
2005-11-03	13346.540	1080.870	6874.900	2192.410	765.370	5632.970	2.989	1.368
2005-11-10	14075.960	1100.050	7205.000	2266.520	772.960	5911.740	2.976	1.363
2005-11-17	14155.060	1090.190	7351.300	2266.030	762.830	6075.260	2.974	1.353
2005-11-24	14623.120	1117.000	7431.400	2293.200	760.660	6106.740	2.984	1.350
2005-12-01	14784.290	1114.920	7498.700	2295.730	785.110	6128.200	2.981	1.332
2005-12-08	15421.600	1094.290	7589.300	2332.520	796.340	6228.950	3.016	1.339
2005-12-15	15404.050	1113.480	7567.400	2321.100	811.370	6264.360	3.044	1.367
2005-12-22	15173.070	1127.510	7491.000	2325.530	812.300	6350.690	3.046	1.366
2005-12-29	16107.670	1144.870	7497.800	2328.290	829.240	6512.630	3.064	1.337
2006-01-05	16111.430	1161.060	7583.900	2347.340	847.420	6548.340	3.074	1.332
2006-01-12	16428.210	1209.420	7718.500	2420.740	831.910	6694.820	3.081	1.339
2006-01-19	16454.950	1221.460	7802.500	2405.860	857.950	6682.350	3.079	1.328
2006-01-26	15696.690	1255.310	7697.500	2388.910	857.040	6486.630	3.076	1.325
2006-02-02	16460.680	1258.050	7779.400	2412.080	851.320	6594.600	3.081	1.352
2006-02-09	16659.640	1258.050	7840.800	2431.720	848.370	6594.600	3.083	1.355
2006-02-16	16257.830	1282.660	7861.600	2423.590	826.320	6594.920	3.084	1.352
2006-02-23	15713.450	1267.410	7917.100	2431.340	822.760	6673.750	3.077	1.341
2006-03-02	16101.910	1296.870	7954.300	2453.670	810.910	6538.220	3.076	1.360
2006-03-09	15663.340	1293.300	7916.000	2493.430	829.390	6553.660	3.089	1.361
2006-03-16	16115.630	1245.650	7970.600	2496.730	847.980	6490.680	3.102	1.400
2006-03-23	16339.730	1269.460	8047.100	2494.410	848.280	6528.570	3.094	1.401
2006-03-30	16560.870	1294.700	8045.100	2497.310	860.650	6376.620	3.094	1.367
2006-04-06	17059.660	1298.300	8023.300	2533.400	860.650	6613.970	3.091	1.373
2006-04-13	17563.370	1342.960	8105.200	2552.050	860.650	6781.940	3.084	1.356
2006-04-20	17233.820	1359.540	7961.400	2550.340	869.930	6952.540	3.064	1.322
2006-04-27	17403.960	1416.790	8093.500	2603.450	869.930	7093.050	3.049	1.295
2006-05-04	16906.230	1440.220	8047.300	2610.710	879.810	7171.770	3.059	1.285
2006-05-11	17291.670	1440.220	8058.100	2632.420	890.580	7370.440	3.074	1.307
2006-05-18	16601.780	1602.830	7954.100	2534.830	916.850	7278.960	3.089	1.319
2006-05-25	16155.450	1659.550	7614.300	2493.980	868.150	7074.150	3.089	1.337
2006-06-01	15970.760	1613.890	7679.500	2445.020	884.800	6879.510	3.096	1.346
2006-06-08	15789.310	1669.400	7665.100	2419.420	868.870	6959.640	3.054	1.356
2006-06-15	14750.840	1551.380	7434.600	2337.440	852.720	6444.630	3.091	1.361
2006-06-22	14879.340	1574.470	7294.500	2373.910	825.450	6575.770	3.101	1.368
2006-06-29	15124.040	1605.710	7485.800	2343.030	828.880	6452.310	3.097	1.341
2006-07-06	15505.180	1672.210	7652.100	2435.390	797.810	6704.410	3.096	1.327
2006-07-13	15307.610	1730.190	7655.200	2445.130	823.060	6660.610	3.109	1.331
2006-07-20	14845.240	1665.210	7506.800	2363.550	780.040	6428.030	3.101	1.309
2006-07-27	14821.260	1665.330	7618.100	2371.370	794.820	6420.010	3.099	1.316
2006-08-03	15342.870	1662.030	7946.500	2429.440	791.740	6480.070	3.093	1.304
2006-08-10	15499.180	1570.150	7891.000	2462.920	822.160	6442.610	3.096	1.310
2006-08-17	15565.020	1605.930	7858.600	2450.630	808.880	6571.100	3.092	1.311
2006-08-24	16105.980	1598.020	8084.200	2483.530	823.320	6721.080	3.102	1.311
2006-08-31	15938.660	1623.030	8102.500	2453.210	830.750	6526.220	3.104	1.316
2006-09-07	16134.250	1636.690	8189.100	2491.490	816.200	6651.460	3.111	1.325
2006-09-14	16080.460	1667.980	8167.000	2510.140	801.770	6693.110	3.121	1.323
2006-09-21	15866.930	1721.050	8229.300	2521.910	819.510	6681.090	3.119	1.336
2006-09-28	15634.670	1725.360	8294.500	2520.500	835.370	6885.600	3.122	1.343
2006-10-05	16127.580	1752.420	8425.900	2568.860	837.230	6883.050	3.124	1.332
2006-10-12	16436.060	1752.420	8521.200	2649.300	877.770	7006.670	3.116	1.319
2006-10-19	16536.540	1784.660	8651.100	2666.680	874.640	7068.800	3.126	1.312
2006-10-26	16651.630	1790.360	8643.000	2686.430	898.280	7039.370	3.116	1.292
2006-11-02	16669.070	1807.180	8695.400	2729.980	895.010	7086.740	3.091	1.301
2006-11-09	16364.760	1866.360	8698.500	2722.310	916.620	7161.610	3.094	1.302
2006-11-16	16112.430	1883.350	8735.800	2745.310	920.350	7174.200	3.094	1.291
2006-11-23	16091.730	1971.790	8745.800	2813.180	927.440	7259.540	3.091	1.267

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2006-11-30	15734.600	2050.810	8641.500	2814.810	931.680	7427.360	3.069	1.265
2006-12-07	16321.780	2102.050	8420.300	2836.040	936.820	7613.570	3.086	1.276
2006-12-14	16417.820	2093.640	8540.900	2865.140	934.930	7636.300	3.072	1.273
2006-12-21	16914.310	2273.910	8786.900	2931.290	948.770	7538.820	3.089	1.269
2006-12-28	17104.960	2343.670	8726.700	2942.390	947.390	7652.470	3.094	1.273
2007-01-04	17225.830	2675.470	8785.700	2985.830	932.150	7823.720	3.113	1.279
2007-01-11	17091.590	2641.330	8900.200	3029.040	949.720	7835.570	3.107	1.269
2007-01-18	17057.010	2668.110	9032.800	3009.090	917.770	7761.710	3.116	1.286
2007-01-25	17310.440	2832.210	9155.100	3072.880	943.190	7840.080	3.116	1.291
2007-02-01	17421.930	2882.560	9041.100	3087.740	955.160	7821.320	3.116	1.280
2007-02-08	17547.110	2673.210	9260.500	3217.680	958.260	7777.030	3.111	1.275
2007-02-15	17504.330	2730.390	9292.100	3220.890	982.790	7859.530	3.121	1.267
2007-02-22	17875.650	2998.470	9336.300	3236.930	1001.680	7900.200	3.111	1.272
2007-03-01	18188.420	2998.470	9258.000	3310.440	993.330	7900.200	3.119	1.289
2007-03-08	17217.930	2831.530	8798.700	3078.740	970.720	7670.770	3.119	1.269
2007-03-15	17164.040	2937.910	8933.900	3143.710	982.730	7568.200	3.119	1.237
2007-03-22	16744.150	2930.480	8717.600	3068.750	955.000	7719.800	3.131	1.238
2007-03-29	17480.610	3074.290	9089.800	3205.820	983.790	7859.320	3.106	1.221
2007-04-05	17287.650	3183.980	8977.000	3231.240	981.400	7884.410	3.119	1.208
2007-04-12	17484.780	3323.580	9150.700	3400.000	1027.910	8056.560	3.126	1.197
2007-04-19	17363.950	3518.270	9177.500	3373.590	1030.650	8002.300	3.124	1.211
2007-04-26	17452.620	3584.200	9399.800	3360.670	1043.310	7942.670	3.117	1.213
2007-05-03	17400.410	3759.870	9419.900	3398.600	1063.040	7949.420	3.114	1.202
2007-05-10	17669.830	3841.270	9455.500	3485.760	1094.140	8066.060	3.116	1.217
2007-05-17	17553.720	4021.680	9408.300	3446.920	1087.420	8031.540	3.112	1.219
2007-05-24	17399.580	4030.260	9424.700	3512.400	1111.980	8034.140	3.107	1.209
2007-05-31	17481.210	4179.780	9381.300	3486.630	1087.110	8159.970	3.096	1.184
2007-06-07	17958.880	4000.740	9531.500	3548.320	1123.220	8249.900	3.096	1.198
2007-06-14	17779.090	3913.140	9150.700	3491.590	1117.950	8300.710	3.097	1.181
2007-06-21	17971.490	4132.870	9395.800	3581.160	1123.130	8573.640	3.109	1.182
2007-06-28	18188.630	4091.450	9166.500	3615.380	1115.930	8846.390	3.114	1.168
2007-07-05	18138.360	3820.700	9209.400	3548.200	1100.110	8883.210	3.114	1.157
2007-07-12	18140.940	3781.350	9264.000	3561.960	1140.740	9188.310	3.144	1.137
2007-07-19	18238.950	3914.400	9261.700	3654.610	1149.100	9471.300	3.186	1.139
2007-07-26	18157.930	4058.850	9105.500	3651.380	1143.300	9585.900	3.178	1.164
2007-08-02	17283.810	4345.360	8705.600	3492.700	1145.900	9162.280	3.194	1.171
2007-08-09	16979.860	4560.770	8671.400	3436.040	1075.520	9057.820	3.230	1.272
2007-08-16	16764.090	4749.370	8565.500	3359.180	1065.080	8931.310	3.214	1.230
2007-08-23	15273.680	4656.570	8543.000	3130.710	1025.910	8090.290	3.229	1.222
2007-08-30	16248.970	5107.670	8775.900	3369.450	1027.680	8690.090	3.214	1.209
2007-09-06	16569.090	5218.830	8881.500	3392.910	1043.940	8982.160	3.204	1.191
2007-09-13	16122.160	5277.180	8676.100	3488.970	1020.110	9018.080	3.201	1.157
2007-09-20	16127.420	5312.180	8772.600	3536.400	1043.600	9031.630	3.194	1.140
2007-09-27	16312.610	5454.670	8897.300	3542.220	1063.970	9105.280	3.197	1.126
2007-10-04	16785.690	5552.300	8933.500	3706.230	1095.370	9411.950	3.197	1.106
2007-10-11	17065.040	5552.300	9075.300	3822.620	1127.660	9617.260	3.216	1.118
2007-10-18	17331.170	5903.260	9197.500	3857.250	1154.590	9496.470	3.224	1.104
2007-10-25	16814.370	5818.050	8937.200	3747.980	1157.560	9611.720	3.187	1.089
2007-11-01	16505.630	5589.630	8962.900	3771.550	1188.690	9631.510	3.154	1.079
2007-11-08	16517.480	5777.810	8770.400	3715.320	1189.040	9273.090	3.161	1.121
2007-11-15	15583.420	5315.540	8417.200	3599.670	1176.940	8970.920	3.169	1.150
2007-11-22	15154.610	5316.270	8478.800	3440.960	1154.260	8764.820	3.169	1.133
2007-11-29	15135.210	5032.130	8371.800	3325.890	1109.850	8342.200	3.159	1.146
2007-12-06	15680.670	4871.780	8828.400	3521.270	1129.480	8586.400	3.156	1.144
2007-12-13	15956.370	5091.760	8799.700	3557.950	1154.020	8722.380	3.161	1.166
2007-12-20	15514.510	5007.910	8675.900	3466.380	1120.030	8118.080	3.174	1.140
2007-12-27	15257.000	5101.780	8468.400	3398.100	1129.240	7941.440	3.172	1.134
2008-01-03	15307.780	5261.560	8484.500	3445.820	1159.640	8396.950	3.173	1.125
2008-01-10	14691.410	5361.570	8130.000	3437.790	1159.240	8221.100	3.174	1.133
2008-01-17	14110.790	5484.680	8159.700	3050.090	1105.440	8029.310	3.183	1.138

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2008-01-24	13861.290	5180.510	7692.000	3050.090	1072.280	8184.650	3.172	1.115
2008-01-31	13629.160	4761.690	7686.900	3159.480	998.130	7739.590	3.174	1.118
2008-02-07	13497.160	4320.770	7816.000	3007.800	1016.610	7673.990	3.176	1.107
2008-02-14	13017.240	4599.700	7447.000	2868.290	986.450	7553.300	3.181	1.086
2008-02-21	13622.560	4497.130	7353.000	3088.680	1019.610	7876.370	3.187	1.057
2008-02-28	13500.460	4370.290	7454.800	3048.640	1015.420	8108.710	3.174	1.073
2008-03-06	13603.020	4348.540	7533.900	3026.450	1042.670	8412.760	3.181	1.063
2008-03-13	12782.800	4300.520	7174.100	2866.280	1011.190	8531.380	3.173	1.116
2008-03-20	12241.600	3962.670	7132.000	2839.010	888.210	8161.390	3.194	1.087
2008-03-27	12482.570	3796.580	7234.400	2927.790	946.920	8524.990	3.181	1.093
2008-04-03	12820.470	3580.150	7239.400	3031.900	954.530	8623.480	3.186	1.073
2008-04-10	13293.220	3446.240	7573.500	3155.560	978.090	8729.790	3.208	1.067
2008-04-17	13323.730	3492.890	7259.000	3126.870	975.570	8909.580	3.249	1.065
2008-04-24	13476.450	3094.670	7418.000	3124.870	1017.600	9074.340	3.232	1.071
2008-05-01	13863.470	3557.750	7509.500	3189.200	1004.820	8947.830	3.247	1.061
2008-05-08	14049.260	3761.010	7665.800	3236.100	996.170	8963.630	3.251	1.062
2008-05-15	13655.340	3613.490	7484.000	3162.030	1007.810	8792.390	3.209	1.047
2008-05-22	14219.480	3624.230	7653.700	3241.490	1032.700	9197.410	3.187	1.048
2008-05-29	14012.200	3473.090	7459.900	3122.150	1008.630	8834.730	3.159	1.045
2008-06-05	14338.540	3433.350	7511.300	3192.620	1026.450	8619.080	3.121	1.070
2008-06-12	14489.440	3329.670	7386.400	3146.730	1034.860	8745.350	3.111	1.053
2008-06-19	13973.730	2868.800	7261.400	2979.560	1016.680	8105.590	3.091	1.045
2008-06-26	13942.080	2831.740	7069.400	3001.810	1036.270	7902.440	3.064	1.041
2008-07-03	13544.360	2748.430	6861.500	2955.910	984.400	7548.760	3.058	1.039
2008-07-10	13237.890	2669.890	6772.700	2934.120	927.960	7228.410	3.073	1.026
2008-07-17	13039.690	2856.630	6638.900	2926.840	931.680	7244.760	3.064	1.045
2008-07-24	12803.700	2778.370	6827.300	2847.730	891.310	6815.320	3.059	1.062
2008-07-31	13334.760	2865.100	7015.000	2922.910	949.680	7233.620	3.066	1.102
2008-08-07	13094.590	2801.820	7078.200	2906.070	928.460	7002.540	3.077	1.148
2008-08-14	13168.410	2605.720	7262.100	2807.540	929.580	7209.040	3.074	1.139
2008-08-21	13019.410	2450.610	7235.900	2797.500	917.460	7196.500	3.066	1.160
2008-08-28	12666.040	2405.230	7094.100	2723.300	943.390	6911.640	3.074	1.205
2008-09-04	13072.870	2397.370	7238.700	2739.950	934.230	7046.110	3.145	1.254
2008-09-11	12212.230	2202.450	6976.600	2574.210	910.370	6307.280	3.184	1.252
2008-09-18	12214.760	2079.670	7215.500	2570.670	884.140	6310.680	3.159	1.196
2008-09-25	11920.860	2075.090	7025.200	2559.070	767.570	5970.380	3.174	1.287
2008-10-02	11893.160	2293.780	6815.500	2411.460	810.590	5929.630	3.295	1.426
2008-10-09	10938.140	2173.740	6879.800	2297.120	684.790	5742.230	3.305	1.491
2008-10-16	8276.430	2000.570	5347.200	1948.330	695.740	5020.440	3.315	1.503
2008-10-23	8693.820	1930.650	6099.600	1878.510	709.410	4960.400	3.430	1.494
2008-10-30	7649.080	1839.620	5675.100	1600.280	644.190	4579.620	3.392	1.473
2008-11-06	8576.980	1728.790	6153.200	1794.200	643.310	4870.660	3.382	1.562
2008-11-13	8583.000	1747.710	6008.200	1863.490	683.320	4742.330	3.378	1.616
2008-11-20	8462.390	1986.440	5834.800	1759.140	583.260	4452.700	3.408	1.515
2008-11-27	7910.790	1969.390	5144.000	1662.100	585.410	4171.100	3.500	1.532
2008-12-04	8512.270	1871.160	5816.600	1732.570	569.240	4460.490	3.473	1.476
2008-12-11	7917.510	2018.660	5530.800	1659.170	564.310	4225.070	3.469	1.432
2008-12-18	8235.870	1954.210	5636.200	1740.340	577.750	4481.270	3.452	1.466
2008-12-24	8588.520	2018.460	5459.900	1795.470	579.450	4694.520	3.535	1.432
2008-12-31	8739.520	1851.520	5399.600	1725.610	550.490	4425.080	3.548	1.415
2009-01-08	9043.120	1880.720	5533.600	1829.710	592.330	4698.310	3.537	1.525
2009-01-15	8836.800	1904.860	5697.200	1806.020	610.650	4502.740	3.522	1.530
2009-01-22	8230.150	1954.440	5435.500	1730.450	584.640	4353.700	3.547	1.527
2009-01-29	7745.250	1990.660	5306.900	1685.230	582.950	4259.980	3.552	1.530
2009-02-05	7994.050	2011.680	5290.000	1746.470	607.740	4259.980	3.545	1.537
2009-02-12	8076.620	2181.240	5123.100	1715.350	641.860	4471.250	3.600	1.551
2009-02-19	7779.400	2320.790	5126.800	1705.640	627.950	4592.500	3.650	1.530
2009-02-26	7416.380	2261.480	4851.200	1594.940	601.520	4436.940	3.727	1.561
2009-03-05	7568.420	2082.850	4690.700	1594.870	577.620	4557.150	3.735	1.545
2009-03-12	7173.100	2193.010	4311.600	1513.120	576.060	4653.630	3.745	1.444

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2009-03-19	7569.280	2128.850	4726.700	1577.520	606.360	4897.390	3.770	1.424
2009-03-26	8215.530	2281.090	4787.200	1596.920	633.000	4961.620	3.772	1.395
2009-04-02	8626.970	2374.440	4872.300	1745.660	654.400	5390.700	3.717	1.395
2009-04-09	8749.840	2419.780	5043.000	1820.870	666.260	5529.630	3.725	1.389
2009-04-16	8964.110	2444.230	5070.600	1876.770	717.420	5781.960	3.740	1.407
2009-04-23	8907.580	2503.940	5192.600	1896.560	717.420	5755.380	3.745	1.367
2009-04-30	8707.990	2448.590	5113.000	1852.850	700.210	5880.770	3.738	1.320
2009-05-07	8977.370	2559.910	5225.900	1920.280	728.330	6330.400	3.772	1.321
2009-05-14	9432.830	2625.650	5391.000	2238.210	768.510	6583.870	3.807	1.292
2009-05-21	9265.020	2645.260	5350.700	2139.780	764.960	6489.090	3.788	1.273
2009-05-28	9225.810	2597.600	5409.300	2245.270	784.810	6737.290	3.807	1.252
2009-06-04	9522.500	2721.280	5349.700	2329.080	792.560	6954.100	3.828	1.220
2009-06-11	9768.010	2753.890	5398.900	2396.350	811.460	6767.100	3.850	1.244
2009-06-18	10135.820	2743.760	5521.800	2377.070	817.770	6448.230	3.885	1.252
2009-06-25	9786.260	2880.490	5421.600	2273.180	784.220	6231.150	3.855	1.258
2009-07-02	9877.390	2928.210	5376.000	2317.950	797.790	6463.560	3.839	1.277
2009-07-09	9816.070	3088.370	5338.500	2299.750	779.870	6665.400	3.868	1.247
2009-07-16	9287.280	3113.930	5237.800	2307.980	785.180	6769.860	3.889	1.219
2009-07-23	9395.320	3189.740	5594.100	2430.960	812.090	6850.990	3.869	1.209
2009-07-30	9944.550	3372.600	5760.900	2533.430	840.670	6973.280	3.848	1.191
2009-08-06	10356.830	3412.060	5950.700	2659.200	883.160	7077.710	3.861	1.187
2009-08-13	10412.090	3260.690	6026.400	2549.350	892.040	6882.870	3.883	1.204
2009-08-20	10597.330	3046.970	5985.300	2631.510	858.490	7069.510	3.862	1.197
2009-08-27	10238.200	2960.770	6139.800	2544.860	870.700	6654.800	3.858	1.190
2009-09-03	10534.140	2860.690	6211.600	2642.800	885.020	6809.860	3.848	1.164
2009-09-10	10187.110	2861.610	6119.100	2622.690	885.730	7153.130	3.848	1.146
2009-09-17	10444.330	2989.790	6233.000	2681.030	873.230	7337.140	3.865	1.152
2009-09-24	10370.540	2962.670	6325.100	2647.910	906.450	7526.550	3.840	1.145
2009-10-01	10265.980	2838.840	6236.900	2662.820	923.480	7345.220	3.838	1.102
2009-10-08	9731.870	2911.720	6150.200	2604.530	940.670	7411.880	3.817	1.087
2009-10-15	10016.390	2911.720	6291.600	2652.510	966.130	7571.960	3.842	1.085
2009-10-22	10257.560	2976.630	6345.300	2708.120	972.780	7715.100	3.829	1.094
2009-10-29	10282.990	3107.850	6378.100	2715.340	989.400	7649.280	3.788	1.101
2009-11-05	10034.740	2995.850	6285.800	2651.130	964.970	7340.080	3.807	1.082
2009-11-12	9789.350	3164.040	6293.600	2658.210	978.540	7463.050	3.838	1.089
2009-11-19	9770.310	3187.650	6351.100	2727.230	989.490	7665.630	3.817	1.097
2009-11-26	9497.680	3308.350	6277.500	2761.540	1008.990	7682.970	3.807	1.079
2009-12-03	9081.520	3096.260	6336.700	2762.220	1002.720	7490.910	3.800	1.092
2009-12-10	10022.590	3317.040	6501.200	2791.010	1039.370	7650.910	3.848	1.129
2009-12-17	10107.870	3247.320	6411.600	2800.750	1043.990	7795.070	3.835	1.133
2009-12-24	10142.050	3113.890	6464.300	2802.590	1038.240	7753.630	3.858	1.114
2009-12-31	10494.710	3141.350	6591.000	2855.680	1065.730	7972.590	3.865	1.091
2010-01-07	10654.790	3243.760	6631.400	2894.550	1089.030	8207.850	3.882	1.075
2010-01-14	10798.320	3196.000	6617.900	2922.760	1100.220	8280.900	3.876	1.105
2010-01-21	10982.100	3224.150	6576.000	2908.420	1093.200	8356.890	3.896	1.116
2010-01-28	10590.550	3128.590	6494.000	2819.710	1073.830	7927.310	3.925	1.157
2010-02-04	10198.040	2989.290	6440.700	2745.350	1063.000	7640.440	3.925	1.125
2010-02-11	10057.090	2939.400	6264.300	2683.560	1076.810	7217.830	3.943	1.115
2010-02-18	10092.190	3018.130	6416.200	2758.900	1065.870	7560.040	3.928	1.135
2010-02-25	10123.580	3003.400	6709.700	2757.140	1109.630	7560.040	3.908	1.112
2010-03-04	10126.030	3051.940	6711.000	2750.860	1113.640	7436.100	3.911	1.093
2010-03-11	10368.960	3031.060	6847.800	2790.290	1125.010	7666.260	3.903	1.087
2010-03-18	10751.260	3013.410	6836.600	2881.360	1143.480	7748.330	3.895	1.097
2010-03-25	10824.720	3067.750	6880.800	2915.700	1136.350	7897.910	3.883	1.086
2010-04-01	10996.370	3059.720	6839.000	2906.280	1160.220	7876.860	3.900	1.077
2010-04-08	11286.090	3157.960	6888.900	2968.380	1159.570	8025.930	3.915	1.073
2010-04-15	11204.340	3145.350	6889.000	2971.970	1147.140	8092.030	3.913	1.082
2010-04-22	11102.180	3130.300	6893.700	3007.190	1157.780	8111.570	3.912	1.078
2010-04-29	10914.460	2983.540	6768.000	2988.490	1136.970	8004.890	3.912	1.119
2010-05-06	11057.400	2870.610	6616.800	2974.610	1118.580	8004.250	3.935	1.111

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Date	Japan Nikke225	China SSECI	Switzerland SMI	Singapore STI	Israel TA100	Taiwan TWII	Argintina ARS/USD	Australia AUD/USD
2010-05-13	10364.590	2688.380	6205.600	2821.110	1092.660	7567.100	3.958	1.212
2010-05-20	10462.510	2696.630	6428.700	2855.210	1089.820	7772.130	3.955	1.181
2010-05-27	9784.540	2583.520	6206.600	2701.200	1031.340	7237.710	3.995	1.188
2010-06-03	9762.980	2655.770	6321.900	2739.700	1012.110	7295.320	4.040	1.181
2010-06-10	9901.190	2553.590	6299.000	2806.510	1006.900	7344.590	4.025	1.156
2010-06-17	9705.250	2569.940	6426.700	2796.290	1012.310	7299.490	4.020	1.152
2010-06-24	9995.020	2513.220	6447.100	2833.400	1058.240	7493.110	3.999	1.179
2010-06-30	9737.480	2552.820	6275.400	2851.640	1039.470	7474.710	3.972	1.149
2010-07-08	9203.710	2382.900	5974.300	2844.190	990.340	7330.740	4.000	1.139
2010-07-15	9585.320	2470.920	6210.500	2917.170	1031.600	7647.250	4.014	1.121
2010-07-22	9408.360	2424.270	6184.400	2957.720	1016.710	7664.570	4.026	1.114
2010-07-29	9430.960	2572.030	6201.300	2973.470	1032.190	7761.220	4.002	1.095
2010-08-05	9537.300	2637.500	6200.800	2987.700	1032.280	7760.630	4.002	1.116
2010-08-12	9642.120	2658.390	6321.400	2995.060	1073.730	7963.300	4.000	1.120
2010-08-19	9253.460	2606.700	6294.300	2939.970	1054.890	7891.580	4.018	1.126
2010-08-26	9179.380	2642.310	6185.800	2936.480	1071.060	7927.310	3.997	1.099
2010-09-02	8991.060	2610.740	6183.100	2938.740	1053.640	7722.910	3.988	1.081
2010-09-09	9114.130	2655.390	6400.700	3002.560	1087.400	7830.210	4.002	1.069
2010-09-16	9239.170	2663.210	6467.700	3022.280	1098.330	7890.110	4.018	1.049
2010-09-23	9626.090	2598.690	6389.000	3076.370	1111.850	8158.330	4.023	1.037
2010-09-30	9471.670	2627.970	6360.800	3092.680	1130.570	8166.620	4.007	1.019
2010-10-07	9404.230	2738.740	6284.200	3130.900	1127.010	8244.180	4.018	1.006
2010-10-14	9588.880	2738.740	6363.200	3153.340	1144.410	8244.190	4.043	1.017
2010-10-21	9500.250	2971.160	6443.000	3204.270	1161.240	8205.300	4.037	1.022
2010-10-28	9426.710	2975.040	6477.100	3173.570	1175.100	8168.060	4.031	0.986
2010-11-04	9202.450	2978.830	6472.200	3142.620	1161.720	8287.090	4.020	0.998
2010-11-10	9625.990	3129.500	6587.700	3240.310	1164.370	8449.340	4.055	1.011
2010-11-18	9724.810	2985.430	6505.300	3252.000	1165.590	8316.050	4.071	1.019
2010-11-25	10022.390	2888.570	6590.800	3197.370	1167.810	8306.120	4.071	1.023
2010-12-02	10039.560	2871.700	6483.600	3158.080	1164.920	8312.150	4.029	1.018
2010-12-09	10178.320	2842.430	6440.900	3172.440	1156.570	8624.010	4.068	1.014
2010-12-16	10211.950	2841.040	6519.100	3185.420	1201.990	8718.830	4.082	0.995
2010-12-23	10303.830	2893.740	6538.200	3153.010	1215.950	8817.900	4.112	0.988
2010-12-30	10279.190	2835.160	6599.400	3143.800	1203.740	8861.100	4.105	0.977

APPENDIX C2
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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2000-01-06	1.813	1.449	1.571	8.278	0.971	0.610	7.778	7154.500
2000-01-13	1.778	1.448	1.591	8.279	0.987	0.611	7.779	7180.500
2000-01-20	1.778	1.434	1.631	8.280	0.990	0.605	7.779	7234.600
2000-01-27	1.773	1.441	1.628	8.279	1.024	0.617	7.780	7414.600
2000-02-03	1.769	1.450	1.629	8.276	1.024	0.629	7.781	7634.800
2000-02-10	1.776	1.452	1.627	8.279	1.016	0.628	7.782	7254.100
2000-02-17	1.778	1.458	1.620	8.279	1.015	0.625	7.781	7328.900
2000-02-24	1.758	1.454	1.670	8.278	1.025	0.628	7.783	7256.800
2000-03-02	1.734	1.457	1.660	8.279	1.040	0.632	7.783	7287.500
2000-03-09	1.735	1.472	1.659	8.280	1.035	0.633	7.784	7354.800
2000-03-16	1.723	1.473	1.651	8.278	1.031	0.636	7.785	7432.300
2000-03-23	1.752	1.455	1.661	8.280	1.028	0.629	7.784	7434.600
2000-03-30	1.744	1.452	1.639	8.277	1.045	0.628	7.787	7622.300
2000-04-06	1.763	1.466	1.651	8.278	1.043	0.632	7.787	7566.900
2000-04-13	1.781	1.473	1.677	8.278	1.045	0.630	7.788	7594.700
2000-04-20	1.810	1.479	1.731	8.276	1.064	0.633	7.789	7840.400
2000-04-27	1.813	1.498	1.735	8.279	1.100	0.642	7.789	7909.300
2000-05-04	1.818	1.489	1.725	8.279	1.117	0.654	7.790	7956.100
2000-05-11	1.830	1.501	1.737	8.276	1.101	0.659	7.790	8443.100
2000-05-18	1.845	1.506	1.720	8.278	1.118	0.673	7.791	8373.000
2000-05-25	1.820	1.491	1.688	8.279	1.074	0.672	7.792	8490.400
2000-06-01	1.798	1.480	1.639	8.278	1.060	0.663	7.792	8226.700
2000-06-08	1.811	1.476	1.638	8.276	1.050	0.663	7.793	8460.800
2000-06-15	1.812	1.473	1.646	8.275	1.036	0.659	7.794	8429.700
2000-06-22	1.817	1.482	1.637	8.278	1.068	0.666	7.792	8671.400
2000-06-29	1.796	1.485	1.624	8.279	1.047	0.661	7.796	8740.000
2000-07-06	1.807	1.481	1.658	8.281	1.054	0.660	7.796	9280.600
2000-07-13	1.801	1.475	1.669	8.282	1.067	0.667	7.796	9387.100
2000-07-20	1.784	1.471	1.661	8.282	1.070	0.659	7.797	8828.600
2000-07-27	1.802	1.484	1.709	8.282	1.081	0.665	7.798	8968.000
2000-08-03	1.796	1.482	1.707	8.281	1.102	0.665	7.799	8818.100
2000-08-10	1.809	1.476	1.708	8.281	1.106	0.665	7.800	8483.200
2000-08-17	1.821	1.487	1.712	8.279	1.103	0.671	7.799	8326.000
2000-08-24	1.820	1.472	1.742	8.280	1.108	0.678	7.800	8379.100
2000-08-31	1.821	1.478	1.772	8.277	1.112	0.685	7.799	8340.300
2000-09-07	1.832	1.487	1.773	8.277	1.154	0.704	7.799	8404.500
2000-09-14	1.853	1.487	1.772	8.276	1.166	0.714	7.797	8607.900
2000-09-21	1.848	1.503	1.729	8.281	1.137	0.686	7.798	8790.200
2000-09-28	1.851	1.495	1.750	8.280	1.131	0.676	7.797	8795.300
2000-10-05	1.861	1.508	1.741	8.279	1.151	0.692	7.796	8804.800
2000-10-12	1.874	1.511	1.787	8.279	1.167	0.685	7.797	8957.600
2000-10-19	1.946	1.519	1.821	8.280	1.190	0.692	7.797	8861.300
2000-10-26	1.919	1.533	1.780	8.278	1.189	0.689	7.800	9143.000
2000-11-02	1.962	1.545	1.774	8.278	1.160	0.690	7.797	9180.300
2000-11-09	1.947	1.552	1.788	8.279	1.160	0.699	7.799	9191.000
2000-11-16	1.944	1.543	1.811	8.279	1.174	0.703	7.800	9361.800
2000-11-23	1.972	1.536	1.736	8.278	1.193	0.714	7.800	9328.900
2000-11-30	1.974	1.522	1.702	8.278	1.141	0.696	7.800	9472.100
2000-12-07	1.964	1.517	1.699	8.275	1.131	0.692	7.796	9555.600
2000-12-14	1.953	1.519	1.672	8.275	1.113	0.677	7.800	9329.500
2000-12-21	1.955	1.507	1.645	8.276	1.083	0.676	7.799	9352.600
2000-12-28	1.938	1.498	1.611	8.278	1.065	0.669	7.800	9623.100
2001-01-04	1.949	1.498	1.613	8.279	1.049	0.667	7.799	9468.300
2001-01-11	1.953	1.516	1.617	8.275	1.054	0.677	7.800	9577.300
2001-01-18	1.974	1.508	1.655	8.279	1.067	0.681	7.799	9405.200
2001-01-25	1.982	1.495	1.633	8.277	1.086	0.686	7.800	9403.400
2001-02-01	1.992	1.511	1.670	8.276	1.069	0.680	7.799	9506.900
2001-02-08	1.983	1.528	1.692	8.275	1.079	0.690	7.800	9572.900
2001-02-15	2.043	1.538	1.690	8.278	1.091	0.689	7.800	9380.300
2001-02-22	2.043	1.546	1.655	8.280	1.099	0.691	7.800	9605.000

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2001-03-01	2.044	1.549	1.660	8.276	1.071	0.679	7.800	9790.200
2001-03-08	2.101	1.560	1.701	8.278	1.073	0.681	7.800	9398.300
2001-03-15	2.145	1.573	1.724	8.276	1.120	0.701	7.799	9397.800
2001-03-22	2.142	1.572	1.732	8.279	1.120	0.700	7.800	9398.100
2001-03-29	2.167	1.579	1.702	8.278	1.138	0.705	7.799	10393.000
2001-04-05	2.160	1.560	1.705	8.275	1.111	0.695	7.798	10799.000
2001-04-12	2.195	1.547	1.717	8.278	1.128	0.696	7.799	10792.500
2001-04-19	2.265	1.545	1.705	8.276	1.107	0.693	7.799	11679.100
2001-04-26	2.237	1.533	1.736	8.277	1.120	0.696	7.799	11754.700
2001-05-03	2.280	1.539	1.748	8.279	1.119	0.696	7.799	10950.200
2001-05-10	2.305	1.536	1.739	8.275	1.142	0.705	7.800	11259.800
2001-05-17	2.353	1.547	1.779	8.279	1.140	0.698	7.800	11374.000
2001-05-24	2.357	1.546	1.798	8.279	1.166	0.704	7.800	11457.700
2001-05-31	2.388	1.521	1.791	8.275	1.183	0.706	7.800	11436.400
2001-06-07	2.423	1.521	1.776	8.278	1.175	0.724	7.799	11201.200
2001-06-14	2.387	1.526	1.780	8.278	1.158	0.711	7.799	11158.300
2001-06-21	2.289	1.523	1.796	8.278	1.167	0.707	7.800	11346.100
2001-06-28	2.422	1.510	1.818	8.278	1.180	0.710	7.800	11298.600
2001-07-05	2.575	1.528	1.772	8.277	1.181	0.709	7.800	11321.300
2001-07-12	2.492	1.542	1.732	8.275	1.173	0.714	7.800	11317.500
2001-07-19	2.486	1.534	1.723	8.276	1.148	0.700	7.800	11133.700
2001-07-26	2.480	1.541	1.712	8.277	1.143	0.701	7.800	10003.900
2001-08-02	2.463	1.539	1.694	8.278	1.131	0.701	7.799	9490.600
2001-08-09	2.494	1.531	1.661	8.276	1.118	0.700	7.799	9011.600
2001-08-16	2.530	1.542	1.658	8.279	1.091	0.691	7.800	8760.800
2001-08-23	2.544	1.546	1.657	8.277	1.096	0.692	7.800	8706.200
2001-08-30	2.584	1.558	1.691	8.276	1.100	0.689	7.800	8844.000
2001-09-06	2.723	1.569	1.652	8.278	1.106	0.684	7.800	9167.800
2001-09-13	2.737	1.570	1.592	8.278	1.086	0.681	7.800	9094.800
2001-09-20	2.713	1.579	1.613	8.277	1.098	0.687	7.800	9404.200
2001-09-27	2.731	1.566	1.624	8.278	1.099	0.680	7.800	9687.100
2001-10-04	2.781	1.568	1.647	8.277	1.091	0.675	7.800	9883.500
2001-10-11	2.747	1.576	1.636	8.277	1.101	0.689	7.800	9972.600
2001-10-18	2.730	1.577	1.648	8.277	1.113	0.696	7.799	10101.300
2001-10-25	2.685	1.591	1.627	8.278	1.121	0.697	7.800	10295.400
2001-11-01	2.555	1.598	1.645	8.276	1.106	0.684	7.800	10685.900
2001-11-08	2.545	1.587	1.665	8.278	1.119	0.686	7.800	10403.200
2001-11-15	2.543	1.600	1.660	8.279	1.130	0.700	7.799	10654.400
2001-11-22	2.518	1.583	1.654	8.277	1.140	0.709	7.799	10513.800
2001-11-29	2.425	1.577	1.655	8.277	1.117	0.702	7.799	10478.700
2001-12-06	2.388	1.568	1.642	8.277	1.123	0.699	7.799	10344.700
2001-12-13	2.321	1.578	1.637	8.277	1.106	0.687	7.800	10217.700
2001-12-20	2.332	1.595	1.678	8.277	1.128	0.695	7.797	10157.700
2001-12-27	2.289	1.597	1.649	8.278	1.133	0.691	7.797	10497.400
2002-01-03	2.394	1.601	1.661	8.279	1.117	0.692	7.798	10441.200
2002-01-10	2.361	1.611	1.667	8.277	1.123	0.692	7.798	10439.200
2002-01-17	2.398	1.602	1.675	8.275	1.131	0.696	7.799	10407.700
2002-01-24	2.407	1.592	1.720	8.276	1.155	0.709	7.799	10440.900
2002-01-31	2.454	1.599	1.696	8.275	1.161	0.706	7.800	10329.200
2002-02-07	2.427	1.592	1.701	8.279	1.146	0.705	7.799	10239.800
2002-02-14	2.423	1.591	1.698	8.275	1.145	0.698	7.799	10265.800
2002-02-21	2.359	1.605	1.703	8.276	1.142	0.699	7.799	10219.900
2002-02-28	2.365	1.582	1.672	8.276	1.156	0.705	7.800	10096.200
2002-03-07	2.345	1.594	1.659	8.278	1.143	0.703	7.800	10035.400
2002-03-14	2.348	1.581	1.657	8.276	1.133	0.702	7.800	9973.600
2002-03-21	2.324	1.594	1.684	8.278	1.137	0.701	7.800	9854.400
2002-03-28	2.304	1.593	1.666	8.278	1.135	0.694	7.799	9752.400
2002-04-04	2.272	1.588	1.660	8.277	1.136	0.697	7.800	9521.600
2002-04-11	2.336	1.575	1.648	8.279	1.137	0.696	7.800	9565.100
2002-04-18	2.374	1.563	1.631	8.276	1.124	0.691	7.799	9356.500

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2002-04-25	2.379	1.562	1.610	8.277	1.113	0.687	7.799	9304.800
2002-05-02	2.457	1.569	1.600	8.277	1.095	0.682	7.799	9314.300
2002-05-09	2.492	1.555	1.599	8.278	1.097	0.685	7.799	9271.400
2002-05-16	2.543	1.534	1.575	8.276	1.086	0.685	7.799	9072.900
2002-05-23	2.512	1.534	1.562	8.278	1.085	0.686	7.800	8975.400
2002-05-30	2.653	1.533	1.559	8.275	1.071	0.684	7.800	8679.000
2002-06-06	2.634	1.539	1.564	8.276	1.059	0.685	7.800	8908.700
2002-06-13	2.758	1.531	1.523	8.278	1.058	0.679	7.800	8659.200
2002-06-20	2.866	1.511	1.488	8.275	1.030	0.667	7.800	8653.400
2002-06-27	2.852	1.532	1.496	8.277	1.014	0.656	7.800	8728.200
2002-07-04	2.832	1.522	1.479	8.276	1.028	0.658	7.800	8859.900
2002-07-11	2.861	1.544	1.455	8.275	1.010	0.645	7.800	9054.400
2002-07-18	2.999	1.573	1.449	8.277	0.985	0.634	7.800	8791.400
2002-07-25	3.280	1.587	1.470	8.278	1.012	0.640	7.800	9170.500
2002-08-01	2.930	1.581	1.515	8.275	1.012	0.636	7.800	9075.400
2002-08-08	3.200	1.558	1.491	8.275	1.029	0.656	7.800	8984.600
2002-08-15	3.169	1.557	1.518	8.275	1.017	0.650	7.800	8814.100
2002-08-22	3.127	1.560	1.494	8.278	1.028	0.657	7.800	8890.300
2002-08-29	3.141	1.567	1.473	8.279	1.019	0.646	7.800	8857.400
2002-09-05	3.109	1.585	1.503	8.276	1.016	0.641	7.800	8883.000
2002-09-12	3.406	1.573	1.490	8.268	1.026	0.642	7.800	8958.800
2002-09-19	3.768	1.577	1.503	8.278	1.016	0.643	7.800	9040.200
2002-09-26	3.638	1.590	1.480	8.278	1.023	0.643	7.800	9015.400
2002-10-03	3.940	1.592	1.484	8.276	1.018	0.637	7.800	9006.800
2002-10-10	3.870	1.572	1.509	8.275	1.015	0.641	7.800	9027.300
2002-10-17	3.852	1.561	1.506	8.277	1.030	0.647	7.799	9193.600
2002-10-24	3.624	1.560	1.480	8.278	1.024	0.644	7.799	9219.400
2002-10-31	3.628	1.553	1.451	8.278	1.003	0.639	7.800	9216.600
2002-11-07	3.702	1.575	1.461	8.275	0.986	0.628	7.799	9202.300
2002-11-14	3.541	1.579	1.470	8.278	0.992	0.633	7.800	9036.000
2002-11-21	3.583	1.574	1.483	8.279	1.003	0.634	7.799	8978.400
2002-11-28	3.745	1.561	1.473	8.277	1.007	0.643	7.799	8996.600
2002-12-05	3.777	1.555	1.449	8.279	0.992	0.636	7.799	8998.300
2002-12-12	3.466	1.548	1.433	8.280	0.978	0.629	7.799	8864.800
2002-12-19	3.505	1.548	1.409	8.278	0.974	0.624	7.798	8870.900
2002-12-24	3.540	1.575	1.401	8.279	0.961	0.624	7.799	8911.400
2003-01-02	3.306	1.554	1.394	8.278	0.960	0.623	7.799	8951.400
2003-01-09	3.292	1.536	1.384	8.278	0.949	0.622	7.799	8908.100
2003-01-16	3.527	1.524	1.359	8.277	0.938	0.618	7.799	8875.200
2003-01-23	3.560	1.531	1.363	8.280	0.924	0.613	7.799	8901.200
2003-01-30	3.600	1.522	1.354	8.278	0.931	0.608	7.800	8889.500
2003-02-06	3.635	1.520	1.356	8.276	0.926	0.614	7.799	8843.600
2003-02-13	3.625	1.504	1.358	8.279	0.926	0.621	7.799	8934.100
2003-02-20	3.564	1.495	1.359	8.279	0.927	0.630	7.799	8907.700
2003-02-27	3.525	1.471	1.332	8.279	0.928	0.635	7.799	8904.800
2003-03-06	3.425	1.485	1.349	8.278	0.908	0.624	7.799	8886.100
2003-03-13	3.479	1.478	1.386	8.278	0.932	0.632	7.799	8928.900
2003-03-20	3.400	1.468	1.381	8.276	0.949	0.639	7.799	9034.500
2003-03-27	3.239	1.475	1.381	8.278	0.929	0.638	7.799	8895.800
2003-04-03	3.214	1.457	1.383	8.278	0.933	0.641	7.800	8866.900
2003-04-10	3.033	1.450	1.376	8.279	0.930	0.636	7.800	8851.200
2003-04-17	3.000	1.458	1.359	8.279	0.921	0.641	7.800	8657.100
2003-04-24	2.911	1.419	1.343	8.278	0.906	0.628	7.800	8754.200
2003-05-01	2.902	1.395	1.318	8.275	0.893	0.624	7.799	8672.600
2003-05-08	2.912	1.376	1.313	8.275	0.870	0.623	7.799	8544.200
2003-05-15	2.985	1.368	1.294	8.277	0.866	0.616	7.799	8436.400
2003-05-22	2.931	1.377	1.289	8.275	0.848	0.611	7.799	8248.500
2003-05-29	2.880	1.340	1.297	8.277	0.850	0.610	7.799	8307.900
2003-06-05	2.866	1.349	1.310	8.275	0.855	0.602	7.799	8156.600
2003-06-12	2.888	1.350	1.324	8.275	0.845	0.600	7.799	8196.900

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	Brazil	Canada	Switzerland	China	Euroland	England	Hong Kong	Indonesia
Date	BRL/USD	CAD/USD	CHF/USD	CNY/USD	EUR/USD	GBP/USD	HKD/USD	IDR/USD
2003-06-19	2.891	1.354	1.348	8.276	0.861	0.601	7.799	8237.600
2003-06-26	2.832	1.337	1.345	8.275	0.875	0.606	7.798	8275.500
2003-07-03	2.890	1.382	1.362	8.276	0.870	0.599	7.798	8176.200
2003-07-10	2.860	1.397	1.377	8.277	0.885	0.613	7.799	8191.100
2003-07-17	2.884	1.396	1.352	8.276	0.889	0.630	7.799	8351.500
2003-07-24	2.965	1.407	1.374	8.278	0.869	0.617	7.799	8525.900
2003-07-31	2.997	1.393	1.348	8.278	0.888	0.623	7.799	8514.600
2003-08-07	2.999	1.393	1.372	8.279	0.883	0.622	7.800	8549.100
2003-08-14	3.001	1.407	1.407	8.279	0.888	0.626	7.799	8563.000
2003-08-21	2.952	1.397	1.412	8.276	0.920	0.635	7.799	8442.500
2003-08-28	2.941	1.373	1.413	8.277	0.910	0.634	7.799	8497.500
2003-09-04	2.900	1.371	1.387	8.279	0.903	0.629	7.799	8463.600
2003-09-11	2.891	1.364	1.386	8.277	0.884	0.622	7.799	8465.800
2003-09-18	2.922	1.347	1.346	8.275	0.881	0.613	7.799	8473.000
2003-09-25	2.882	1.338	1.314	8.276	0.871	0.602	7.750	8413.700
2003-10-02	2.849	1.340	1.324	8.276	0.862	0.601	7.711	8386.200
2003-10-09	2.840	1.315	1.326	8.278	0.846	0.600	7.732	8357.600
2003-10-16	2.864	1.309	1.313	8.277	0.860	0.598	7.745	8417.900
2003-10-23	2.848	1.307	1.325	8.279	0.845	0.589	7.753	8486.400
2003-10-30	2.876	1.336	1.374	8.277	0.861	0.590	7.768	8514.200
2003-11-06	2.941	1.300	1.342	8.278	0.869	0.599	7.769	8485.300
2003-11-13	2.943	1.302	1.303	8.279	0.852	0.594	7.754	8521.600
2003-11-20	2.942	1.308	1.301	8.275	0.839	0.587	7.763	8522.200
2003-11-27	2.940	1.312	1.291	8.279	0.834	0.581	7.765	8479.100
2003-12-04	2.941	1.326	1.275	8.279	0.823	0.579	7.763	8470.800
2003-12-11	2.930	1.329	1.256	8.277	0.814	0.572	7.763	8483.900
2003-12-18	2.915	1.311	1.246	8.275	0.808	0.566	7.766	8479.100
2003-12-24	2.880	1.292	1.238	8.279	0.801	0.565	7.763	8454.200
2003-12-31	2.850	1.279	1.226	8.277	0.794	0.558	7.764	8431.400
2004-01-08	2.809	1.298	1.242	8.277	0.778	0.541	7.763	8350.000
2004-01-15	2.839	1.297	1.234	8.275	0.807	0.556	7.766	8372.900
2004-01-22	2.947	1.334	1.261	8.275	0.793	0.549	7.766	8409.600
2004-01-29	2.928	1.332	1.244	8.278	0.803	0.549	7.778	8448.400
2004-02-05	2.900	1.319	1.230	8.275	0.788	0.542	7.773	8465.600
2004-02-12	2.948	1.328	1.243	8.276	0.784	0.531	7.771	8429.500
2004-02-19	2.939	1.343	1.266	8.276	0.796	0.536	7.775	8452.800
2004-02-26	2.888	1.332	1.290	8.276	0.804	0.538	7.784	8481.600
2004-03-04	2.907	1.323	1.278	8.277	0.806	0.543	7.786	8618.300
2004-03-11	2.917	1.329	1.256	8.277	0.820	0.557	7.794	8685.100
2004-03-18	2.933	1.330	1.275	8.276	0.815	0.548	7.793	8587.100
2004-03-25	2.890	1.310	1.263	8.276	0.827	0.552	7.797	8627.500
2004-04-01	2.878	1.326	1.283	8.277	0.826	0.546	7.786	8598.700
2004-04-08	2.910	1.347	1.303	8.275	0.829	0.545	7.796	8573.700
2004-04-15	2.928	1.359	1.313	8.278	0.831	0.555	7.799	8618.600
2004-04-22	2.954	1.370	1.295	8.275	0.847	0.566	7.800	8614.600
2004-04-29	2.993	1.378	1.283	8.276	0.835	0.564	7.800	8786.500
2004-05-06	3.113	1.397	1.306	8.275	0.841	0.560	7.800	8714.500
2004-05-13	3.114	1.370	1.289	8.275	0.842	0.569	7.800	9042.200
2004-05-20	3.147	1.358	1.246	8.279	0.833	0.559	7.790	9033.600
2004-05-27	3.144	1.361	1.252	8.277	0.819	0.546	7.794	9291.200
2004-06-03	3.108	1.357	1.244	8.278	0.816	0.544	7.797	9442.000
2004-06-10	3.123	1.375	1.255	8.275	0.832	0.550	7.795	9411.700
2004-06-17	3.102	1.343	1.242	8.275	0.825	0.544	7.799	9409.700
2004-06-24	3.101	1.340	1.252	8.274	0.823	0.549	7.797	9431.500
2004-06-30	3.042	1.316	1.225	8.279	0.812	0.546	7.800	9139.300
2004-07-08	3.020	1.324	1.237	8.277	0.807	0.539	7.800	8925.000
2004-07-15	3.041	1.313	1.246	8.274	0.804	0.534	7.800	8902.000
2004-07-22	3.032	1.325	1.275	8.275	0.825	0.546	7.800	9115.200
2004-07-29	3.058	1.318	1.276	8.278	0.831	0.550	7.800	9104.100
2004-08-05	3.033	1.333	1.259	8.277	0.815	0.542	7.797	9159.400

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2004-08-12	2.976	1.296	1.241	8.278	0.809	0.543	7.799	9223.900
2004-08-19	2.954	1.312	1.275	8.277	0.811	0.549	7.800	9203.500
2004-08-26	2.937	1.300	1.261	8.278	0.832	0.558	7.800	9292.900
2004-09-02	2.906	1.288	1.264	8.274	0.830	0.563	7.800	9290.000
2004-09-09	2.887	1.289	1.268	8.276	0.814	0.556	7.800	9264.000
2004-09-16	2.871	1.278	1.257	8.278	0.821	0.558	7.800	9025.700
2004-09-23	2.853	1.264	1.247	8.277	0.816	0.555	7.799	9112.900
2004-09-30	2.851	1.258	1.265	8.278	0.806	0.556	7.797	9152.200
2004-10-07	2.865	1.253	1.245	8.278	0.805	0.557	7.786	9067.400
2004-10-14	2.846	1.243	1.217	8.274	0.801	0.554	7.788	9071.700
2004-10-21	2.866	1.220	1.197	8.275	0.791	0.547	7.787	9102.200
2004-10-28	2.814	1.205	1.187	8.278	0.784	0.545	7.784	9109.700
2004-11-04	2.819	1.198	1.180	8.279	0.772	0.539	7.772	9078.000
2004-11-10	2.768	1.207	1.170	8.275	0.771	0.539	7.772	8966.200
2004-11-18	2.747	1.180	1.141	8.278	0.766	0.538	7.772	8959.400
2004-11-25	2.731	1.190	1.152	8.275	0.753	0.527	7.773	8987.800
2004-12-02	2.785	1.226	1.155	8.275	0.747	0.516	7.773	9078.800
2004-12-09	2.738	1.236	1.155	8.275	0.756	0.523	7.775	9220.300
2004-12-16	2.697	1.236	1.145	8.277	0.752	0.516	7.780	9289.400
2004-12-23	2.653	1.206	1.134	8.279	0.739	0.520	7.783	9244.400
2004-12-30	2.719	1.237	1.174	8.276	0.739	0.522	7.773	9258.500
2005-01-06	2.700	1.200	1.172	8.278	0.766	0.535	7.792	9279.000
2005-01-13	2.726	1.233	1.191	8.279	0.763	0.535	7.796	9177.400
2005-01-20	2.665	1.237	1.186	8.278	0.767	0.534	7.799	9182.000
2005-01-27	2.605	1.243	1.203	8.274	0.767	0.530	7.800	9133.100
2005-02-03	2.612	1.241	1.209	8.278	0.774	0.530	7.799	9189.700
2005-02-10	2.566	1.230	1.183	8.277	0.777	0.536	7.800	9307.500
2005-02-17	2.602	1.242	1.169	8.277	0.765	0.528	7.800	9247.400
2005-02-24	2.697	1.246	1.180	8.275	0.758	0.522	7.800	9259.700
2005-03-03	2.729	1.205	1.155	8.275	0.755	0.520	7.800	9337.900
2005-03-10	2.734	1.202	1.157	8.274	0.742	0.519	7.799	9333.300
2005-03-17	2.742	1.215	1.199	8.279	0.751	0.521	7.799	9396.900
2005-03-24	2.667	1.210	1.196	8.279	0.777	0.536	7.800	9485.300
2005-03-31	2.596	1.221	1.202	8.277	0.776	0.532	7.799	9489.800
2005-04-07	2.577	1.242	1.213	8.278	0.775	0.531	7.799	9493.000
2005-04-14	2.550	1.239	1.179	8.277	0.774	0.528	7.799	9553.100
2005-04-21	2.527	1.251	1.192	8.278	0.765	0.522	7.796	9642.200
2005-04-28	2.471	1.245	1.197	8.277	0.774	0.523	7.795	9594.700
2005-05-05	2.461	1.249	1.215	8.274	0.779	0.529	7.793	9490.100
2005-05-12	2.447	1.262	1.223	8.277	0.791	0.540	7.799	9491.700
2005-05-19	2.410	1.268	1.236	8.277	0.797	0.548	7.791	9426.100
2005-05-26	2.417	1.248	1.252	8.279	0.796	0.549	7.777	9461.700
2005-06-02	2.489	1.255	1.255	8.278	0.818	0.552	7.783	9604.600
2005-06-09	2.412	1.238	1.274	8.278	0.825	0.552	7.778	9610.000
2005-06-16	2.395	1.231	1.278	8.279	0.817	0.548	7.774	9644.500
2005-06-23	2.359	1.226	1.283	8.275	0.827	0.549	7.772	9629.700
2005-06-30	2.387	1.229	1.298	8.274	0.840	0.568	7.774	9842.100
2005-07-07	2.338	1.207	1.290	8.275	0.838	0.576	7.774	9766.400
2005-07-14	2.348	1.218	1.289	8.108	0.831	0.571	7.777	9764.800
2005-07-21	2.414	1.234	1.288	8.108	0.828	0.575	7.774	9821.800
2005-07-28	2.302	1.212	1.258	8.102	0.825	0.568	7.775	9807.200
2005-08-04	2.336	1.203	1.249	8.098	0.811	0.564	7.772	9749.600
2005-08-11	2.368	1.218	1.271	8.100	0.805	0.551	7.770	9792.600
2005-08-18	2.426	1.189	1.256	8.101	0.823	0.557	7.772	9950.000
2005-08-25	2.367	1.185	1.239	8.094	0.812	0.554	7.769	10397.400
2005-09-01	2.319	1.182	1.245	8.076	0.797	0.543	7.767	10332.200
2005-09-08	2.303	1.186	1.266	8.077	0.805	0.544	7.765	10227.000
2005-09-15	2.290	1.167	1.279	8.078	0.819	0.554	7.761	10111.100
2005-09-22	2.224	1.173	1.297	8.075	0.828	0.562	7.759	10182.600
2005-09-29	2.277	1.182	1.275	8.075	0.829	0.565	7.757	10275.200

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2005-10-06	2.262	1.184	1.299	8.074	0.825	0.568	7.755	10041.000
2005-10-13	2.238	1.177	1.292	8.076	0.828	0.566	7.757	10133.300
2005-10-20	2.286	1.170	1.273	8.073	0.836	0.565	7.755	10039.800
2005-10-27	2.221	1.182	1.290	8.067	0.827	0.562	7.753	10060.700
2005-11-03	2.174	1.188	1.310	8.080	0.846	0.571	7.753	10094.900
2005-11-10	2.185	1.186	1.321	8.081	0.857	0.576	7.756	9967.500
2005-11-17	2.236	1.171	1.316	8.079	0.852	0.583	7.753	10086.400
2005-11-24	2.210	1.169	1.321	8.077	0.853	0.583	7.754	10079.300
2005-12-01	2.213	1.157	1.300	8.077	0.854	0.578	7.755	10023.300
2005-12-08	2.297	1.158	1.288	8.073	0.846	0.570	7.754	9813.600
2005-12-15	2.325	1.167	1.310	8.075	0.832	0.565	7.752	9883.800
2005-12-22	2.330	1.165	1.314	8.070	0.843	0.577	7.753	9872.000
2005-12-29	2.282	1.162	1.277	8.062	0.845	0.582	7.754	9880.500
2006-01-05	2.263	1.163	1.286	8.062	0.823	0.565	7.754	9547.500
2006-01-12	2.333	1.166	1.282	8.067	0.826	0.564	7.752	9365.300
2006-01-19	2.230	1.150	1.269	8.061	0.826	0.566	7.755	9454.100
2006-01-26	2.228	1.143	1.285	8.062	0.824	0.564	7.757	9404.900
2006-02-02	2.172	1.145	1.301	8.054	0.832	0.568	7.758	9326.000
2006-02-09	2.117	1.158	1.314	8.046	0.839	0.573	7.759	9233.600
2006-02-16	2.139	1.151	1.308	8.045	0.840	0.575	7.761	9217.600
2006-02-23	2.116	1.132	1.304	8.036	0.842	0.573	7.758	9288.700
2006-03-02	2.167	1.160	1.314	8.052	0.831	0.570	7.759	9154.800
2006-03-09	2.105	1.154	1.293	8.040	0.841	0.580	7.762	9210.300
2006-03-16	2.157	1.166	1.316	8.030	0.820	0.569	7.758	9124.400
2006-03-23	2.192	1.163	1.299	8.024	0.831	0.574	7.759	9120.300
2006-03-30	2.137	1.153	1.292	8.010	0.824	0.575	7.760	9118.000
2006-04-06	2.139	1.152	1.298	8.017	0.826	0.575	7.759	8958.600
2006-04-13	2.125	1.139	1.278	8.014	0.815	0.565	7.759	9018.100
2006-04-20	2.106	1.124	1.261	8.019	0.810	0.561	7.755	8885.200
2006-04-27	2.065	1.107	1.230	8.015	0.792	0.549	7.753	8821.300
2006-05-04	2.095	1.099	1.211	8.004	0.785	0.538	7.752	8787.300
2006-05-11	2.205	1.121	1.212	8.009	0.776	0.529	7.754	8797.600
2006-05-18	2.311	1.107	1.219	8.024	0.784	0.533	7.756	9207.400
2006-05-25	2.270	1.101	1.220	8.018	0.785	0.539	7.757	9227.500
2006-06-01	2.287	1.123	1.233	8.017	0.774	0.532	7.758	9247.100
2006-06-08	2.263	1.118	1.232	8.001	0.791	0.543	7.761	9383.100
2006-06-15	2.235	1.118	1.242	7.999	0.792	0.541	7.765	9277.700
2006-06-22	2.206	1.116	1.249	7.994	0.799	0.549	7.769	9367.500
2006-06-29	2.182	1.112	1.230	7.998	0.783	0.541	7.767	9291.700
2006-07-06	2.207	1.132	1.233	7.994	0.780	0.540	7.769	9052.000
2006-07-13	2.185	1.134	1.244	7.992	0.791	0.545	7.776	9165.800
2006-07-20	2.188	1.135	1.235	7.973	0.788	0.538	7.776	9173.400
2006-07-27	2.183	1.126	1.233	7.977	0.784	0.536	7.771	9111.300
2006-08-03	2.166	1.126	1.237	7.971	0.776	0.524	7.775	9088.700
2006-08-10	2.132	1.117	1.228	7.981	0.784	0.528	7.778	9108.900
2006-08-17	2.165	1.111	1.238	7.971	0.781	0.532	7.774	9058.900
2006-08-24	2.141	1.107	1.234	7.955	0.783	0.530	7.780	9157.000
2006-08-31	2.154	1.110	1.242	7.939	0.779	0.525	7.778	9062.300
2006-09-07	2.156	1.116	1.250	7.948	0.789	0.536	7.778	9172.100
2006-09-14	2.187	1.120	1.252	7.923	0.791	0.532	7.783	9101.600
2006-09-21	2.176	1.111	1.248	7.907	0.782	0.526	7.783	9233.100
2006-09-28	2.166	1.127	1.253	7.908	0.788	0.534	7.792	9217.300
2006-10-05	2.151	1.136	1.271	7.914	0.794	0.535	7.786	9232.800
2006-10-12	2.137	1.132	1.262	7.909	0.800	0.539	7.789	9241.500
2006-10-19	2.136	1.125	1.257	7.892	0.793	0.531	7.785	9147.200
2006-10-26	2.144	1.136	1.245	7.874	0.786	0.527	7.776	9095.900
2006-11-02	2.142	1.129	1.242	7.869	0.787	0.526	7.778	9104.800
2006-11-09	2.151	1.140	1.247	7.870	0.778	0.523	7.783	9118.600
2006-11-16	2.167	1.142	1.223	7.864	0.780	0.528	7.788	9167.200
2006-11-23	2.169	1.142	1.197	7.835	0.765	0.518	7.777	9150.000

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2006-11-30	2.142	1.148	1.195	7.832	0.751	0.505	7.775	9156.000
2006-12-07	2.142	1.157	1.213	7.822	0.757	0.511	7.774	9127.800
2006-12-14	2.159	1.154	1.216	7.816	0.764	0.512	7.772	9113.400
2006-12-21	2.136	1.160	1.221	7.816	0.762	0.511	7.777	9113.400
2006-12-28	2.143	1.177	1.232	7.803	0.758	0.511	7.778	8963.900
2007-01-04	2.146	1.176	1.248	7.795	0.769	0.518	7.791	9042.300
2007-01-11	2.132	1.175	1.250	7.773	0.774	0.511	7.799	9142.200
2007-01-18	2.131	1.178	1.244	7.767	0.771	0.506	7.808	9085.300
2007-01-25	2.107	1.176	1.243	7.759	0.775	0.510	7.809	9145.700
2007-02-01	2.098	1.185	1.247	7.747	0.772	0.509	7.807	9106.200
2007-02-08	2.087	1.164	1.236	7.754	0.769	0.513	7.813	9030.000
2007-02-15	2.075	1.162	1.239	7.749	0.761	0.513	7.813	9020.900
2007-02-22	2.124	1.171	1.223	7.742	0.760	0.509	7.809	9050.800
2007-03-01	2.105	1.180	1.229	7.738	0.759	0.514	7.815	9182.000
2007-03-08	2.092	1.176	1.214	7.746	0.762	0.518	7.814	9150.000
2007-03-15	2.057	1.158	1.212	7.728	0.751	0.515	7.811	9244.100
2007-03-22	2.055	1.158	1.217	7.729	0.752	0.509	7.811	9133.900
2007-03-29	2.032	1.151	1.215	7.724	0.748	0.508	7.814	9150.000
2007-04-05	2.037	1.136	1.216	7.725	0.748	0.510	7.818	9072.400
2007-04-12	2.032	1.129	1.205	7.714	0.740	0.504	7.813	9104.000
2007-04-19	2.022	1.120	1.209	7.726	0.735	0.499	7.814	9127.600
2007-04-26	2.023	1.107	1.215	7.704	0.734	0.500	7.822	9067.500
2007-05-03	2.018	1.107	1.219	7.695	0.736	0.502	7.821	8926.600
2007-05-10	1.955	1.098	1.227	7.682	0.740	0.504	7.820	8837.300
2007-05-17	1.966	1.084	1.230	7.651	0.740	0.506	7.819	8848.800
2007-05-24	1.923	1.070	1.225	7.648	0.743	0.504	7.823	8777.200
2007-05-31	1.968	1.061	1.224	7.646	0.744	0.505	7.811	8836.700
2007-06-07	1.932	1.068	1.245	7.626	0.749	0.509	7.816	9078.600
2007-06-14	1.921	1.073	1.241	7.621	0.748	0.506	7.819	9050.000
2007-06-21	1.923	1.063	1.229	7.613	0.744	0.501	7.815	8971.400
2007-06-28	1.915	1.057	1.218	7.596	0.740	0.498	7.819	9011.900
2007-07-05	1.877	1.047	1.203	7.564	0.734	0.497	7.818	9034.500
2007-07-12	1.855	1.043	1.202	7.561	0.725	0.492	7.820	9031.900
2007-07-19	1.896	1.051	1.207	7.563	0.723	0.486	7.820	9078.300
2007-07-26	1.870	1.053	1.206	7.573	0.733	0.493	7.825	9208.700
2007-08-02	1.915	1.057	1.197	7.563	0.725	0.490	7.829	9235.100
2007-08-09	2.106	1.076	1.218	7.601	0.731	0.495	7.820	9323.900
2007-08-16	2.000	1.057	1.206	7.587	0.741	0.504	7.814	9495.500
2007-08-23	1.967	1.057	1.203	7.543	0.733	0.498	7.801	9397.300
2007-08-30	1.951	1.053	1.201	7.540	0.733	0.496	7.797	9348.700
2007-09-06	1.899	1.033	1.187	7.510	0.726	0.493	7.788	9416.100
2007-09-13	1.857	1.002	1.170	7.514	0.722	0.498	7.788	9357.300
2007-09-20	1.839	1.003	1.174	7.514	0.710	0.495	7.784	9182.600
2007-09-27	1.830	0.998	1.175	7.506	0.703	0.490	7.770	9140.400
2007-10-04	1.790	0.974	1.180	7.506	0.707	0.489	7.756	9085.200
2007-10-11	1.805	0.973	1.170	7.511	0.706	0.492	7.754	9101.900
2007-10-18	1.794	0.967	1.167	7.482	0.701	0.488	7.751	9092.400
2007-10-25	1.748	0.950	1.160	7.462	0.695	0.487	7.751	9160.900
2007-11-01	1.736	0.931	1.127	7.421	0.691	0.480	7.758	9175.500
2007-11-08	1.746	0.981	1.123	7.425	0.682	0.478	7.782	9117.500
2007-11-15	1.775	0.985	1.102	7.414	0.683	0.488	7.783	9354.800
2007-11-22	1.773	0.993	1.118	7.382	0.675	0.486	7.779	9324.500
2007-11-29	1.788	1.012	1.128	7.411	0.681	0.486	7.788	9353.300
2007-12-06	1.777	1.022	1.143	7.366	0.682	0.493	7.794	9308.300
2007-12-13	1.803	0.998	1.156	7.368	0.693	0.495	7.799	9300.000
2007-12-20	1.766	0.981	1.141	7.316	0.696	0.504	7.801	9470.500
2007-12-27	1.752	0.991	1.113	7.272	0.680	0.502	7.805	9408.700
2008-01-03	1.765	1.014	1.107	7.273	0.676	0.506	7.801	9425.500
2008-01-10	1.779	1.029	1.099	7.249	0.676	0.510	7.806	9443.500
2008-01-17	1.786	1.007	1.087	7.225	0.684	0.512	7.808	9445.000

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2008-01-24	1.758	1.002	1.084	7.184	0.682	0.505	7.807	9300.000
2008-01-31	1.761	1.012	1.105	7.189	0.673	0.508	7.797	9206.500
2008-02-07	1.745	0.997	1.098	7.188	0.690	0.514	7.801	9250.900
2008-02-14	1.706	1.009	1.092	7.139	0.682	0.510	7.801	9189.000
2008-02-21	1.680	0.972	1.053	7.115	0.675	0.508	7.797	9149.500
2008-02-28	1.669	0.985	1.029	7.105	0.658	0.503	7.781	9072.200
2008-03-06	1.700	0.984	1.012	7.091	0.652	0.497	7.786	9096.400
2008-03-13	1.740	1.027	1.011	7.053	0.641	0.493	7.783	9224.300
2008-03-20	1.732	1.015	0.993	7.012	0.650	0.504	7.779	9191.900
2008-03-27	1.725	1.008	1.008	7.016	0.634	0.503	7.781	9172.100
2008-04-03	1.682	1.018	1.005	6.991	0.636	0.501	7.791	9173.600
2008-04-10	1.664	1.011	1.003	6.984	0.633	0.507	7.789	9202.700
2008-04-17	1.671	1.013	1.034	6.988	0.635	0.501	7.794	9167.300
2008-04-24	1.662	1.019	1.048	6.988	0.640	0.504	7.791	9240.000
2008-05-01	1.680	1.015	1.051	7.004	0.648	0.506	7.795	9257.300
2008-05-08	1.652	1.000	1.053	6.997	0.647	0.513	7.797	9230.300
2008-05-15	1.657	0.986	1.032	6.944	0.641	0.511	7.800	9315.900
2008-05-22	1.648	0.987	1.048	6.937	0.634	0.505	7.802	9323.600
2008-05-29	1.635	1.020	1.040	6.947	0.643	0.505	7.805	9291.600
2008-06-05	1.640	1.023	1.044	6.909	0.636	0.508	7.810	9345.900
2008-06-12	1.604	1.013	1.046	6.879	0.651	0.513	7.816	9347.300
2008-06-19	1.593	1.012	1.027	6.866	0.640	0.507	7.806	9247.300
2008-06-26	1.607	1.021	1.027	6.850	0.635	0.502	7.803	9202.700
2008-07-03	1.609	1.010	1.028	6.844	0.637	0.504	7.800	9231.800
2008-07-10	1.588	1.002	1.020	6.823	0.629	0.503	7.804	9174.500
2008-07-17	1.578	1.011	1.039	6.829	0.631	0.500	7.797	9139.100
2008-07-24	1.566	1.026	1.049	6.833	0.638	0.503	7.800	9156.800
2008-07-31	1.590	1.051	1.062	6.866	0.642	0.507	7.805	9073.500
2008-08-07	1.623	1.062	1.091	6.865	0.665	0.521	7.813	9205.200
2008-08-14	1.614	1.046	1.086	6.843	0.681	0.536	7.815	9225.200
2008-08-21	1.626	1.053	1.100	6.831	0.676	0.539	7.806	9173.700
2008-08-28	1.697	1.064	1.110	6.844	0.682	0.550	7.804	9160.300
2008-09-04	1.817	1.080	1.140	6.850	0.701	0.565	7.810	9334.200
2008-09-11	1.914	1.070	1.099	6.833	0.706	0.559	7.797	9388.500
2008-09-18	1.833	1.034	1.088	6.819	0.695	0.547	7.777	9348.200
2008-09-25	1.995	1.077	1.134	6.846	0.685	0.544	7.771	9408.200
2008-10-02	2.202	1.149	1.131	6.821	0.724	0.564	7.772	9401.700
2008-10-09	2.194	1.195	1.133	6.834	0.742	0.587	7.759	9840.500
2008-10-16	2.279	1.257	1.163	6.837	0.743	0.578	7.756	9771.100
2008-10-23	2.132	1.222	1.142	6.839	0.790	0.631	7.753	10025.200
2008-10-30	2.187	1.182	1.175	6.823	0.789	0.619	7.750	10861.600
2008-11-06	2.335	1.232	1.200	6.830	0.783	0.633	7.750	10857.800
2008-11-13	2.397	1.286	1.220	6.834	0.786	0.673	7.750	11553.800
2008-11-20	2.245	1.233	1.200	6.827	0.798	0.675	7.751	12013.100
2008-11-27	2.480	1.254	1.197	6.883	0.788	0.652	7.750	12011.600
2008-12-04	2.292	1.218	1.187	6.852	0.790	0.685	7.751	11683.800
2008-12-11	2.357	1.197	1.078	6.833	0.749	0.672	7.750	11019.500
2008-12-18	2.376	1.213	1.079	6.835	0.721	0.673	7.750	10959.800
2008-12-24	2.315	1.225	1.067	6.822	0.703	0.685	7.750	11060.900
2008-12-31	2.266	1.189	1.093	6.836	0.717	0.689	7.751	10907.200
2009-01-08	2.372	1.263	1.123	6.835	0.741	0.656	7.757	10938.500
2009-01-15	2.352	1.263	1.154	6.838	0.755	0.679	7.760	11099.100
2009-01-22	2.290	1.219	1.150	6.840	0.778	0.733	7.757	11142.900
2009-01-29	2.297	1.230	1.166	6.835	0.781	0.694	7.755	11343.100
2009-02-05	2.295	1.248	1.164	6.837	0.777	0.677	7.754	11687.700
2009-02-12	2.353	1.260	1.174	6.834	0.777	0.693	7.753	11729.200
2009-02-19	2.352	1.246	1.165	6.836	0.788	0.698	7.755	11943.800
2009-02-26	2.387	1.288	1.173	6.842	0.790	0.700	7.755	11987.700
2009-03-05	2.327	1.291	1.189	6.839	0.789	0.709	7.755	12021.500
2009-03-12	2.252	1.233	1.119	6.825	0.776	0.716	7.753	12027.400

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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2009-03-19	2.238	1.233	1.127	6.831	0.737	0.693	7.750	11781.900
2009-03-26	2.241	1.238	1.135	6.834	0.752	0.698	7.750	11474.100
2009-04-02	2.178	1.227	1.158	6.834	0.744	0.676	7.750	11423.100
2009-04-09	2.176	1.206	1.147	6.834	0.749	0.674	7.751	11101.800
2009-04-16	2.220	1.229	1.158	6.828	0.767	0.677	7.750	10748.700
2009-04-23	2.173	1.194	1.140	6.819	0.753	0.680	7.750	10797.300
2009-04-30	2.106	1.171	1.128	6.822	0.754	0.672	7.750	10600.000
2009-05-07	2.094	1.173	1.106	6.826	0.741	0.663	7.750	10340.200
2009-05-14	2.033	1.141	1.101	6.827	0.739	0.657	7.751	10403.500
2009-05-21	2.008	1.112	1.084	6.829	0.714	0.629	7.752	10305.500
2009-05-28	1.946	1.100	1.068	6.832	0.708	0.619	7.752	10243.900
2009-06-04	1.950	1.098	1.072	6.838	0.715	0.624	7.751	9951.800
2009-06-11	1.962	1.127	1.083	6.836	0.712	0.605	7.750	10069.400
2009-06-18	1.964	1.158	1.096	6.836	0.714	0.605	7.750	10355.000
2009-06-25	1.957	1.160	1.084	6.830	0.711	0.606	7.750	10204.400
2009-07-02	1.994	1.162	1.077	6.832	0.715	0.612	7.750	10193.900
2009-07-09	1.937	1.117	1.075	6.832	0.718	0.618	7.751	10130.400
2009-07-16	1.888	1.087	1.067	6.830	0.708	0.612	7.750	10152.700
2009-07-23	1.879	1.082	1.090	6.832	0.704	0.609	7.750	9946.800
2009-07-30	1.831	1.076	1.066	6.831	0.700	0.598	7.750	9899.100
2009-08-06	1.833	1.085	1.071	6.834	0.705	0.600	7.751	9942.200
2009-08-13	1.845	1.090	1.066	6.831	0.703	0.605	7.751	9973.600
2009-08-20	1.882	1.096	1.067	6.833	0.699	0.606	7.751	9999.100
2009-08-27	1.874	1.103	1.060	6.832	0.697	0.612	7.751	10073.200
2009-09-03	1.821	1.081	1.040	6.830	0.700	0.611	7.751	10082.400
2009-09-10	1.810	1.061	1.029	6.825	0.686	0.599	7.750	9950.000
2009-09-17	1.803	1.087	1.028	6.827	0.680	0.615	7.750	9661.300
2009-09-24	1.782	1.077	1.042	6.828	0.681	0.626	7.750	9659.300
2009-10-01	1.746	1.054	1.027	6.828	0.685	0.630	7.750	9597.300
2009-10-08	1.702	1.030	1.014	6.828	0.680	0.629	7.750	9476.400
2009-10-15	1.727	1.049	1.007	6.831	0.672	0.612	7.750	9359.500
2009-10-22	1.738	1.071	1.020	6.827	0.665	0.612	7.750	9466.700
2009-10-29	1.724	1.065	1.017	6.828	0.678	0.607	7.750	9534.500
2009-11-05	1.735	1.052	1.017	6.826	0.674	0.603	7.750	9486.700
2009-11-12	1.733	1.064	1.015	6.828	0.672	0.600	7.750	9382.100
2009-11-19	1.754	1.060	1.005	6.827	0.673	0.605	7.750	9465.500
2009-11-26	1.707	1.054	0.999	6.828	0.668	0.606	7.750	9401.800
2009-12-03	1.773	1.052	1.027	6.826	0.672	0.606	7.750	9390.200
2009-12-10	1.791	1.071	1.049	6.828	0.685	0.616	7.750	9450.900
2009-12-17	1.762	1.049	1.037	6.828	0.700	0.622	7.757	9449.600
2009-12-24	1.744	1.047	1.036	6.827	0.697	0.629	7.755	9459.100
2009-12-31	1.742	1.035	1.034	6.828	0.694	0.621	7.756	9349.500
2010-01-07	1.769	1.026	1.021	6.827	0.697	0.625	7.755	9235.700
2010-01-14	1.803	1.049	1.043	6.828	0.696	0.616	7.760	9184.800
2010-01-21	1.871	1.064	1.052	6.827	0.707	0.620	7.771	9348.700
2010-01-28	1.887	1.073	1.066	6.828	0.721	0.625	7.767	9342.100
2010-02-04	1.855	1.052	1.075	6.833	0.735	0.640	7.771	9407.900
2010-02-11	1.823	1.045	1.081	6.831	0.734	0.638	7.770	9319.500
2010-02-18	1.841	1.068	1.086	6.825	0.739	0.648	7.766	9303.600
2010-02-25	1.791	1.031	1.078	6.827	0.732	0.656	7.762	9315.000
2010-03-04	1.770	1.027	1.069	6.830	0.735	0.662	7.763	9266.700
2010-03-11	1.790	1.014	1.063	6.828	0.727	0.658	7.757	9177.500
2010-03-18	1.805	1.019	1.070	6.828	0.739	0.666	7.760	9148.600
2010-03-25	1.766	1.008	1.056	6.826	0.746	0.671	7.763	9101.800
2010-04-01	1.779	1.002	1.073	6.826	0.741	0.654	7.766	9031.500
2010-04-08	1.743	1.001	1.060	6.826	0.743	0.651	7.757	9058.600
2010-04-15	1.769	1.001	1.078	6.826	0.741	0.650	7.762	8980.500
2010-04-22	1.731	1.005	1.083	6.826	0.748	0.651	7.763	9033.300
2010-04-29	1.837	1.044	1.109	6.826	0.752	0.653	7.764	9032.100
2010-05-06	1.772	1.015	1.115	6.830	0.786	0.679	7.780	9150.000

APPENDIX C2
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Date	Brazil BRL/USD	Canada CAD/USD	Switzerland CHF/USD	China CNY/USD	Euroland EUR/USD	England GBP/USD	Hong Kong HKD/USD	Indonesia IDR/USD
2010-05-13	1.889	1.066	1.150	6.828	0.807	0.687	7.783	9073.700
2010-05-20	1.829	1.050	1.150	6.829	0.795	0.691	7.804	9271.900
2010-05-27	1.815	1.042	1.154	6.830	0.809	0.690	7.786	9291.100
2010-06-03	1.815	1.034	1.142	6.832	0.833	0.690	7.792	9144.300
2010-06-10	1.782	1.028	1.114	6.829	0.828	0.688	7.794	9225.900
2010-06-17	1.788	1.043	1.101	6.801	0.809	0.676	7.783	9060.200
2010-06-24	1.798	1.061	1.078	6.781	0.811	0.667	7.779	9017.400
2010-06-30	1.775	1.045	1.052	6.774	0.795	0.659	7.797	9024.600
2010-07-08	1.772	1.040	1.042	6.777	0.791	0.663	7.774	9059.600
2010-07-15	1.764	1.038	1.041	6.782	0.774	0.654	7.776	9006.000
2010-07-22	1.768	1.037	1.041	6.778	0.777	0.649	7.767	9020.000
2010-07-29	1.757	1.016	1.048	6.772	0.765	0.636	7.767	8947.800
2010-08-05	1.769	1.043	1.049	6.784	0.753	0.626	7.763	8933.000
2010-08-12	1.763	1.040	1.031	6.788	0.783	0.642	7.772	8967.200
2010-08-19	1.759	1.055	1.025	6.800	0.776	0.645	7.776	8974.400
2010-08-26	1.733	1.052	1.012	6.809	0.783	0.644	7.779	9013.700
2010-09-02	1.726	1.033	1.015	6.781	0.776	0.647	7.772	8975.000
2010-09-09	1.720	1.027	1.014	6.724	0.786	0.650	7.766	9007.000
2010-09-16	1.719	1.031	0.985	6.704	0.767	0.640	7.765	8983.500
2010-09-23	1.699	1.030	0.981	6.691	0.742	0.632	7.757	8924.300
2010-09-30	1.680	1.017	0.967	6.693	0.727	0.632	7.758	8960.500
2010-10-07	1.664	1.004	0.953	6.651	0.718	0.627	7.758	8969.900
2010-10-14	1.693	1.023	0.964	6.649	0.714	0.624	7.758	8945.100
2010-10-21	1.712	1.020	0.984	6.686	0.719	0.638	7.765	8924.300
2010-10-28	1.679	1.002	0.963	6.665	0.720	0.624	7.752	8936.800
2010-11-04	1.709	1.002	0.974	6.634	0.713	0.617	7.751	8942.000
2010-11-10	1.714	1.017	0.997	6.632	0.730	0.618	7.752	8920.400
2010-11-18	1.719	1.008	0.999	6.651	0.732	0.627	7.754	8954.400
2010-11-25	1.702	1.005	0.990	6.662	0.755	0.640	7.764	9018.600
2010-12-02	1.707	1.010	0.985	6.657	0.748	0.636	7.762	8982.100
2010-12-09	1.705	1.006	0.966	6.664	0.755	0.633	7.774	9011.600
2010-12-16	1.694	1.010	0.962	6.646	0.760	0.646	7.777	9039.300
2010-12-23	1.664	1.001	0.937	6.602	0.762	0.648	7.781	9066.700
2010-12-30	1.660	0.995	0.934	6.591	0.747	0.641	7.773	9041.800

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2000-01-06	4.145	43.478	105.190	1138.000	1.936	9.518
2000-01-13	4.119	43.496	105.790	1125.200	1.919	9.454
2000-01-20	4.105	43.555	104.920	1127.300	1.959	9.452
2000-01-27	4.088	43.597	107.120	1121.000	2.056	9.572
2000-02-03	4.063	43.595	107.550	1130.100	2.021	9.479
2000-02-10	4.069	43.606	108.950	1114.600	2.033	9.417
2000-02-17	4.050	43.646	110.920	1129.000	2.036	9.354
2000-02-24	4.051	43.595	110.970	1136.700	2.047	9.376
2000-03-02	4.028	43.591	107.780	1120.200	2.046	9.317
2000-03-09	3.977	43.570	106.220	1120.200	2.019	9.313
2000-03-16	3.963	43.573	106.060	1116.900	2.064	9.324
2000-03-23	4.049	43.572	107.240	1108.900	2.048	9.184
2000-03-30	4.014	43.596	102.650	1105.300	2.016	9.288
2000-04-06	4.034	43.612	105.310	1107.500	2.000	9.319
2000-04-13	4.035	43.667	105.080	1110.900	2.008	9.501
2000-04-20	4.035	43.643	105.650	1108.900	2.021	9.437
2000-04-27	4.037	43.652	108.030	1110.300	2.059	9.410
2000-05-04	4.113	43.649	108.520	1111.000	2.041	9.479
2000-05-11	4.139	43.994	108.700	1113.900	2.098	9.563
2000-05-18	4.164	43.954	106.880	1122.600	2.152	9.622
2000-05-25	4.159	44.353	107.120	1136.800	2.157	9.531
2000-06-01	4.129	44.599	108.120	1124.800	2.144	9.554
2000-06-08	4.148	44.750	106.750	1115.000	2.135	9.935
2000-06-15	4.090	44.734	106.240	1116.500	2.088	9.922
2000-06-22	4.092	44.675	104.610	1118.900	2.120	9.974
2000-06-29	4.083	44.651	106.120	1114.800	2.131	9.842
2000-07-06	4.086	44.706	107.790	1118.700	2.169	9.506
2000-07-13	4.101	44.705	107.860	1112.600	2.169	9.424
2000-07-20	4.096	44.713	109.080	1113.100	2.157	9.343
2000-07-27	4.085	44.889	109.590	1116.600	2.185	9.362
2000-08-03	4.081	45.390	108.510	1115.200	2.195	9.358
2000-08-10	4.060	45.796	108.620	1115.600	2.225	9.280
2000-08-17	4.040	45.803	108.410	1115.300	2.221	9.250
2000-08-24	4.041	45.944	107.120	1113.900	2.293	9.232
2000-08-31	4.015	45.747	105.780	1105.400	2.333	9.209
2000-09-07	4.035	45.636	106.000	1109.400	2.386	9.323
2000-09-14	4.043	45.769	107.320	1120.200	2.389	9.359
2000-09-21	4.073	46.082	107.910	1134.200	2.426	9.474
2000-09-28	4.024	45.973	107.870	1115.500	2.458	9.436
2000-10-05	4.055	46.085	108.770	1117.600	2.483	9.464
2000-10-12	4.104	46.377	107.630	1130.200	2.506	9.590
2000-10-19	4.125	46.351	109.080	1130.700	2.495	9.557
2000-10-26	4.131	46.732	108.700	1136.300	2.479	9.629
2000-11-02	4.113	46.615	107.510	1134.700	2.522	9.606
2000-11-09	4.113	46.720	107.850	1135.600	2.518	9.605
2000-11-16	4.100	46.770	108.810	1143.200	2.495	9.479
2000-11-23	4.105	46.827	111.370	1189.500	2.502	9.397
2000-11-30	4.099	46.840	111.180	1209.700	2.408	9.417
2000-12-07	4.090	46.762	111.300	1190.700	2.338	9.402
2000-12-14	4.093	46.753	112.580	1207.300	2.337	9.403
2000-12-21	4.062	46.696	112.770	1237.100	2.269	9.599
2000-12-28	4.044	46.677	114.340	1264.900	2.259	9.611
2001-01-04	4.099	46.706	116.200	1263.900	2.211	9.754
2001-01-11	4.113	46.974	117.750	1278.100	2.241	9.872
2001-01-18	4.128	46.369	117.210	1276.900	2.228	9.789
2001-01-25	4.136	46.476	117.130	1280.900	2.294	9.693
2001-02-01	4.145	46.399	115.600	1248.800	2.245	9.769
2001-02-08	4.118	46.466	117.560	1264.300	2.283	9.762
2001-02-15	4.108	46.513	115.460	1243.400	2.322	9.708
2001-02-22	4.134	46.602	116.120	1248.900	2.320	9.712

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Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2001-03-01	4.115	46.540	119.020	1267.100	2.286	9.665
2001-03-08	4.126	46.510	119.650	1269.100	2.382	9.671
2001-03-15	4.183	46.665	122.900	1294.000	2.414	9.619
2001-03-22	4.207	46.661	122.570	1308.600	2.395	9.657
2001-03-29	4.202	46.710	125.590	1331.100	2.476	9.485
2001-04-05	4.186	46.550	124.010	1342.500	2.466	9.405
2001-04-12	4.182	47.023	124.570	1329.400	2.445	9.337
2001-04-19	4.156	46.826	122.490	1313.500	2.401	9.371
2001-04-26	4.153	46.832	123.730	1326.800	2.423	9.299
2001-05-03	4.151	46.810	121.050	1292.000	2.365	9.252
2001-05-10	4.147	46.894	122.460	1297.300	2.371	9.223
2001-05-17	4.143	46.924	123.630	1303.600	2.346	8.981
2001-05-24	4.142	46.967	120.720	1288.700	2.355	9.089
2001-05-31	4.144	46.994	119.130	1284.200	2.435	9.174
2001-06-07	4.149	47.192	120.620	1285.700	2.389	9.075
2001-06-14	4.170	47.001	122.930	1291.900	2.394	9.054
2001-06-21	4.185	46.985	124.200	1303.400	2.421	9.074
2001-06-28	4.170	47.046	124.710	1300.500	2.471	9.056
2001-07-05	4.202	47.126	125.810	1294.500	2.475	9.150
2001-07-12	4.200	47.160	124.740	1303.400	2.454	9.346
2001-07-19	4.198	47.126	122.800	1300.300	2.444	9.173
2001-07-26	4.201	47.146	123.260	1295.000	2.429	9.184
2001-08-02	4.217	47.123	123.480	1282.200	2.381	9.169
2001-08-09	4.241	47.115	122.040	1279.200	2.346	9.124
2001-08-16	4.230	47.124	120.370	1278.500	2.268	9.113
2001-08-23	4.230	47.125	120.110	1275.700	2.279	9.145
2001-08-30	4.263	47.114	118.780	1279.100	2.284	9.207
2001-09-06	4.295	47.220	120.040	1285.000	2.296	9.326
2001-09-13	4.325	47.794	117.440	1297.100	2.358	9.486
2001-09-20	4.380	48.027	116.770	1300.100	2.471	9.489
2001-09-27	4.355	47.848	119.220	1303.900	2.455	9.512
2001-10-04	4.350	48.005	120.340	1306.800	2.416	9.580
2001-10-11	4.319	48.013	120.920	1294.000	2.410	9.359
2001-10-18	4.315	48.028	121.170	1299.100	2.401	9.204
2001-10-25	4.310	48.010	123.040	1293.300	2.415	9.277
2001-11-01	4.273	47.987	121.660	1291.300	2.410	9.279
2001-11-08	4.234	47.996	120.230	1277.600	2.384	9.229
2001-11-15	4.236	47.975	122.680	1278.200	2.413	9.208
2001-11-22	4.235	48.049	124.430	1265.300	2.437	9.148
2001-11-29	4.234	47.935	123.220	1267.600	2.400	9.257
2001-12-06	4.228	47.808	125.630	1269.100	2.411	9.211
2001-12-13	4.249	47.807	127.360	1281.400	2.393	9.089
2001-12-20	4.345	47.801	129.470	1304.200	2.412	9.133
2001-12-27	4.399	48.235	131.300	1317.600	2.408	9.181
2002-01-03	4.484	48.248	131.010	1304.100	2.330	9.139
2002-01-10	4.492	48.385	132.140	1310.300	2.355	9.243
2002-01-17	4.518	48.227	132.630	1315.800	2.360	9.124
2002-01-24	4.597	48.329	134.460	1322.300	2.359	9.136
2002-01-31	4.589	48.497	133.750	1312.500	2.397	9.163
2002-02-07	4.667	48.657	134.790	1314.700	2.391	9.149
2002-02-14	4.627	48.660	132.790	1310.700	2.366	9.062
2002-02-21	4.692	48.740	133.880	1316.500	2.387	9.105
2002-02-28	4.689	48.708	133.340	1318.300	2.365	9.095
2002-03-07	4.693	48.713	128.210	1309.300	2.322	9.071
2002-03-14	4.677	48.674	129.080	1318.200	2.290	9.083
2002-03-21	4.644	48.754	132.890	1323.800	2.273	9.036
2002-03-28	4.800	48.777	133.320	1322.900	2.257	9.016
2002-04-04	4.755	48.806	131.750	1325.100	2.282	9.024
2002-04-11	4.795	48.886	132.100	1326.500	2.259	9.078
2002-04-18	4.785	48.877	130.470	1307.700	2.238	9.219

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2002-04-25	4.884	48.942	128.170	1293.000	2.222	9.316
2002-05-02	4.836	48.946	127.200	1279.500	2.232	9.495
2002-05-09	4.937	48.966	127.870	1274.600	2.208	9.515
2002-05-16	4.873	48.996	126.000	1257.100	2.157	9.480
2002-05-23	4.905	48.973	124.720	1232.800	2.122	9.563
2002-05-30	4.921	49.005	124.130	1214.200	2.086	9.637
2002-06-06	5.011	49.002	124.460	1227.800	2.046	9.741
2002-06-13	4.968	48.973	124.360	1226.300	2.068	9.663
2002-06-20	4.966	48.892	121.240	1209.700	2.013	9.961
2002-06-27	4.755	48.864	119.850	1203.400	2.053	9.972
2002-07-04	4.807	48.812	120.180	1195.200	2.057	9.896
2002-07-11	4.716	48.748	116.690	1172.600	2.064	9.722
2002-07-18	4.664	48.702	115.720	1160.300	2.050	9.713
2002-07-25	4.744	48.666	118.780	1180.400	2.161	9.757
2002-08-01	4.711	48.628	119.040	1179.100	2.156	9.840
2002-08-08	4.680	48.618	120.150	1198.400	2.185	9.754
2002-08-15	4.665	48.556	117.550	1183.700	2.141	9.855
2002-08-22	4.661	48.498	119.520	1197.700	2.143	9.841
2002-08-29	4.663	48.473	118.750	1197.300	2.136	9.917
2002-09-05	4.736	48.523	118.500	1191.600	2.125	9.958
2002-09-12	4.735	48.418	121.530	1198.600	2.107	9.960
2002-09-19	4.815	48.415	123.170	1205.400	2.123	10.248
2002-09-26	4.846	48.351	122.870	1223.000	2.124	10.166
2002-10-03	4.838	48.324	123.060	1227.300	2.090	10.180
2002-10-10	4.820	48.306	124.030	1255.000	2.080	10.159
2002-10-17	4.758	48.387	125.510	1238.800	2.077	9.982
2002-10-24	4.749	48.359	124.120	1226.400	2.056	9.976
2002-10-31	4.755	48.313	122.150	1225.500	2.033	10.194
2002-11-07	4.708	48.239	119.700	1199.700	2.007	10.319
2002-11-14	4.663	48.181	120.380	1200.700	2.000	10.248
2002-11-21	4.682	48.177	122.850	1204.400	1.987	10.123
2002-11-28	4.648	48.315	122.720	1195.900	2.006	10.152
2002-12-05	4.710	48.190	123.670	1220.300	1.995	10.267
2002-12-12	4.657	48.154	120.730	1204.800	1.946	10.191
2002-12-19	4.740	47.973	120.520	1204.300	1.941	10.193
2002-12-24	4.792	47.963	119.920	1198.200	1.929	10.318
2003-01-02	4.792	47.979	119.840	1196.700	1.905	10.367
2003-01-09	4.808	47.943	119.450	1178.700	1.864	10.466
2003-01-16	4.851	47.906	117.870	1173.900	1.813	10.582
2003-01-23	4.896	47.850	117.780	1162.800	1.817	10.833
2003-01-30	4.823	47.781	119.960	1163.600	1.837	10.906
2003-02-06	4.866	47.668	120.400	1183.700	1.825	10.896
2003-02-13	4.915	47.866	120.410	1195.000	1.812	10.880
2003-02-20	4.877	47.624	118.780	1191.900	1.791	10.972
2003-02-27	4.817	47.602	118.220	1193.500	1.793	11.024
2003-03-06	4.844	47.650	116.460	1218.800	1.779	11.116
2003-03-13	4.811	47.613	118.580	1241.400	1.813	10.835
2003-03-20	4.757	47.702	121.440	1244.300	1.806	10.748
2003-03-27	4.714	47.502	120.170	1258.800	1.818	10.659
2003-04-03	4.670	47.389	120.040	1258.000	1.846	10.674
2003-04-10	4.659	47.330	120.470	1229.100	1.834	10.705
2003-04-17	4.597	47.328	120.550	1208.000	1.799	10.531
2003-04-24	4.576	47.320	120.260	1237.800	1.805	10.425
2003-05-01	4.488	47.300	119.110	1212.500	1.776	10.196
2003-05-08	4.457	47.146	117.210	1201.600	1.735	10.107
2003-05-15	4.485	47.063	116.020	1199.900	1.731	10.362
2003-05-22	4.470	46.822	116.860	1194.700	1.715	10.234
2003-05-29	4.395	47.026	119.480	1205.600	1.733	10.338
2003-06-05	4.415	46.835	118.840	1200.400	1.729	10.494
2003-06-12	4.399	46.652	117.470	1191.900	1.722	10.613

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2003-06-19	4.383	46.516	118.360	1190.200	1.711	10.469
2003-06-26	4.342	46.354	119.620	1194.800	1.718	10.417
2003-07-03	4.295	46.302	118.120	1180.400	1.679	10.399
2003-07-10	4.360	46.054	117.820	1178.200	1.687	10.429
2003-07-17	4.436	46.245	118.380	1185.100	1.745	10.369
2003-07-24	4.395	46.101	118.820	1180.500	1.701	10.500
2003-07-31	4.460	46.147	119.980	1184.400	1.705	10.589
2003-08-07	4.427	45.960	118.980	1180.900	1.717	10.671
2003-08-14	4.453	45.949	119.250	1177.600	1.705	10.724
2003-08-21	4.497	45.850	117.560	1166.200	1.709	10.853
2003-08-28	4.444	45.864	116.700	1174.800	1.728	11.037
2003-09-04	4.446	45.856	117.060	1170.900	1.743	10.857
2003-09-11	4.530	45.754	117.370	1172.000	1.714	10.984
2003-09-18	4.480	45.933	113.980	1165.400	1.696	10.897
2003-09-25	4.457	45.794	111.780	1150.900	1.701	10.926
2003-10-02	4.414	45.331	110.890	1146.800	1.685	11.240
2003-10-09	4.422	45.362	108.570	1145.300	1.668	11.172
2003-10-16	4.434	45.314	109.550	1175.600	1.678	11.262
2003-10-23	4.493	45.268	109.230	1185.900	1.640	11.172
2003-10-30	4.493	45.319	110.090	1183.600	1.633	11.067
2003-11-06	4.489	45.301	109.290	1179.800	1.624	10.967
2003-11-13	4.530	45.365	108.430	1171.400	1.588	11.147
2003-11-20	4.489	45.703	108.870	1195.100	1.561	11.196
2003-11-27	4.444	45.776	109.500	1202.300	1.564	11.410
2003-12-04	4.439	45.612	107.800	1189.200	1.550	11.190
2003-12-11	4.395	45.533	107.730	1184.700	1.542	11.242
2003-12-18	4.385	45.506	107.940	1194.000	1.553	11.232
2003-12-24	4.369	45.627	106.910	1197.800	1.542	11.233
2003-12-31	4.400	45.631	106.940	1195.600	1.517	11.096
2004-01-08	4.380	45.442	106.510	1181.800	1.466	10.849
2004-01-15	4.390	45.394	106.820	1186.300	1.500	10.830
2004-01-22	4.446	45.379	106.180	1184.000	1.487	10.930
2004-01-29	4.484	45.301	105.840	1173.800	1.491	11.012
2004-02-05	4.465	45.254	105.550	1167.900	1.447	11.128
2004-02-12	4.458	45.189	105.590	1160.600	1.427	10.959
2004-02-19	4.453	45.207	108.830	1167.700	1.460	10.941
2004-02-26	4.489	45.213	109.250	1178.600	1.459	11.062
2004-03-04	4.500	45.266	111.430	1172.100	1.483	10.919
2004-03-11	4.513	45.216	110.750	1180.500	1.552	10.958
2004-03-18	4.481	45.149	106.990	1156.400	1.526	10.986
2004-03-25	4.521	44.429	105.880	1157.900	1.540	11.055
2004-04-01	4.515	43.693	104.510	1142.000	1.519	11.173
2004-04-08	4.525	43.609	105.480	1142.200	1.508	11.231
2004-04-15	4.542	43.809	107.700	1162.100	1.560	11.243
2004-04-22	4.572	43.977	109.390	1158.400	1.599	11.342
2004-04-29	4.589	44.474	110.370	1173.500	1.602	11.392
2004-05-06	4.593	44.611	112.290	1171.300	1.621	11.533
2004-05-13	4.613	45.521	114.260	1186.100	1.656	11.568
2004-05-20	4.580	45.227	112.070	1175.600	1.633	11.561
2004-05-27	4.565	45.390	110.170	1164.400	1.590	11.415
2004-06-03	4.558	45.052	111.230	1164.000	1.613	11.422
2004-06-10	4.526	45.069	110.080	1164.400	1.590	11.371
2004-06-17	4.499	45.632	108.640	1159.200	1.594	11.338
2004-06-24	4.500	45.827	107.800	1149.800	1.571	11.313
2004-06-30	4.473	45.697	108.560	1155.400	1.547	11.471
2004-07-08	4.482	45.643	108.190	1149.600	1.519	11.503
2004-07-15	4.488	45.932	108.780	1164.200	1.518	11.430
2004-07-22	4.497	46.294	110.100	1166.600	1.572	11.439
2004-07-29	4.515	46.378	111.400	1169.000	1.571	11.409
2004-08-05	4.532	46.299	110.040	1162.200	1.530	11.415

APPENDIX C2
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Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2004-08-12	4.546	46.266	110.670	1162.200	1.504	11.401
2004-08-19	4.531	46.231	109.340	1153.500	1.485	11.345
2004-08-26	4.550	46.333	109.500	1151.400	1.527	11.379
2004-09-02	4.524	46.301	110.460	1150.000	1.547	11.519
2004-09-09	4.499	46.254	109.350	1145.600	1.522	11.600
2004-09-16	4.479	45.812	109.940	1146.100	1.516	11.478
2004-09-23	4.484	45.876	110.710	1149.400	1.498	11.409
2004-09-30	4.476	45.827	110.420	1149.200	1.485	11.338
2004-10-07	4.456	45.768	109.440	1148.000	1.463	11.247
2004-10-14	4.468	45.840	109.100	1145.400	1.455	11.434
2004-10-21	4.437	45.713	107.450	1140.900	1.440	11.440
2004-10-28	4.460	45.312	106.040	1120.900	1.463	11.582
2004-11-04	4.423	45.151	105.590	1110.600	1.440	11.403
2004-11-10	4.425	45.068	105.530	1104.200	1.444	11.376
2004-11-18	4.368	45.068	102.810	1068.700	1.404	11.377
2004-11-25	4.366	44.973	102.530	1046.600	1.391	11.242
2004-12-02	4.358	44.075	102.500	1046.600	1.393	11.107
2004-12-09	4.355	44.544	105.520	1067.300	1.421	11.323
2004-12-16	4.339	43.903	104.270	1060.700	1.400	11.229
2004-12-23	4.331	43.646	103.610	1048.200	1.394	11.147
2004-12-30	4.320	43.295	102.710	1034.900	1.389	11.165
2005-01-06	4.398	43.654	104.980	1051.190	1.438	11.364
2005-01-13	4.364	43.577	102.530	1043.250	1.433	11.239
2005-01-20	4.368	43.677	102.840	1038.430	1.402	11.245
2005-01-27	4.394	43.659	103.580	1024.840	1.404	11.261
2005-02-03	4.356	43.396	103.680	1027.800	1.404	11.139
2005-02-10	4.377	43.742	105.760	1033.310	1.403	11.162
2005-02-17	4.360	43.738	105.760	1024.920	1.382	11.080
2005-02-24	4.361	43.629	105.220	1007.140	1.389	11.098
2005-03-03	4.334	43.647	104.470	1008.680	1.360	11.055
2005-03-10	4.297	43.481	103.890	997.510	1.353	11.016
2005-03-17	4.313	43.596	104.740	1005.690	1.343	11.178
2005-03-24	4.368	43.731	107.260	1018.820	1.411	11.330
2005-03-31	4.360	43.679	107.590	1012.250	1.412	11.185
2005-04-07	4.371	43.673	108.300	1015.420	1.394	11.133
2005-04-14	4.393	43.775	107.640	1015.450	1.394	11.088
2005-04-21	4.353	43.688	105.850	1004.230	1.366	11.039
2005-04-28	4.369	43.521	104.650	996.750	1.362	11.084
2005-05-05	4.364	43.393	104.930	999.360	1.366	10.944
2005-05-12	4.380	43.396	107.170	1000.320	1.404	11.025
2005-05-19	4.377	43.391	108.180	1007.260	1.412	10.974
2005-05-26	4.403	43.498	107.870	1000.320	1.400	10.886
2005-06-02	4.409	43.551	107.860	1006.120	1.430	10.829
2005-06-09	4.444	43.515	108.440	1006.690	1.415	10.863
2005-06-16	4.474	43.530	108.870	1009.400	1.394	10.791
2005-06-23	4.532	43.478	109.220	1013.650	1.418	10.765
2005-06-30	4.591	43.543	111.580	1043.850	1.471	10.746
2005-07-07	4.600	43.553	112.210	1054.230	1.488	10.746
2005-07-14	4.543	43.515	112.300	1042.360	1.485	10.614
2005-07-21	4.536	43.434	111.160	1020.870	1.458	10.627
2005-07-28	4.522	43.441	112.270	1023.290	1.464	10.605
2005-08-04	4.471	43.447	112.100	1016.430	1.451	10.597
2005-08-11	4.515	43.507	109.570	1014.180	1.413	10.638
2005-08-18	4.488	43.556	110.660	1022.660	1.442	10.762
2005-08-25	4.527	43.639	109.860	1029.000	1.435	10.860
2005-09-01	4.492	43.845	109.680	1026.080	1.418	10.685
2005-09-08	4.501	43.803	109.660	1025.370	1.416	10.711
2005-09-15	4.543	43.831	111.380	1030.490	1.421	10.814
2005-09-22	4.605	43.874	112.190	1030.810	1.456	10.843
2005-09-29	4.597	43.964	113.290	1042.280	1.442	10.791

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2005-10-06	4.591	44.332	113.840	1037.810	1.436	10.788
2005-10-13	4.649	44.790	114.050	1044.580	1.434	10.917
2005-10-20	4.624	45.029	115.920	1058.710	1.431	10.919
2005-10-27	4.654	45.048	115.550	1042.610	1.421	10.839
2005-11-03	4.667	45.462	118.220	1049.870	1.465	10.747
2005-11-10	4.743	45.635	118.900	1037.380	1.471	10.689
2005-11-17	4.721	45.724	119.210	1037.660	1.456	10.665
2005-11-24	4.694	45.779	119.650	1041.140	1.437	10.610
2005-12-01	4.654	46.121	120.780	1038.120	1.404	10.456
2005-12-08	4.634	46.209	120.550	1033.930	1.420	10.643
2005-12-15	4.580	45.207	115.780	1016.170	1.452	10.767
2005-12-22	4.583	45.116	116.390	1013.840	1.486	10.677
2005-12-29	4.606	44.998	117.930	1011.190	1.463	10.628
2006-01-05	4.617	44.323	114.400	989.640	1.447	10.570
2006-01-12	4.619	44.072	114.450	987.500	1.434	10.577
2006-01-19	4.619	44.107	115.410	986.660	1.474	10.524
2006-01-26	4.634	44.012	117.170	970.730	1.464	10.459
2006-02-02	4.699	44.153	118.960	970.470	1.456	10.495
2006-02-09	4.698	44.104	117.620	967.480	1.473	10.512
2006-02-16	4.690	44.332	118.420	973.140	1.499	10.456
2006-02-23	4.722	44.368	116.900	966.280	1.508	10.480
2006-03-02	4.699	44.103	116.450	971.090	1.502	10.580
2006-03-09	4.714	44.328	119.060	980.150	1.559	10.706
2006-03-16	4.656	44.280	115.900	971.330	1.577	10.700
2006-03-23	4.679	44.506	117.500	979.360	1.634	10.860
2006-03-30	4.665	44.495	117.500	971.770	1.623	10.897
2006-04-06	4.609	44.480	118.310	953.200	1.639	11.166
2006-04-13	4.589	45.002	117.700	956.010	1.602	11.087
2006-04-20	4.553	45.077	116.920	948.540	1.579	11.074
2006-04-27	4.481	44.884	113.790	943.010	1.571	11.092
2006-05-04	4.472	44.808	112.450	939.900	1.560	10.952
2006-05-11	4.445	44.897	110.520	933.080	1.590	11.052
2006-05-18	4.463	45.368	111.770	946.340	1.610	11.188
2006-05-25	4.516	45.832	112.590	945.600	1.581	11.145
2006-06-01	4.512	45.679	111.670	947.800	1.587	11.347
2006-06-08	4.463	45.828	113.900	954.480	1.579	11.384
2006-06-15	4.434	45.708	115.130	955.400	1.620	11.425
2006-06-22	4.468	46.013	116.260	955.870	1.650	11.441
2006-06-29	4.430	45.885	114.510	948.940	1.639	11.289
2006-07-06	4.387	45.857	113.980	947.570	1.642	11.035
2006-07-13	4.531	46.205	116.340	953.810	1.611	11.031
2006-07-20	4.468	46.657	116.340	950.290	1.599	10.906
2006-07-27	4.424	46.532	114.750	954.220	1.620	10.895
2006-08-03	4.399	46.436	114.210	964.900	1.602	10.899
2006-08-10	4.380	46.509	116.210	961.720	1.575	10.815
2006-08-17	4.357	46.398	115.770	958.450	1.564	10.843
2006-08-24	4.397	46.418	117.340	961.810	1.574	10.959
2006-08-31	4.365	46.395	117.190	960.560	1.527	10.893
2006-09-07	4.388	46.068	116.890	956.410	1.570	11.014
2006-09-14	4.368	45.956	117.720	956.020	1.509	10.943
2006-09-21	4.327	45.787	116.460	946.780	1.516	11.072
2006-09-28	4.305	45.784	118.000	945.970	1.532	10.977
2006-10-05	4.236	45.438	118.890	948.950	1.516	11.065
2006-10-12	4.251	45.323	119.800	955.210	1.523	10.878
2006-10-19	4.289	45.203	118.720	957.530	1.498	10.818
2006-10-26	4.292	45.077	117.610	947.330	1.511	10.706
2006-11-02	4.296	44.766	118.060	936.930	1.493	10.804
2006-11-09	4.286	44.568	117.490	933.690	1.501	10.914
2006-11-16	4.316	44.762	117.730	939.260	1.507	10.966
2006-11-23	4.298	44.599	115.930	932.290	1.490	11.026

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2006-11-30	4.236	44.516	115.350	928.220	1.461	10.984
2006-12-07	4.184	44.543	116.230	920.080	1.450	10.850
2006-12-14	4.186	44.584	117.850	922.970	1.448	10.767
2006-12-21	4.184	44.379	118.910	928.890	1.430	10.857
2006-12-28	4.216	44.123	119.030	930.010	1.419	10.800
2007-01-04	4.244	44.208	118.790	934.420	1.455	10.965
2007-01-11	4.222	44.326	120.440	939.920	1.446	10.988
2007-01-18	4.219	44.160	121.220	936.100	1.438	10.892
2007-01-25	4.244	44.121	121.540	940.830	1.439	11.047
2007-02-01	4.245	44.007	121.030	937.290	1.471	11.002
2007-02-08	4.230	43.933	121.600	934.630	1.463	10.961
2007-02-15	4.201	43.880	119.240	936.200	1.434	10.989
2007-02-22	4.191	44.083	121.090	938.060	1.415	11.033
2007-03-01	4.216	44.118	116.840	943.260	1.452	11.183
2007-03-08	4.198	44.080	118.160	946.040	1.446	11.123
2007-03-15	4.208	44.086	116.820	944.490	1.433	11.160
2007-03-22	4.191	43.381	117.840	937.750	1.404	11.016
2007-03-29	4.158	43.115	117.570	941.140	1.397	11.043
2007-04-05	4.122	42.674	119.290	932.960	1.389	10.973
2007-04-12	4.069	42.447	119.260	928.980	1.356	10.995
2007-04-19	4.078	41.597	118.830	927.850	1.340	10.985
2007-04-26	4.019	40.794	119.600	929.420	1.350	10.924
2007-05-03	4.037	40.590	120.170	927.830	1.360	10.884
2007-05-10	3.973	40.743	120.200	926.370	1.362	10.821
2007-05-17	3.996	40.386	121.110	934.250	1.368	10.830
2007-05-24	4.047	40.284	121.730	928.290	1.377	10.774
2007-05-31	4.068	40.258	122.110	928.550	1.345	10.712
2007-06-07	4.185	40.838	121.630	930.940	1.322	10.980
2007-06-14	4.123	40.528	123.560	928.610	1.328	10.811
2007-06-21	4.243	40.562	124.110	928.350	1.304	10.795
2007-06-28	4.252	40.588	123.390	923.890	1.294	10.790
2007-07-05	4.233	40.385	123.280	919.300	1.278	10.781
2007-07-12	4.273	40.281	122.000	916.620	1.273	10.766
2007-07-19	4.230	40.200	121.170	914.990	1.256	10.797
2007-07-26	4.319	40.389	118.550	921.670	1.307	11.012
2007-08-02	4.316	40.275	118.440	922.700	1.309	10.966
2007-08-09	4.255	40.476	118.000	931.560	1.341	10.999
2007-08-16	4.222	41.062	113.830	950.400	1.453	11.134
2007-08-23	4.155	40.921	116.120	941.410	1.392	11.031
2007-08-30	4.123	40.646	115.850	938.190	1.425	11.033
2007-09-06	4.139	40.422	113.570	938.260	1.452	11.127
2007-09-13	4.093	40.365	115.310	928.130	1.404	11.111
2007-09-20	4.046	39.845	115.600	920.790	1.349	10.948
2007-09-27	4.017	39.662	114.980	914.880	1.322	10.933
2007-10-04	4.002	39.485	116.840	916.150	1.311	10.849
2007-10-11	4.029	39.175	117.510	917.910	1.290	10.825
2007-10-18	4.026	39.516	115.150	916.160	1.330	10.795
2007-10-25	3.972	39.309	114.010	909.170	1.307	10.762
2007-11-01	3.967	39.274	114.750	906.880	1.314	10.701
2007-11-08	3.933	39.113	110.910	906.470	1.304	10.883
2007-11-15	3.934	39.246	111.050	916.970	1.324	10.930
2007-11-22	3.865	39.679	108.180	930.690	1.323	10.975
2007-11-29	3.836	39.526	111.030	921.550	1.304	10.902
2007-12-06	3.882	39.377	111.730	918.920	1.283	10.814
2007-12-13	4.005	39.306	113.360	930.000	1.303	10.822
2007-12-20	3.906	39.304	113.960	940.780	1.308	10.823
2007-12-27	3.848	39.313	112.940	936.370	1.295	10.899
2008-01-03	3.816	39.165	108.385	938.120	1.297	10.928
2008-01-10	3.762	39.167	109.115	937.410	1.275	10.923
2008-01-17	3.774	39.204	106.828	942.770	1.320	10.939

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2008-01-24	3.693	39.342	107.319	946.650	1.298	10.873
2008-01-31	3.566	39.130	106.309	944.260	1.258	10.812
2008-02-07	3.650	39.615	107.326	941.660	1.269	10.758
2008-02-14	3.599	39.667	107.664	944.910	1.268	10.762
2008-02-21	3.581	40.047	107.007	948.270	1.241	10.777
2008-02-28	3.659	39.992	104.190	939.400	1.246	10.727
2008-03-06	3.598	40.436	102.704	957.970	1.259	10.844
2008-03-13	3.466	40.418	100.213	996.970	1.228	10.761
2008-03-20	3.534	40.153	100.820	997.360	1.255	10.670
2008-03-27	3.530	39.863	99.716	993.270	1.254	10.694
2008-04-03	3.629	39.885	101.765	974.030	1.269	10.567
2008-04-10	3.597	39.856	101.139	975.640	1.260	10.527
2008-04-17	3.443	39.748	104.562	1000.400	1.271	10.462
2008-04-24	3.489	40.142	104.182	995.490	1.278	10.468
2008-05-01	3.466	40.634	105.338	1009.220	1.278	10.458
2008-05-08	3.483	41.574	103.021	1044.750	1.304	10.571
2008-05-15	3.364	42.507	103.866	1037.250	1.293	10.432
2008-05-22	3.328	42.691	103.217	1045.820	1.270	10.396
2008-05-29	3.224	42.163	105.475	1029.200	1.276	10.329
2008-06-05	3.340	42.641	105.336	1031.080	1.305	10.368
2008-06-12	3.426	42.877	107.925	1043.860	1.333	10.367
2008-06-19	3.353	42.884	107.436	1031.640	1.312	10.276
2008-06-26	3.359	42.785	106.290	1042.540	1.313	10.302
2008-07-03	3.260	43.158	106.692	1049.070	1.317	10.338
2008-07-10	3.385	42.799	106.154	1000.200	1.314	10.309
2008-07-17	3.412	42.670	106.754	1013.400	1.312	10.204
2008-07-24	3.478	42.157	107.887	1007.330	1.348	10.024
2008-07-31	3.522	42.263	107.609	1016.150	1.376	9.974
2008-08-07	3.584	42.072	110.105	1029.700	1.419	10.131
2008-08-14	3.576	42.813	110.487	1039.080	1.417	10.201
2008-08-21	3.476	43.322	109.876	1066.060	1.408	10.114
2008-08-28	3.585	43.692	108.694	1088.730	1.431	10.297
2008-09-04	3.608	44.654	106.956	1117.750	1.501	10.494
2008-09-11	3.591	45.630	107.498	1106.250	1.508	10.577
2008-09-18	3.469	45.720	107.198	1140.520	1.457	10.608
2008-09-25	3.422	46.512	106.078	1161.500	1.459	10.796
2008-10-02	3.455	47.029	105.793	1225.850	1.510	11.126
2008-10-09	3.617	48.422	99.474	1307.020	1.679	13.025
2008-10-16	3.738	48.835	101.398	1334.430	1.627	12.832
2008-10-23	3.818	49.773	94.241	1427.360	1.792	13.340
2008-10-30	3.716	49.411	98.343	1287.300	1.720	12.668
2008-11-06	3.823	47.568	98.134	1312.090	1.697	12.854
2008-11-13	3.887	48.793	96.661	1399.660	1.779	13.004
2008-11-20	3.985	49.553	95.427	1494.650	1.883	13.948
2008-11-27	3.933	49.567	95.463	1469.360	1.819	13.390
2008-12-04	3.992	49.576	92.175	1475.430	1.906	13.800
2008-12-11	3.916	48.245	91.290	1371.360	1.836	13.532
2008-12-18	3.739	47.067	89.468	1289.390	1.739	13.124
2008-12-24	3.848	48.282	90.193	1263.450	1.718	13.528
2008-12-31	3.807	48.254	91.167	1321.700	1.710	13.786
2009-01-08	3.864	48.291	90.257	1348.800	1.686	13.716
2009-01-15	3.821	48.650	90.295	1353.000	1.847	13.932
2009-01-22	3.975	49.018	88.763	1391.300	1.899	14.071
2009-01-29	4.064	48.735	89.855	1381.500	1.968	14.333
2009-02-05	4.030	48.622	91.975	1373.500	1.887	14.182
2009-02-12	4.041	48.604	91.824	1404.900	1.900	14.470
2009-02-19	4.150	49.746	93.870	1520.100	1.973	14.836
2009-02-26	4.166	50.909	97.746	1532.800	1.990	15.095
2009-03-05	4.241	51.700	97.892	1549.800	1.985	15.264
2009-03-12	4.175	51.553	98.069	1485.900	1.908	14.594

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2009-03-19	4.032	50.515	96.198	1401.000	1.785	14.143
2009-03-26	4.218	50.518	98.038	1354.300	1.751	14.324
2009-04-02	4.172	49.927	99.976	1336.600	1.725	13.633
2009-04-09	4.141	49.784	100.180	1328.800	1.700	13.092
2009-04-16	4.175	49.820	99.232	1327.400	1.763	13.139
2009-04-23	4.239	49.704	97.055	1339.200	1.748	13.250
2009-04-30	4.147	49.674	99.264	1277.900	1.759	13.829
2009-05-07	4.111	49.155	98.983	1242.600	1.673	13.113
2009-05-14	4.145	49.395	94.883	1253.300	1.702	13.210
2009-05-21	3.937	46.961	94.474	1245.300	1.610	13.172
2009-05-28	3.919	47.124	95.562	1254.100	1.570	13.185
2009-06-04	3.946	47.069	98.203	1252.400	1.582	13.299
2009-06-11	3.943	47.602	98.216	1248.800	1.557	13.402
2009-06-18	3.956	48.030	96.141	1269.600	1.545	13.340
2009-06-25	3.967	48.026	95.219	1282.700	1.553	13.243
2009-07-02	3.881	47.823	95.962	1265.900	1.586	13.249
2009-07-09	3.988	48.765	92.314	1288.700	1.599	13.722
2009-07-16	3.906	48.578	94.086	1259.100	1.555	13.394
2009-07-23	3.864	48.165	94.856	1246.200	1.523	13.225
2009-07-30	3.795	47.913	94.566	1223.400	1.515	13.199
2009-08-06	3.908	47.740	97.631	1224.500	1.488	12.932
2009-08-13	3.795	48.203	94.659	1239.700	1.476	12.884
2009-08-20	3.805	48.448	94.645	1242.700	1.465	12.821
2009-08-27	3.816	48.545	93.543	1247.600	1.456	13.269
2009-09-03	3.768	48.873	92.751	1237.400	1.458	13.427
2009-09-10	3.781	48.405	90.302	1221.100	1.413	13.334
2009-09-17	3.739	48.047	91.346	1207.700	1.411	13.251
2009-09-24	3.769	47.936	89.835	1186.400	1.395	13.525
2009-10-01	3.768	47.628	89.628	1183.900	1.396	13.674
2009-10-08	3.735	46.473	89.707	1164.700	1.366	13.264
2009-10-15	3.709	46.235	90.734	1155.600	1.353	13.083
2009-10-22	3.691	46.434	91.853	1188.700	1.322	13.016
2009-10-29	3.759	46.925	90.538	1182.700	1.383	13.157
2009-11-05	3.763	46.853	89.857	1167.800	1.381	13.377
2009-11-12	3.774	46.270	89.582	1157.300	1.348	13.076
2009-11-19	3.816	46.646	88.911	1158.800	1.379	13.092
2009-11-26	3.813	46.556	86.868	1175.200	1.406	12.918
2009-12-03	3.771	46.127	89.889	1151.900	1.395	12.633
2009-12-10	3.771	46.487	89.250	1164.500	1.382	12.935
2009-12-17	3.803	46.710	90.492	1174.700	1.411	12.867
2009-12-24	3.795	46.576	91.998	1166.500	1.389	13.078
2009-12-31	3.740	46.289	92.578	1149.300	1.365	12.916
2010-01-07	3.705	45.528	92.688	1128.000	1.363	12.728
2010-01-14	3.687	45.801	90.794	1123.000	1.355	12.686
2010-01-21	3.725	46.232	90.060	1154.500	1.403	12.930
2010-01-28	3.723	46.184	90.407	1158.900	1.419	13.028
2010-02-04	3.744	46.752	89.226	1169.600	1.463	13.197
2010-02-11	3.760	46.474	90.009	1152.200	1.439	12.984
2010-02-18	3.773	46.270	91.968	1153.900	1.437	12.825
2010-02-25	3.781	46.066	88.827	1160.500	1.429	12.760
2010-03-04	3.772	45.513	90.307	1134.100	1.439	12.660
2010-03-11	3.718	45.498	90.471	1129.400	1.428	12.547
2010-03-18	3.740	45.335	90.508	1133.400	1.410	12.560
2010-03-25	3.739	45.169	92.574	1139.000	1.421	12.543
2010-04-01	3.690	44.417	94.309	1122.600	1.419	12.274
2010-04-08	3.687	44.178	93.275	1117.200	1.397	12.189
2010-04-15	3.719	44.334	92.004	1110.300	1.413	12.277
2010-04-22	3.722	44.426	94.239	1109.200	1.399	12.203
2010-04-29	3.722	44.233	94.278	1108.000	1.366	12.229
2010-05-06	3.790	45.431	91.661	1155.100	1.399	12.829

APPENDIX C2
DATA FOR CHAPTER 2 AND 3

Date	Israel ILS/USD	India INR/USD	Japan JPY/USD	Korea KRW/USD	New Zealand NZD/USD	Mexico MXN/USD
2010-05-13	3.772	45.210	91.947	1130.500	1.406	12.584
2010-05-20	3.834	46.915	90.188	1194.300	1.471	12.974
2010-05-27	3.837	46.333	90.822	1194.400	1.471	12.866
2010-06-03	3.876	46.884	91.843	1201.800	1.487	12.884
2010-06-10	3.853	46.777	91.767	1246.400	1.452	12.677
2010-06-17	3.817	46.159	90.762	1207.300	1.418	12.545
2010-06-24	3.864	46.357	89.397	1215.700	1.409	12.699
2010-06-30	3.899	46.584	87.718	1229.700	1.450	13.082
2010-07-08	3.870	46.670	88.500	1198.100	1.411	12.784
2010-07-15	3.863	46.707	86.440	1202.900	1.406	12.926
2010-07-22	3.858	46.915	87.315	1199.200	1.372	12.768
2010-07-29	3.790	46.372	86.471	1182.800	1.377	12.644
2010-08-05	3.764	45.964	85.253	1162.100	1.371	12.669
2010-08-12	3.806	46.625	86.181	1183.400	1.412	12.726
2010-08-19	3.811	46.625	85.644	1183.800	1.424	12.771
2010-08-26	3.822	46.809	85.117	1195.700	1.408	13.002
2010-09-02	3.774	46.582	84.436	1173.700	1.387	12.946
2010-09-09	3.771	46.282	84.143	1166.400	1.374	12.962
2010-09-16	3.734	45.895	85.806	1160.800	1.377	12.808
2010-09-23	3.690	45.251	84.261	1155.700	1.363	12.551
2010-09-30	3.631	44.413	83.320	1131.200	1.347	12.545
2010-10-07	3.599	44.417	81.874	1121.200	1.326	12.467
2010-10-14	3.571	44.159	81.319	1109.500	1.323	12.416
2010-10-21	3.627	44.544	81.517	1126.600	1.342	12.402
2010-10-28	3.633	44.450	80.474	1124.500	1.312	12.343
2010-11-04	3.588	43.925	81.357	1109.100	1.259	12.213
2010-11-10	3.675	44.780	82.420	1127.500	1.288	12.270
2010-11-18	3.646	45.268	83.467	1131.700	1.287	12.300
2010-11-25	3.666	45.823	84.084	1155.400	1.333	12.495
2010-12-02	3.623	44.951	82.730	1138.000	1.312	12.357
2010-12-09	3.614	45.118	83.899	1143.000	1.336	12.456
2010-12-16	3.593	45.176	84.156	1155.700	1.359	12.430
2010-12-23	3.587	45.029	82.899	1151.500	1.335	12.355
2010-12-30	3.538	44.721	81.126	1122.600	1.285	12.343

APPENDIX - C3
CHAPTER 3 - UNCONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	23-Feb-01	12.024	1	19	11	15	1	8	1	16	9	14	20	22	2	16	6	14	22	1	14	9	14
2	2-Mar-01	11.997	1	19	11	15	8	8	1	16	9	14	20	22	2	16	6	14	22	1	14	9	14
3	9-Mar-01	12.018	1	19	2	16	1	8	1	16	9	4	20	10	11	16	6	14	22	1	14	9	14
4	16-Mar-01	11.452	1	19	2	16	1	8	1	6	9	4	20	10	11	16	9	14	22	1	14	9	14
5	23-Mar-01	11.517	1	19	11	16	1	8	1	6	9	14	20	10	2	16	9	14	2	1	14	9	14
6	30-Mar-01	11.379	1	1	11	16	1	6	1	7	9	14	20	22	2	16	9	14	22	1	14	9	14
7	6-Apr-01	11.361	1	1	2	16	1	6	1	7	9	20	20	22	11	16	9	14	22	1	4	9	14
8	13-Apr-01	11.283	1	1	20	16	8	6	1	7	9	14	20	22	2	16	9	14	2	1	11	9	14
9	20-Apr-01	11.196	1	1	20	15	8	6	1	7	9	14	20	22	2	16	9	14	2	1	11	9	14
10	27-Apr-01	11.256	1	1	20	15	1	6	6	7	9	14	20	22	2	16	9	14	2	1	11	9	14
11	4-May-01	11.234	1	1	20	15	1	6	1	7	9	14	20	22	2	16	9	14	2	1	11	9	14
12	11-May-01	11.107	1	1	20	15	1	6	1	6	9	14	20	22	2	16	9	14	2	1	11	9	14
13	18-May-01	11.105	1	1	20	15	1	6	1	6	9	14	20	22	2	16	9	14	2	1	11	9	14
14	25-May-01	11.051	1	1	20	15	1	6	6	6	9	14	20	22	2	16	9	14	2	1	11	9	14
15	1-Jun-01	11.066	1	1	20	15	1	6	6	6	9	14	20	22	2	16	9	14	2	1	11	9	14
16	8-Jun-01	11.363	1	1	20	15	1	6	1	6	9	14	20	22	2	16	9	14	2	1	11	9	14
17	15-Jun-01	11.408	1	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	2	1	11	9	14
18	22-Jun-01	11.472	1	1	14	15	1	6	6	8	9	9	20	22	11	16	9	14	2	1	14	9	14
19	29-Jun-01	11.411	1	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	2	1	14	9	14
20	6-Jul-01	11.424	1	1	14	15	1	6	1	8	9	9	20	22	11	16	9	14	1	1	14	9	14
21	13-Jul-01	11.489	1	1	11	15	1	6	6	8	9	9	20	12	11	16	9	14	1	1	14	9	14
22	20-Jul-01	11.574	1	1	20	15	1	6	6	8	9	9	20	12	11	16	9	14	2	1	14	9	14
23	27-Jul-01	12.348	1	1	20	15	1	6	1	8	9	9	20	12	11	16	9	14	2	1	14	9	14
24	3-Aug-01	12.484	1	1	20	15	1	6	1	8	9	9	20	12	11	16	9	14	2	1	14	9	14
25	10-Aug-01	12.432	1	1	14	15	1	6	1	8	9	9	20	12	11	16	9	14	2	1	14	9	14
26	17-Aug-01	12.327	1	1	20	15	1	6	6	8	9	14	20	12	2	16	9	14	2	1	14	9	14
27	24-Aug-01	12.304	1	1	20	15	1	6	6	8	9	14	20	12	20	16	9	14	2	1	2	9	14
28	31-Aug-01	12.297	1	1	14	15	1	6	1	8	9	14	20	12	20	16	9	14	2	1	2	9	14
29	7-Sep-01	12.077	1	1	14	15	1	6	1	8	9	20	20	12	11	16	9	14	2	1	2	9	14
30	14-Sep-01	11.203	1	1	20	15	1	6	6	8	9	14	20	12	20	16	9	14	2	1	2	9	14
31	21-Sep-01	10.953	1	1	20	15	1	6	6	8	9	20	20	12	11	16	9	14	2	1	2	9	14
32	28-Sep-01	10.862	1	1	20	15	1	6	6	8	9	20	14	12	11	16	9	14	2	1	2	9	14
33	5-Oct-01	10.871	7	1	20	16	1	6	6	8	9	20	14	12	11	5	9	14	2	1	2	9	14
34	12-Oct-01	10.844	8	1	20	16	1	6	6	8	9	20	14	12	11	5	9	14	2	1	2	9	14
35	19-Oct-01	10.896	8	1	20	16	1	6	6	8	9	20	14	12	11	5	9	14	2	1	2	9	14
36	26-Oct-01	10.877	8	1	20	16	1	8	6	8	9	20	14	12	11	5	9	14	1	1	2	9	14
37	2-Nov-01	11.030	8	1	20	16	1	8	6	8	9	20	14	12	11	5	9	14	1	1	2	9	14
38	9-Nov-01	10.974	8	1	20	16	1	1	6	8	9	20	14	12	11	5	9	14	1	1	2	9	14
39	16-Nov-01	10.997	8	1	20	16	1	6	6	8	9	7	14	12	11	5	9	14	1	1	2	9	14
40	23-Nov-01	10.918	8	1	20	16	1	6	6	8	9	9	13	20	11	5	9	14	1	1	2	9	14
41	30-Nov-01	10.934	8	1	20	16	1	6	6	8	9	9	13	20	11	5	9	14	1	1	2	9	14
42	7-Dec-01	10.781	7	1	20	16	1	6	6	8	9	9	13	20	11	5	9	14	1	1	11	9	14
43	14-Dec-01	10.645	8	1	20	16	1	6	6	8	9	8	13	20	20	5	9	14	1	1	8	9	14
44	21-Dec-01	10.470	8	1	20	16	1	6	6	8	9	8	13	20	20	5	9	14	1	1	8	9	14
45	28-Dec-01	10.546	8	1	20	16	1	6	6	8	9	8	13	20	11	5	9	14	1	1	8	9	14
46	4-Jan-02	10.438	8	1	20	16	1	6	6	8	9	8	13	20	20	5	9	14	1	1	8	9	14
47	11-Jan-02	10.380	8	1	20	16	1	6	6	8	9	8	13	20	11	5	9	14	1	1	8	9	14
48	18-Jan-02	10.291	8	1	20	16	1	6	6	8	9	8	13	20	20	5	9	14	1	1	8	9	14
49	25-Jan-02	10.298	7	1	20	16	1	6	6	8	9	8	13	20	20	5	8	14	9	7	8	5	14
50	1-Feb-02	10.404	8	1	20	16	1	6	6	8	9	8	13	20	20	5	8	14	10	7	8	9	14
51	8-Feb-02	10.384	7	1	20	16	1	6	6	8	9	8	13	20	20	5	8	14	10	7	8	9	14
52	15-Feb-02	10.432	7	1	20	16	1	6	6	8	9	8	13	20	20	5	8	14	10	7	8	9	14
53	22-Feb-02	10.485	7	1	20	16	1	6	6	8	9	8	13	20	20	5	8	14	10	7	8	10	14
54	1-Mar-02	10.452	7	1	20	16	1	6	6	8	9	7	13	20	20	16	8	14	10	7	8	10	14
55	8-Mar-02	10.349	7	1	20	16	1	6	6	8	9	8	13	20	20	5	8	11	10	7	8	10	14
56	15-Mar-02	10.337	7	1	20	16	1	6	6	8	9	8	13	20	22	16	8	11	10	7	8	10	20
57	22-Mar-02	10.324	7	1	20	8	1	6	6	8	9	8	13	20	20	16	8	11	10	7	8	10	14
58	29-Mar-02	10.402	7	1	20	8	1	6	6	8	9	8	13	20	20	16	8	11	10	7	8	10	14
59	5-Apr-02	10.410	6	7	20	8	1	6	6	8	9	8	13	20	20	16	8	11	10	7	8	10	14
60	12-Apr-02	10.292	6	1	20	8	1	6	6	8	9	8	13	20	10	16	8	11	10	7	8	10	14
61	19-Apr-02	10.254	6	1	20	16	1	6	6	8	9	8	13	20	10	16	8	11	10	7	8	10	14
62	26-Apr-02	10.153	7	1	20	16	1	1	6	8	9	8	13	20	10	16	8	10	17	7	8	10	14
63	3-May-02	10.101	6	7	20	16	1	6	6	8	9	8	13	20	10	16	8	10	11	7	8	10	14
64	10-May-02	10.591	6	7	20	16	1	6	6	8	9	8	13	20	22	16	8	10	10	7	8	10	20
65	17-May-02	10.523	6	7	20	16	1	6	6	8	9	8	13	20	22	16	8	11	11	7	8	10	20
66	24-May-02	10.480	6	7	20	16	1	6	6	8	9	8	13	20	22	16	8	11	11	7	8	10	20
67	31-May-02	10.610	6	7	20	16	1	6	6	8	9	8	13	20	22	16	8	11	11	7	8	10	20
68	7-Jun-02	10.567	6	7	10	16	1	6	6	8	9	8	13	20	22	16	8	11	11	7	8	10	20
69	14-Jun-02	10.510	6	7	20	8	1	1	6	8	9	8	20	20	22	16	9	11	11	7	8	10	20

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
70	21-Jun-02	10.592	6	7	20	16	1	1	6	8	9	8	20	20	22	16	9	11	11	7	8	10	20
71	28-Jun-02	10.647	6	19	20	16	1	1	6	8	9	8	13	20	22	16	9	11	17	7	8	10	20
72	5-Jul-02	10.631	6	19	20	16	1	1	6	8	9	8	13	20	22	16	9	11	17	7	11	10	20
73	12-Jul-02	10.728	6	19	20	16	1	1	6	8	8	8	13	20	22	16	20	11	17	7	11	5	20
74	19-Jul-02	10.770	6	11	20	16	1	1	6	8	9	8	13	20	22	16	20	11	17	1	11	5	20
75	26-Jul-02	10.324	10	2	20	16	1	6	6	6	8	8	3	20	22	16	8	11	17	7	8	5	20
76	2-Aug-02	10.505	10	2	20	16	1	6	6	6	6	8	3	20	22	16	8	11	17	7	10	5	20
77	9-Aug-02	10.444	10	2	20	16	1	6	6	6	6	8	20	20	22	16	8	11	17	7	11	5	20
78	16-Aug-02	10.523	10	2	20	8	1	6	6	6	6	8	20	20	22	16	8	11	17	7	11	5	20
79	23-Aug-02	10.521	10	2	20	8	1	6	6	6	6	8	20	20	22	16	8	11	17	7	11	5	20
80	30-Aug-02	10.515	10	2	20	16	1	6	6	6	6	8	20	20	22	16	8	11	17	7	11	8	20
81	6-Sep-02	10.343	10	2	20	16	1	6	6	6	6	8	20	20	22	16	8	11	17	7	11	16	20
82	13-Sep-02	10.268	10	2	20	16	1	6	6	6	6	8	22	20	22	16	8	11	17	7	11	16	20
83	20-Sep-02	10.067	10	2	20	16	1	6	6	6	8	8	22	20	22	16	8	11	17	7	11	16	20
84	27-Sep-02	10.121	10	2	20	8	1	6	6	6	8	8	22	20	22	16	8	11	17	7	11	16	20
85	4-Oct-02	10.156	10	2	20	16	1	6	6	6	8	8	22	20	22	16	8	11	17	7	11	16	20
86	11-Oct-02	10.191	10	2	20	16	1	6	6	6	8	8	22	20	22	16	8	11	17	7	11	16	20
87	18-Oct-02	9.958	10	2	20	16	1	6	6	6	8	7	3	20	22	16	8	11	17	7	11	16	20
88	25-Oct-02	10.026	10	2	20	16	1	6	6	6	8	8	22	20	22	16	8	11	17	7	11	16	20
89	1-Nov-02	10.175	10	2	20	16	1	6	6	6	8	7	3	20	22	16	8	11	17	7	11	16	20
90	8-Nov-02	11.082	10	2	20	16	1	6	6	6	8	7	3	20	22	16	8	11	17	7	11	16	20
91	15-Nov-02	11.777	10	11	8	16	1	6	6	6	8	7	3	20	22	16	1	11	17	7	11	8	20
92	22-Nov-02	12.077	10	11	14	16	1	6	6	6	8	10	1	20	22	16	1	11	17	6	11	8	20
93	29-Nov-02	11.959	10	2	14	16	1	6	6	6	8	10	1	20	22	16	1	11	17	6	11	16	20
94	6-Dec-02	12.063	10	2	14	2	1	6	6	6	8	10	1	20	22	16	14	11	17	6	11	16	20
95	13-Dec-02	12.148	10	2	14	2	1	6	6	6	8	10	1	20	22	16	1	11	17	6	11	16	20
96	20-Dec-02	12.089	10	2	11	2	1	6	6	6	8	10	1	20	22	7	1	11	17	6	11	16	20
97	27-Dec-02	12.167	10	2	11	2	1	6	6	6	8	20	1	20	22	7	1	11	17	6	10	16	20
98	3-Jan-03	12.166	10	2	11	16	1	6	6	6	8	10	1	20	22	7	1	11	17	7	11	16	20
99	10-Jan-03	12.380	10	2	16	2	1	6	6	6	8	7	1	20	22	7	1	11	17	7	11	16	20
100	17-Jan-03	12.391	10	2	14	16	1	6	6	6	8	7	1	20	22	16	1	11	17	7	11	16	20
101	24-Jan-03	12.318	10	2	16	16	1	6	6	6	8	7	3	20	22	16	1	11	17	7	11	16	20
102	31-Jan-03	12.549	10	2	8	16	1	6	6	6	8	7	3	20	22	6	1	11	17	7	10	16	2
103	7-Feb-03	12.507	10	2	16	16	1	6	6	6	8	7	3	20	22	7	1	11	17	6	10	16	2
104	14-Feb-03	12.381	10	2	16	16	1	6	6	6	8	7	3	20	22	7	1	11	17	6	22	8	2
105	21-Feb-03	12.442	10	2	16	16	1	6	6	6	8	7	3	20	22	7	1	11	17	6	22	8	2
106	28-Feb-03	12.652	10	2	16	16	1	6	6	6	8	7	3	20	22	7	1	11	17	6	22	16	2
107	7-Mar-03	12.653	10	2	16	16	1	6	6	6	8	20	3	20	22	7	1	11	13	6	22	8	2
108	14-Mar-03	12.664	10	2	16	16	1	6	6	6	8	20	3	20	22	7	1	11	13	6	22	16	2
109	21-Mar-03	12.414	10	2	14	16	1	1	6	19	8	7	3	20	22	7	1	11	13	7	11	16	2
110	28-Mar-03	12.334	10	2	14	16	1	6	6	19	8	7	3	20	22	7	1	11	17	7	11	16	2
111	4-Apr-03	12.169	10	2	20	16	1	6	6	19	8	7	3	20	22	7	1	11	17	7	11	16	2
112	11-Apr-03	12.158	10	2	20	16	1	6	6	19	8	20	3	20	22	7	1	11	13	7	22	16	2
113	18-Apr-03	12.109	10	2	20	16	1	6	6	19	8	10	3	22	22	7	1	11	13	7	11	16	2
114	25-Apr-03	12.040	10	2	20	16	1	6	6	19	8	10	3	20	22	7	1	11	13	7	11	16	2
115	2-May-03	12.098	10	2	20	16	1	6	6	19	8	10	3	22	11	7	1	11	21	7	11	16	14
116	9-May-03	11.958	10	2	20	16	1	6	6	19	8	10	3	22	11	7	1	11	21	7	11	16	14
117	16-May-03	11.935	10	2	20	16	1	6	6	19	8	10	3	22	11	7	1	11	13	7	11	16	14
118	23-May-03	11.868	10	2	20	16	1	6	6	19	8	10	3	22	11	7	1	11	13	7	11	16	14
119	30-May-03	11.790	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	11	13	7	11	16	14
120	6-Jun-03	11.645	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	11	13	7	11	16	14
121	13-Jun-03	11.603	10	2	20	16	1	6	6	19	8	10	2	20	11	7	1	20	13	7	11	16	14
122	20-Jun-03	11.554	10	2	20	16	1	6	6	19	8	10	2	20	11	7	1	20	13	7	11	16	14
123	27-Jun-03	11.456	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	20	13	7	11	16	14
124	4-Jul-03	11.458	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	20	13	7	11	16	14
125	11-Jul-03	11.444	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	20	13	7	11	16	14
126	18-Jul-03	11.496	10	2	20	16	1	6	6	19	8	10	2	22	11	7	1	20	17	6	11	16	14
127	25-Jul-03	11.458	10	2	20	16	1	6	6	19	8	9	14	22	11	6	1	20	17	7	11	16	14
128	1-Aug-03	11.568	10	2	20	16	1	6	6	19	8	6	14	22	11	8	1	20	17	6	11	16	14
129	8-Aug-03	11.598	10	2	1	16	1	6	6	19	8	14	2	22	22	8	1	20	14	6	11	16	2
130	15-Aug-03	11.468	10	2	1	2	1	6	6	19	8	22	2	22	22	8	1	20	12	6	11	16	2
131	22-Aug-03	11.144	10	2	1	2	1	6	6	19	8	22	18	22	22	8	1	20	13	6	11	16	2
132	29-Aug-03	11.094	10	2	1	2	1	6	6	19	8	22	14	22	22	6	1	20	12	6	11	16	2
133	5-Sep-03	11.057	10	2	1	2	1	6	6	19	8	22	17	22	22	6	1	20	12	6	11	16	2
134	12-Sep-03	11.020	10	2	1	2	1	6	6	7	8	22	17	22	22	2	1	20	13	7	11	16	2
135	19-Sep-03	12.015	10	2	1	2	1	19	6	8	9	9	18	22	22	9	9	20	13	6	11	16	11
136	26-Sep-03	11.949	10	2	11	16	1	19	6	8	9	22	18	22	22	9	9	14	13	6	11	16	2
137	3-Oct-03	11.951	10	2	11	2	1	19	6	8	9	22	18	22	22	9	9	14	13	6	11	16	2
138	10-Oct-03	11.662	10	2	11	2	1	19	6	8	9	22	18	22	22	9	6	14	13	6	11	16	2

			From Top Row Node to Row-Obs.th Node																		
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
139	17-Oct-03	11.585	10	2	11	2	1	6	6	8	9	22	18	22	22	9	6	14	13	6	11	16	2
140	24-Oct-03	11.585	10	2	11	2	1	6	6	8	9	22	14	22	22	9	6	20	13	6	11	16	2
141	31-Oct-03	11.842	10	2	11	2	1	6	6	8	9	22	18	22	22	7	6	14	13	6	11	16	2
142	7-Nov-03	11.819	10	2	11	2	1	6	6	8	9	22	18	22	22	7	6	14	13	6	11	16	2
143	14-Nov-03	12.382	10	2	20	2	1	6	6	8	9	22	18	22	22	7	1	14	13	6	11	16	2
144	21-Nov-03	12.467	10	2	20	9	1	6	6	8	9	22	18	22	22	9	1	14	13	6	11	16	2
145	28-Nov-03	12.318	10	2	20	9	1	6	6	8	9	14	18	22	10	9	6	20	13	6	11	16	14
146	5-Dec-03	12.040	10	2	20	9	1	6	6	8	9	14	18	22	8	2	6	20	13	6	11	16	14
147	12-Dec-03	12.527	10	2	11	9	1	6	6	8	9	14	14	22	8	2	6	20	13	6	11	16	14
148	19-Dec-03	12.455	10	2	20	9	1	6	6	8	7	14	14	22	8	2	6	20	13	6	11	16	14
149	26-Dec-03	12.317	10	2	20	9	1	6	6	8	9	14	14	22	8	2	6	20	13	6	11	16	14
150	2-Jan-04	11.943	10	2	11	9	1	6	6	8	7	20	14	22	8	2	6	20	13	6	22	16	14
151	9-Jan-04	11.703	10	2	20	9	1	6	6	8	7	20	18	22	8	2	6	20	13	6	22	16	14
152	16-Jan-04	11.714	10	2	20	9	1	6	6	8	7	20	14	22	8	2	6	20	12	6	22	16	14
153	23-Jan-04	11.680	10	2	20	9	1	6	6	8	7	20	18	22	8	2	6	20	13	6	14	16	14
154	30-Jan-04	11.458	10	2	20	9	1	6	6	8	7	20	18	22	8	2	6	20	13	6	22	16	14
155	6-Feb-04	11.415	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	12	6	22	16	14
156	13-Feb-04	11.221	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	12	6	22	16	14
157	20-Feb-04	11.267	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	13	6	22	16	14
158	27-Feb-04	11.420	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	13	6	22	16	14
159	5-Mar-04	11.333	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	12	6	22	9	14
160	12-Mar-04	11.071	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	12	6	22	6	14
161	19-Mar-04	11.368	10	2	20	9	1	6	6	8	7	20	20	22	8	2	6	20	12	6	22	9	14
162	26-Mar-04	11.510	10	2	20	10	1	6	6	8	7	20	11	22	8	2	6	20	12	6	14	6	14
163	2-Apr-04	11.544	10	2	20	10	1	6	6	8	7	20	11	22	8	2	6	20	12	6	14	6	14
164	9-Apr-04	11.537	10	2	20	10	1	6	6	8	7	20	11	22	8	5	6	20	12	6	14	6	14
165	16-Apr-04	11.398	10	2	20	10	1	6	6	8	7	20	11	22	8	5	6	20	12	6	14	6	14
166	23-Apr-04	11.450	10	2	20	10	1	6	6	8	7	20	14	22	8	5	6	20	12	6	14	6	14
167	30-Apr-04	11.094	10	2	10	10	1	6	6	8	7	20	14	22	8	5	5	20	12	6	14	6	14
168	7-May-04	10.758	10	2	20	10	1	6	1	8	6	20	14	22	8	5	10	20	12	6	14	6	14
169	14-May-04	10.268	10	2	20	10	8	6	1	6	6	20	14	22	8	5	10	20	12	6	14	9	14
170	21-May-04	10.285	10	2	20	9	8	6	1	6	7	20	14	22	8	5	10	20	12	6	14	6	14
171	28-May-04	10.231	10	2	20	9	8	6	1	6	6	20	14	22	8	5	10	20	12	6	14	9	14
172	4-Jun-04	10.186	10	2	20	10	8	6	1	6	6	20	14	22	8	5	10	14	13	6	17	9	14
173	11-Jun-04	10.222	10	2	20	10	8	6	1	8	6	20	11	22	8	2	10	14	12	6	14	9	14
174	18-Jun-04	10.284	10	2	20	10	1	6	6	8	6	20	11	22	8	2	14	14	13	6	14	9	14
175	25-Jun-04	10.476	10	2	20	10	1	6	1	8	6	20	11	22	2	2	10	14	13	6	14	9	14
176	2-Jul-04	10.534	10	2	20	10	1	6	1	8	6	20	11	22	20	2	10	14	13	6	1	9	14
177	9-Jul-04	10.370	10	2	20	10	1	6	1	8	6	20	20	22	20	2	10	14	12	6	1	9	14
178	16-Jul-04	10.265	10	2	20	10	1	6	1	8	6	20	20	22	8	2	10	14	12	6	1	9	14
179	23-Jul-04	10.283	10	2	20	10	1	6	1	1	9	20	20	22	17	3	10	20	3	6	1	10	14
180	30-Jul-04	10.327	10	2	20	10	1	6	1	1	6	20	20	14	20	2	10	14	3	6	1	10	14
181	6-Aug-04	10.303	10	2	20	10	1	6	1	8	6	20	20	22	1	3	10	14	3	6	14	10	14
182	13-Aug-04	10.342	10	2	20	10	1	6	1	8	9	20	20	22	17	3	10	20	12	6	1	10	14
183	20-Aug-04	10.378	10	2	20	10	1	6	1	8	6	20	20	22	17	13	10	2	3	6	17	10	14
184	27-Aug-04	10.256	10	2	20	10	1	6	1	1	6	20	20	11	1	13	10	14	12	6	17	10	14
185	3-Sep-04	10.276	10	2	20	10	1	6	1	1	6	20	20	11	1	13	10	14	3	6	17	9	14
186	10-Sep-04	10.086	10	2	20	10	1	6	1	1	1	20	20	11	1	13	10	14	3	6	17	9	14
187	17-Sep-04	10.043	10	2	20	10	1	6	1	1	1	20	20	11	11	13	10	14	12	6	2	9	14
188	24-Sep-04	10.054	10	19	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	17	9	14
189	1-Oct-04	10.017	10	19	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	17	9	14
190	8-Oct-04	10.051	10	2	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	2	9	14
191	15-Oct-04	9.946	10	2	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	7	9	14
192	22-Oct-04	9.837	10	19	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	2	9	14
193	29-Oct-04	9.804	10	19	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	7	9	14
194	5-Nov-04	9.654	10	19	20	10	1	6	1	1	1	20	20	20	1	13	10	14	12	6	2	9	14
195	12-Nov-04	9.646	10	19	20	10	1	6	6	1	1	20	20	20	1	13	10	14	12	6	2	9	14
196	19-Nov-04	9.574	3	19	20	10	1	6	6	1	2	20	20	20	11	13	10	20	12	6	1	9	14
197	26-Nov-04	9.670	3	19	20	10	1	6	6	1	2	20	20	20	11	13	9	20	12	6	1	9	14
198	3-Dec-04	9.837	3	19	20	10	1	6	1	1	2	20	20	11	11	13	9	20	12	6	1	9	14
199	10-Dec-04	9.618	3	19	20	10	1	6	1	1	2	20	20	11	20	13	9	20	12	6	1	9	14
200	17-Dec-04	9.630	20	7	20	10	1	6	1	1	2	20	20	11	20	13	9	20	12	6	1	9	14
201	24-Dec-04	9.681	3	7	20	10	8	6	1	1	2	20	20	12	20	13	9	20	12	6	1	9	14
202	31-Dec-04	9.545	20	1	20	10	1	6	1	1	2	20	20	12	20	13	9	2	12	6	7	9	14
203	7-Jan-05	9.492	10	1	8	10	1	6	1	1	16	20	20	20	17	13	9	2	12	6	7	9	14
204	14-Jan-05	9.403	20	8	8	10	1	6	1	1	2	20	20	20	17	13	10	2	20	6	7	9	14
205	21-Jan-05	9.491	10	8	8	10	1	6	1	1	16	20	20	20	17	13	9	2	12	6	2	9	14
206	28-Jan-05	9.550	10	8	8	10	1	6	1	1	16	20	20	20	17	13	9	2	12	6	2	1	14
207	4-Feb-05	9.343	10	8	1	10	1	6	1	1	16	20	20	20	17	22	9	2	20	6	2	1	14

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
208	11-Feb-05	9.285	10	8	20	10	1	6	1	1	16	20	20	12	17	13	9	2	20	6	7	1	14
209	18-Feb-05	9.427	20	1	20	10	1	6	1	1	16	20	20	20	17	22	9	2	20	6	7	1	14
210	25-Feb-05	9.625	20	1	20	10	1	6	1	1	16	20	20	20	17	22	9	2	21	6	7	1	14
211	4-Mar-05	9.912	20	1	20	10	1	6	1	1	16	20	20	20	17	22	9	2	21	6	7	1	14
212	11-Mar-05	9.915	10	1	20	10	1	6	1	1	16	20	20	12	17	5	9	2	21	6	7	1	14
213	18-Mar-05	9.699	20	7	20	10	1	6	1	8	2	20	20	20	17	5	9	2	21	6	7	8	14
214	25-Mar-05	9.489	10	7	20	16	1	6	1	8	5	20	20	20	17	2	9	2	21	6	7	1	14
215	1-Apr-05	9.507	10	7	20	16	1	6	1	8	5	20	20	20	17	2	9	2	5	6	7	1	14
216	8-Apr-05	9.585	10	7	20	16	1	6	1	8	5	20	20	12	17	2	9	2	21	6	7	1	14
217	15-Apr-05	9.197	10	7	20	16	1	6	1	1	16	20	20	20	17	2	9	2	5	6	7	1	14
218	22-Apr-05	9.204	10	7	20	16	1	6	1	1	16	20	20	20	17	2	9	2	5	6	7	1	14
219	29-Apr-05	9.285	10	7	20	16	1	6	1	8	6	20	20	11	17	2	9	20	5	6	7	1	14
220	6-May-05	9.368	10	7	20	16	1	6	1	8	5	20	20	20	17	10	9	20	5	6	7	8	14
221	13-May-05	9.220	10	1	20	16	1	6	1	8	5	20	20	11	17	10	9	20	5	6	7	8	14
222	20-May-05	9.067	10	1	20	16	1	6	1	8	5	20	20	11	17	10	9	20	5	6	7	8	14
223	27-May-05	9.334	10	1	20	16	1	6	1	8	16	20	20	20	17	10	9	20	5	6	7	8	14
224	3-Jun-05	9.353	10	1	20	16	1	6	1	8	16	20	20	20	17	10	9	20	5	6	7	8	14
225	10-Jun-05	9.503	10	1	20	16	1	1	1	8	16	20	20	20	17	10	9	20	20	6	7	8	14
226	17-Jun-05	9.541	10	1	20	16	1	1	1	1	16	20	20	20	17	10	9	2	20	6	17	8	14
227	24-Jun-05	9.847	3	1	20	16	1	1	1	8	2	20	20	20	17	10	9	20	20	6	7	8	17
228	1-Jul-05	9.838	7	1	20	16	1	8	1	8	2	20	20	20	17	10	9	20	20	6	7	8	17
229	8-Jul-05	10.792	10	1	8	16	1	6	1	8	16	20	20	12	22	10	9	20	20	6	7	8	17
230	15-Jul-05	10.773	10	1	8	16	1	6	1	8	16	20	20	11	22	10	9	20	20	6	7	8	17
231	22-Jul-05	10.744	10	1	8	16	1	6	6	1	16	20	20	20	22	10	9	2	20	6	2	8	17
232	29-Jul-05	10.767	10	1	8	16	1	6	6	8	16	20	20	20	1	10	9	22	20	6	2	8	14
233	5-Aug-05	10.564	10	1	8	16	1	6	6	1	16	14	20	12	17	10	9	8	20	6	2	8	17
234	12-Aug-05	10.704	10	1	8	16	1	6	6	1	16	14	20	20	17	10	9	8	7	6	2	8	17
235	19-Aug-05	10.563	10	1	8	16	1	6	6	1	16	14	20	12	17	10	9	8	20	6	2	8	14
236	26-Aug-05	10.561	7	1	8	16	1	6	6	1	2	14	20	12	1	10	9	14	7	6	2	8	14
237	2-Sep-05	10.452	10	1	8	16	1	1	6	1	16	14	20	12	1	10	9	14	7	6	8	8	14
238	9-Sep-05	10.507	10	1	8	16	1	1	6	8	16	14	20	12	1	5	9	14	7	6	8	8	17
239	16-Sep-05	10.635	10	1	8	16	1	1	6	8	16	7	20	20	1	5	9	14	13	6	8	8	17
240	23-Sep-05	10.428	10	1	8	16	1	1	6	8	16	7	20	20	1	5	9	14	7	6	2	8	14
241	30-Sep-05	10.266	10	1	8	16	1	1	6	8	16	7	8	20	1	5	9	14	7	6	8	8	14
242	7-Oct-05	9.877	10	1	8	16	1	1	6	8	16	7	20	20	1	5	9	14	14	6	14	8	14
243	14-Oct-05	9.735	10	1	8	16	1	1	6	8	16	7	20	20	1	5	9	14	14	6	14	8	14
244	21-Oct-05	9.758	10	1	8	16	1	1	6	8	7	7	20	20	1	5	9	14	14	6	14	8	14
245	28-Oct-05	9.841	10	1	8	16	1	1	6	8	7	14	20	20	1	5	9	14	14	6	14	8	14
246	4-Nov-05	9.752	10	1	8	16	1	1	6	1	7	14	8	20	1	5	9	14	14	6	14	8	14
247	11-Nov-05	9.830	10	1	14	16	1	1	6	1	7	14	8	20	1	5	9	14	14	6	14	8	14
248	18-Nov-05	9.814	10	1	14	16	1	1	6	1	7	14	8	20	1	5	9	14	14	6	14	8	14
249	25-Nov-05	9.894	10	1	14	16	1	1	6	8	7	14	8	20	1	5	9	14	14	6	14	8	14
250	2-Dec-05	10.038	10	1	14	16	1	1	6	8	7	14	8	20	1	5	9	14	14	6	14	8	14
251	9-Dec-05	10.249	10	1	14	16	1	1	6	8	7	14	8	20	1	5	9	2	14	6	14	8	14
252	16-Dec-05	10.234	10	1	8	16	1	1	6	8	7	14	8	20	1	5	9	14	14	6	14	8	14
253	23-Dec-05	10.210	10	1	8	16	1	1	6	8	7	14	8	20	8	5	9	14	14	6	14	8	14
254	30-Dec-05	10.526	10	1	8	16	1	1	6	8	7	14	8	20	8	5	9	14	14	8	14	8	14
255	6-Jan-06	10.202	10	1	8	16	1	1	6	8	7	14	8	20	8	5	9	14	14	6	14	8	14
256	13-Jan-06	10.244	10	1	8	16	1	1	6	8	7	14	20	20	8	5	9	14	14	6	14	8	14
257	20-Jan-06	10.174	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	14	8	14
258	27-Jan-06	10.078	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	14	19	14
259	3-Feb-06	10.313	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	22	19	14
260	10-Feb-06	10.354	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	22	19	14
261	17-Feb-06	10.441	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	22	19	14
262	24-Feb-06	10.530	10	1	8	16	1	6	6	8	7	14	20	20	8	5	9	14	20	6	8	19	14
263	3-Mar-06	10.863	10	1	6	16	1	6	6	6	7	14	19	20	8	5	9	14	20	6	6	19	14
264	10-Mar-06	10.692	10	1	14	16	1	6	6	8	7	14	19	20	8	5	9	14	20	6	6	19	14
265	17-Mar-06	10.481	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	20	6	22	19	14
266	24-Mar-06	10.463	10	1	14	16	1	6	6	8	7	14	19	20	8	5	9	14	20	6	22	19	14
267	31-Mar-06	10.444	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	20	7	22	19	14
268	7-Apr-06	10.389	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	11	7	22	19	14
269	14-Apr-06	10.389	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	11	6	22	19	14
270	21-Apr-06	10.166	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	20	7	22	19	14
271	28-Apr-06	10.109	10	1	14	16	1	6	6	6	7	14	19	20	8	5	9	14	20	7	22	19	14
272	5-May-06	10.048	10	1	14	16	1	6	6	6	7	14	19	20	8	10	9	14	20	7	22	19	14
273	12-May-06	10.357	10	1	14	16	1	6	6	6	7	14	19	20	8	10	9	14	13	7	22	19	14
274	19-May-06	9.678	10	7	14	16	1	6	6	6	7	14	19	12	8	10	9	14	13	7	22	19	14
275	26-May-06	9.635	3	1	14	16	1	6	6	6	7	14	19	12	8	10	9	14	13	7	22	19	14
276	2-Jun-06	9.621	14	7	14	16	1	6	6	6	7	14	19	12	8	10	9	14	13	7	22	12	14

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
277	9-Jun-06	8.968	14	1	14	16	8	6	1	6	7	14	19	20	8	5	9	14	13	7	22	12	14
278	16-Jun-06	8.977	3	1	14	16	1	6	6	1	7	14	19	12	8	5	9	14	13	6	22	19	14
279	23-Jun-06	9.023	14	1	14	16	8	6	1	1	7	14	19	12	8	5	9	14	13	6	22	19	14
280	30-Jun-06	8.758	14	6	3	16	8	6	1	1	7	14	19	12	8	5	3	14	13	6	22	12	14
281	7-Jul-06	8.815	10	1	3	3	8	6	1	1	7	14	19	12	8	5	3	14	13	6	22	12	14
282	14-Jul-06	8.481	3	7	14	3	8	6	1	1	7	14	19	12	17	5	3	8	13	6	22	12	14
283	21-Jul-06	8.658	3	7	3	3	8	6	1	1	7	14	19	12	17	5	1	8	13	6	22	16	14
284	28-Jul-06	8.505	3	6	3	3	8	6	1	1	7	14	19	12	17	5	6	6	13	6	22	16	14
285	4-Aug-06	8.510	3	6	3	3	1	6	6	1	7	14	19	12	17	10	6	8	13	7	22	12	14
286	11-Aug-06	8.512	14	6	3	3	8	6	1	1	7	14	19	12	22	10	6	14	2	7	8	12	20
287	18-Aug-06	8.382	11	6	3	3	8	6	1	1	7	14	19	12	22	5	6	14	2	6	8	12	20
288	25-Aug-06	8.386	11	7	3	7	8	6	1	1	7	14	19	12	22	5	6	14	2	6	6	12	20
289	1-Sep-06	8.234	10	7	3	7	8	6	1	1	7	14	19	12	22	5	6	14	13	6	6	12	20
290	8-Sep-06	8.235	10	19	3	3	8	6	1	1	7	2	19	12	17	5	6	6	13	6	22	12	14
291	15-Sep-06	8.187	10	19	3	3	8	6	1	1	7	5	19	12	22	5	1	14	13	6	6	16	20
292	22-Sep-06	8.229	3	7	3	3	8	6	1	1	7	14	19	12	22	10	1	14	13	6	6	12	20
293	29-Sep-06	8.213	3	6	3	3	8	6	1	1	7	14	19	12	22	10	3	14	13	6	6	12	20
294	6-Oct-06	8.265	3	6	3	7	8	6	1	8	3	5	19	12	22	10	7	20	13	6	6	12	20
295	13-Oct-06	8.306	3	7	3	7	8	6	1	1	7	5	19	12	22	10	7	20	13	6	6	12	20
296	20-Oct-06	8.233	3	6	3	7	8	6	1	1	7	5	19	12	22	10	3	6	13	6	17	12	20
297	27-Oct-06	8.219	3	6	3	7	8	6	1	1	7	5	19	19	22	10	3	6	13	6	17	12	20
298	3-Nov-06	8.191	3	6	3	7	8	6	1	1	7	5	19	2	22	10	3	6	13	6	17	12	20
299	10-Nov-06	8.184	3	7	3	7	8	6	1	1	7	5	19	12	22	10	3	20	13	6	6	12	20
300	17-Nov-06	8.150	3	6	3	7	8	6	1	1	7	5	19	12	22	10	3	8	13	6	17	12	20
301	24-Nov-06	8.152	3	6	3	7	8	6	1	1	7	5	19	12	22	10	3	8	13	6	17	12	20
302	1-Dec-06	8.273	3	7	3	7	8	6	1	1	7	5	19	12	22	10	3	20	13	6	5	12	20
303	8-Dec-06	8.446	3	7	3	7	8	6	1	1	7	5	19	12	22	10	3	8	13	6	17	12	20
304	15-Dec-06	8.709	3	7	3	7	8	6	1	1	7	20	19	12	17	10	7	8	13	6	17	12	14
305	22-Dec-06	8.538	3	6	3	7	8	6	1	8	7	5	19	12	17	10	8	20	2	6	5	12	14
306	29-Dec-06	8.585	3	6	3	3	8	6	1	8	7	5	19	12	17	10	8	20	2	6	5	12	14
307	5-Jan-07	8.517	3	6	3	3	8	6	1	8	3	20	19	12	17	10	3	8	2	6	17	12	20
308	12-Jan-07	8.592	3	6	3	3	8	6	1	8	7	20	22	12	17	3	3	8	2	6	17	12	20
309	19-Jan-07	8.507	3	6	3	3	8	6	1	8	7	20	22	12	17	10	3	8	2	6	17	12	20
310	26-Jan-07	8.459	3	6	3	3	8	6	1	1	7	20	19	12	17	3	3	8	2	6	17	12	20
311	2-Feb-07	8.563	3	6	3	3	8	6	1	1	15	12	22	12	17	3	3	8	2	6	17	12	14
312	9-Feb-07	8.555	3	6	3	3	8	6	1	1	15	12	22	12	17	3	3	8	2	6	17	12	14
313	16-Feb-07	8.483	3	6	3	3	8	6	1	1	15	12	22	12	17	3	3	8	2	6	17	12	20
314	23-Feb-07	8.508	3	6	3	3	8	6	1	8	15	12	22	12	17	3	6	8	2	6	17	12	20
315	2-Mar-07	7.987	7	6	3	9	8	1	1	1	15	20	22	20	2	7	7	8	2	6	9	12	14
316	9-Mar-07	7.997	7	6	3	9	8	1	1	1	15	20	22	20	2	7	7	8	2	6	9	12	14
317	16-Mar-07	7.935	7	6	3	9	8	1	1	1	15	20	22	20	2	7	7	3	2	6	9	12	14
318	23-Mar-07	7.649	7	6	3	9	8	1	1	1	15	20	22	20	2	7	7	3	2	6	9	12	14
319	30-Mar-07	7.651	7	6	3	9	8	1	1	1	15	20	22	20	2	7	7	3	2	6	9	12	14
320	6-Apr-07	7.467	3	6	19	9	1	1	6	1	15	20	22	20	2	7	8	3	2	6	9	12	14
321	13-Apr-07	7.411	5	6	10	9	1	1	6	1	15	20	22	20	2	7	8	3	2	6	9	12	14
322	20-Apr-07	7.371	5	6	19	7	1	1	6	1	15	20	11	20	2	7	8	3	2	6	9	12	14
323	27-Apr-07	7.333	5	6	19	9	1	1	6	1	15	20	11	20	2	7	8	3	2	6	9	12	14
324	4-May-07	7.358	7	6	19	9	1	1	6	1	7	20	11	20	2	8	8	3	2	6	9	12	14
325	11-May-07	7.394	7	6	19	9	1	1	6	1	7	20	11	20	2	8	8	3	2	6	9	12	17
326	18-May-07	7.403	7	8	3	9	1	1	6	1	7	20	11	20	2	8	8	3	2	6	9	12	17
327	25-May-07	7.415	7	8	3	9	1	1	6	1	7	20	22	20	2	8	8	3	2	6	9	12	17
328	1-Jun-07	7.406	7	8	3	8	1	6	6	1	7	20	22	20	2	8	8	3	2	6	9	12	17
329	8-Jun-07	7.224	7	6	3	8	1	6	6	1	7	20	3	20	2	8	8	3	2	6	9	12	17
330	15-Jun-07	7.288	7	6	3	8	1	6	6	1	15	20	3	20	2	8	8	3	2	6	9	12	17
331	22-Jun-07	7.418	7	6	3	8	1	6	6	1	7	20	3	20	2	8	8	3	16	6	9	12	17
332	29-Jun-07	7.435	15	6	19	8	1	6	6	1	15	20	3	20	2	8	8	3	13	6	9	12	17
333	6-Jul-07	7.333	15	6	19	7	1	6	6	1	15	20	11	20	2	3	8	3	16	6	1	12	17
334	13-Jul-07	7.939	5	6	19	9	1	6	6	1	15	20	20	20	2	8	8	3	2	6	1	16	17
335	20-Jul-07	7.891	5	6	10	9	1	6	6	1	15	20	20	20	2	8	8	3	15	6	1	16	17
336	27-Jul-07	7.288	10	6	10	9	1	6	6	1	7	20	20	20	2	8	7	3	15	6	9	12	14
337	3-Aug-07	7.867	10	6	10	7	1	6	6	1	7	20	11	20	2	8	7	20	13	6	9	12	11
338	10-Aug-07	7.721	7	6	10	7	1	1	6	8	5	20	11	20	2	3	8	20	13	6	1	12	11
339	17-Aug-07	6.871	5	6	10	3	1	1	6	8	5	20	11	20	2	3	7	20	13	6	5	12	2
340	24-Aug-07	6.492	5	6	10	3	1	1	6	8	5	20	20	20	2	3	7	20	13	6	5	16	2
341	31-Aug-07	6.483	5	6	10	3	1	6	6	8	5	20	20	20	2	3	6	20	13	6	5	16	2
342	7-Sep-07	6.794	5	6	10	3	7	1	6	8	5	20	20	20	2	3	5	20	13	6	2	12	2
343	14-Sep-07	6.852	5	6	13	3	1	6	6	8	5	20	20	20	2	3	5	20	13	6	2	12	2
344	21-Sep-07	6.852	5	6	13	3	1	6	6	8	5	20	11	20	2	3	5	2	13	6	2	9	2
345	28-Sep-07	6.782	5	6	13	16	1	6	6	8	5	20	11	20	2	3	3	2	13	6	2	9	2

APPENDIX - C3
CHAPTER 3 - UNCONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
346	5-Oct-07	6.749	5	16	13	16	1	6	6	6	5	20	11	20	2	3	7	2	13	6	2	9	2
347	12-Oct-07	6.730	5	16	13	6	7	1	6	6	5	20	11	20	2	3	7	2	12	6	2	9	2
348	19-Oct-07	6.751	5	16	12	6	7	1	6	8	5	20	11	20	2	3	7	2	12	6	2	12	2
349	26-Oct-07	6.804	5	16	7	6	7	1	6	8	5	2	11	20	2	3	7	2	12	6	2	12	2
350	2-Nov-07	6.896	5	15	7	6	7	1	6	8	5	20	11	20	2	5	3	2	12	6	2	12	2
351	9-Nov-07	6.904	5	16	7	6	7	1	6	6	5	20	20	20	2	5	7	2	11	6	2	12	2
352	16-Nov-07	6.787	5	7	7	6	7	1	6	19	7	20	20	20	2	5	7	2	11	6	2	12	2
353	23-Nov-07	6.750	5	7	5	15	7	1	6	19	7	20	20	20	2	3	3	2	11	6	2	12	2
354	30-Nov-07	6.676	5	7	5	15	7	1	6	19	7	20	20	20	2	3	3	2	11	6	2	12	2
355	7-Dec-07	6.687	5	7	5	15	7	1	6	19	7	20	20	20	2	3	9	2	12	6	2	12	2
356	14-Dec-07	6.541	5	7	5	15	7	1	6	19	7	20	20	20	2	3	9	2	11	6	2	12	2
357	21-Dec-07	6.572	20	7	5	15	7	1	6	16	5	20	20	15	2	3	3	2	11	6	13	9	2
358	28-Dec-07	6.536	5	7	5	15	7	1	6	16	5	20	20	20	2	3	5	2	12	6	2	10	2
359	4-Jan-08	6.505	5	7	5	6	7	1	6	16	5	20	20	20	2	5	5	2	12	6	2	10	2
360	11-Jan-08	6.721	15	7	5	6	7	1	6	16	7	2	13	2	2	5	5	2	12	6	2	10	2
361	18-Jan-08	6.416	5	7	5	6	7	1	6	16	1	2	13	2	2	5	5	20	12	6	2	10	2
362	25-Jan-08	6.608	5	7	5	15	1	1	6	16	7	2	13	15	2	3	5	20	11	6	2	6	14
363	1-Feb-08	6.630	5	7	5	15	1	1	6	16	7	2	13	2	2	3	5	2	11	6	2	6	14
364	8-Feb-08	6.500	5	7	5	16	1	1	6	19	7	2	2	2	2	5	9	2	13	6	11	6	14
365	15-Feb-08	6.481	5	7	5	16	1	1	6	7	7	2	2	2	2	5	9	20	13	6	11	6	14
366	22-Feb-08	6.548	5	7	11	16	1	1	6	7	7	2	2	2	2	5	9	20	13	6	11	6	14
367	29-Feb-08	6.558	15	7	11	16	1	1	6	7	7	2	2	2	2	5	9	22	13	6	11	6	14
368	7-Mar-08	6.310	10	7	11	6	1	1	6	16	7	2	2	2	2	5	5	20	13	6	11	6	14
369	14-Mar-08	6.422	15	7	11	7	1	1	6	16	7	2	14	12	2	5	5	20	13	6	11	12	14
370	21-Mar-08	6.506	10	7	11	7	1	1	6	16	7	2	14	12	2	5	5	20	13	6	11	6	14
371	28-Mar-08	6.546	15	7	11	7	1	1	6	16	7	2	14	12	2	5	5	20	13	6	11	6	14
372	4-Apr-08	6.585	5	1	11	7	1	1	6	16	7	2	13	2	2	5	5	20	13	6	2	6	14
373	11-Apr-08	6.627	5	1	12	7	1	1	6	16	7	2	13	2	2	5	5	20	13	6	11	6	14
374	18-Apr-08	6.693	5	1	12	7	1	1	6	16	7	2	13	2	2	5	5	20	13	6	11	6	14
375	25-Apr-08	7.094	5	1	13	7	1	1	6	16	7	2	13	2	2	5	5	20	13	6	2	6	14
376	2-May-08	7.168	5	7	13	7	1	1	6	7	7	2	13	14	2	5	9	20	14	6	11	6	14
377	9-May-08	7.247	5	7	11	7	1	1	6	7	7	2	13	2	2	5	9	20	14	6	11	6	14
378	16-May-08	7.332	5	1	11	7	1	1	6	7	7	2	13	14	2	5	9	20	14	6	11	6	14
379	23-May-08	7.333	5	1	11	7	1	1	6	7	7	2	13	14	2	5	9	20	14	6	11	6	14
380	30-May-08	7.445	5	1	11	7	1	1	6	16	7	2	13	14	2	5	5	20	14	6	11	9	14
381	6-Jun-08	7.458	5	7	11	7	1	1	6	16	7	2	13	14	2	5	5	20	14	6	11	9	14
382	13-Jun-08	7.265	5	1	11	7	1	1	6	16	7	2	13	14	2	5	5	20	14	6	11	6	14
383	20-Jun-08	7.291	5	7	11	7	1	1	6	16	7	2	13	14	2	5	5	20	11	6	11	6	14
384	27-Jun-08	7.261	5	7	11	7	1	1	6	16	7	2	13	14	2	5	5	20	11	6	11	6	14
385	4-Jul-08	7.156	5	7	11	7	1	1	6	16	7	2	13	14	2	5	5	20	11	6	11	6	14
386	11-Jul-08	7.238	5	7	11	7	1	6	6	16	7	2	13	14	2	5	5	20	11	6	11	6	14
387	18-Jul-08	7.277	5	7	11	7	1	6	6	16	7	2	13	14	2	5	7	20	11	6	11	22	14
388	25-Jul-08	7.268	5	7	11	7	1	6	6	16	7	2	13	14	11	5	7	20	11	6	11	22	14
389	1-Aug-08	7.316	10	7	11	7	1	6	6	16	7	2	13	14	11	5	7	20	11	6	11	22	14
390	8-Aug-08	7.438	5	7	11	7	1	1	6	16	7	2	13	14	11	5	7	20	11	6	11	22	14
391	15-Aug-08	7.334	5	7	11	3	1	1	6	16	7	2	13	14	11	5	7	20	11	6	11	22	14
392	22-Aug-08	7.384	5	7	11	7	1	1	6	16	7	2	13	14	11	5	7	20	11	6	11	22	14
393	29-Aug-08	7.594	5	7	11	7	1	1	6	7	7	2	13	14	11	5	9	20	11	6	11	22	14
394	5-Sep-08	7.289	5	7	11	7	1	6	6	16	7	2	13	14	11	5	5	20	11	6	2	22	14
395	12-Sep-08	7.478	5	1	11	3	1	6	6	16	1	2	13	14	2	5	5	20	11	6	2	22	14
396	19-Sep-08	7.736	5	1	11	3	1	6	6	16	2	2	13	14	22	5	5	20	11	6	2	22	17
397	26-Sep-08	7.901	5	1	11	3	1	6	6	16	7	2	13	14	22	2	5	11	11	6	11	22	17
398	3-Oct-08	7.318	5	1	11	3	1	6	6	16	5	2	13	11	2	5	5	2	11	6	11	15	14
399	10-Oct-08	5.415	3	1	11	3	7	1	6	16	3	20	15	12	11	2	1	2	13	6	17	14	14
400	17-Oct-08	5.701	7	1	11	10	1	6	6	6	2	20	15	12	20	2	9	2	13	6	17	14	17
401	24-Oct-08	5.395	7	1	11	10	1	6	6	6	2	20	15	12	20	8	9	2	13	6	3	14	17
402	31-Oct-08	5.298	3	1	11	8	1	6	6	16	2	20	13	4	20	8	5	2	13	6	3	22	17
403	7-Nov-08	5.302	3	1	11	7	1	6	6	16	2	20	13	4	20	8	5	2	13	6	3	22	17
404	14-Nov-08	5.459	3	1	11	8	1	6	6	7	2	20	13	4	20	8	5	2	13	6	3	22	14
405	21-Nov-08	5.340	3	1	11	8	1	6	6	7	2	20	3	12	20	8	5	2	13	6	3	22	14
406	28-Nov-08	5.237	3	1	11	8	1	6	6	7	3	20	3	12	20	8	5	2	13	6	2	14	14
407	5-Dec-08	5.370	3	1	11	7	1	6	6	16	2	20	15	12	20	8	5	2	13	6	2	22	14
408	12-Dec-08	5.236	3	1	11	8	1	6	6	16	7	20	15	12	20	8	5	2	13	6	3	14	14
409	19-Dec-08	5.182	3	1	11	8	1	6	6	16	7	20	15	12	20	8	8	2	13	6	2	22	14
410	26-Dec-08	5.218	3	1	11	7	1	6	6	16	7	20	15	12	20	8	8	2	13	6	2	22	14
411	2-Jan-09	5.139	7	1	11	7	1	6	6	7	7	20	15	12	20	8	8	2	13	6	2	22	14
412	9-Jan-09	5.192	7	1	11	7	1	6	6	16	5	20	15	4	20	8	8	2	13	6	2	22	14
413	16-Jan-09	5.154	7	1	11	7	1	6	6	16	5	17	15	12	20	8	8	2	13	6	11	22	17
414	23-Jan-09	5.164	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	17

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
415	30-Jan-09	5.195	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	17
416	6-Feb-09	5.235	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	14
417	13-Feb-09	5.246	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	14
418	20-Feb-09	5.196	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	14
419	27-Feb-09	5.249	7	1	11	7	1	6	6	16	5	17	15	4	20	8	8	2	13	6	11	22	14
420	6-Mar-09	5.254	7	1	11	10	1	6	6	16	2	17	15	4	20	8	8	2	13	6	11	22	14
421	13-Mar-09	5.154	6	1	11	10	1	6	6	16	2	17	15	4	20	8	8	2	13	6	11	22	14
422	20-Mar-09	4.971	6	6	11	10	1	6	6	16	2	20	15	4	20	8	8	2	13	6	8	22	20
423	27-Mar-09	4.889	6	6	11	10	1	6	6	16	2	20	15	4	20	8	8	2	13	6	8	14	20
424	3-Apr-09	4.813	6	6	11	10	1	6	6	16	2	20	15	4	20	8	8	2	13	6	8	14	20
425	10-Apr-09	4.781	6	6	11	10	1	6	6	16	2	20	15	4	20	8	8	2	13	6	2	14	20
426	17-Apr-09	4.769	6	6	11	10	1	6	6	16	2	20	13	4	20	8	8	2	13	6	8	14	20
427	24-Apr-09	4.818	6	6	11	10	1	6	6	16	2	20	13	4	20	8	8	2	13	6	2	14	20
428	1-May-09	4.797	6	6	20	10	1	6	6	16	2	20	15	4	20	8	8	2	13	6	2	14	20
429	8-May-09	4.890	6	1	11	10	1	6	6	16	2	20	15	11	20	8	8	2	13	6	2	14	20
430	15-May-09	4.892	6	6	11	10	1	6	6	16	2	20	15	11	20	8	8	2	13	6	2	14	14
431	22-May-09	4.876	6	6	20	10	1	6	6	16	2	20	15	20	20	8	8	2	13	6	2	22	20
432	29-May-09	4.805	6	6	20	10	1	6	6	16	2	20	15	20	20	8	8	2	11	6	2	22	20
433	5-Jun-09	4.819	6	6	20	10	1	6	6	16	2	20	15	20	20	8	8	2	11	6	2	14	20
434	12-Jun-09	4.742	6	6	20	10	1	6	6	16	2	20	15	20	20	8	8	2	13	6	2	14	20
435	19-Jun-09	4.727	6	2	11	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
436	26-Jun-09	4.701	6	6	20	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	11
437	3-Jul-09	4.684	6	6	20	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
438	10-Jul-09	4.729	6	6	11	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
439	17-Jul-09	4.687	6	6	11	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
440	24-Jul-09	4.619	6	6	11	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
441	31-Jul-09	4.592	6	6	11	10	1	6	6	16	2	20	15	20	20	2	8	2	13	6	2	14	20
442	7-Aug-09	4.660	6	6	11	10	1	6	6	16	2	2	15	20	20	2	8	2	13	6	11	14	20
443	14-Aug-09	4.664	6	6	11	10	1	6	6	16	2	2	15	20	20	5	8	2	13	6	11	14	20
444	21-Aug-09	4.672	6	6	11	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
445	28-Aug-09	4.675	6	6	20	10	1	6	6	16	6	20	15	20	20	5	8	2	13	6	2	14	20
446	4-Sep-09	4.675	6	6	20	7	1	6	6	16	5	2	15	20	20	5	8	2	13	6	11	14	20
447	11-Sep-09	4.620	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
448	18-Sep-09	4.630	6	6	20	10	1	6	6	16	6	2	15	20	8	5	8	2	13	6	11	14	20
449	25-Sep-09	4.628	6	6	20	10	1	6	6	16	6	2	15	20	8	5	8	2	13	6	11	14	20
450	2-Oct-09	4.645	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
451	9-Oct-09	4.658	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
452	16-Oct-09	4.607	6	6	20	10	1	6	6	16	6	2	15	20	8	5	8	2	13	6	11	14	20
453	23-Oct-09	4.624	6	6	20	10	1	6	6	16	6	2	15	20	8	8	8	2	13	6	11	14	20
454	30-Oct-09	4.692	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
455	6-Nov-09	4.646	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	14	20
456	13-Nov-09	4.603	6	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	12	20
457	20-Nov-09	4.509	1	6	20	10	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	12	20
458	27-Nov-09	4.605	1	6	20	7	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	4	20
459	4-Dec-09	5.550	10	6	20	7	1	6	6	16	6	2	15	20	20	5	8	2	13	6	11	20	20
460	11-Dec-09	5.453	1	6	20	7	1	1	6	16	1	2	15	2	8	5	8	2	13	6	11	20	20
461	18-Dec-09	5.948	1	6	20	7	1	1	6	16	1	20	15	2	8	1	8	2	13	6	2	4	20
462	25-Dec-09	5.764	1	6	13	10	1	1	6	16	1	20	20	2	1	5	8	2	11	6	2	12	14
463	1-Jan-10	5.676	1	6	13	10	1	1	6	16	1	20	20	2	1	5	8	2	11	6	2	12	14
464	8-Jan-10	5.508	1	6	13	10	1	1	6	16	1	2	20	2	1	5	8	2	21	3	11	4	14
465	15-Jan-10	5.894	1	6	13	10	1	1	6	16	1	2	20	2	1	5	8	2	21	6	11	1	20
466	22-Jan-10	5.894	1	6	1	10	1	1	6	16	1	20	20	2	1	1	8	2	21	6	2	5	20
467	29-Jan-10	5.721	1	6	1	1	1	1	6	10	1	2	20	2	1	5	9	2	22	6	11	5	4
468	5-Feb-10	5.666	1	6	1	10	1	1	6	10	1	2	20	2	2	5	9	2	22	6	11	5	4
469	12-Feb-10	5.687	1	6	1	10	1	1	6	10	8	2	20	2	3	5	9	2	22	6	11	5	20
470	19-Feb-10	5.581	1	6	1	10	1	1	6	10	1	2	20	2	3	5	9	2	22	6	11	5	20
471	26-Feb-10	5.661	1	6	1	10	1	1	6	10	1	2	20	2	3	5	9	2	22	6	11	1	14
472	5-Mar-10	5.543	1	6	1	6	1	1	6	10	8	2	20	2	3	5	9	2	22	6	11	8	14
473	12-Mar-10	5.688	1	6	1	6	1	1	6	10	8	2	20	2	3	5	9	14	22	6	11	8	14
474	19-Mar-10	5.890	1	6	1	6	1	1	6	10	8	2	20	2	3	1	9	14	22	6	11	8	14
475	26-Mar-10	5.846	1	6	1	6	1	1	6	10	8	2	20	2	3	1	9	14	22	6	11	8	14
476	2-Apr-10	5.736	1	6	1	6	1	1	6	10	8	2	20	2	3	1	9	14	22	6	11	8	14
477	9-Apr-10	5.723	1	6	1	6	1	1	6	10	8	2	20	2	2	1	9	14	22	6	11	8	14
478	16-Apr-10	6.168	1	6	1	10	1	1	6	10	8	2	20	2	2	1	9	2	14	6	11	8	14
479	23-Apr-10	6.038	3	6	1	6	1	1	6	10	8	2	20	2	2	1	9	2	22	6	11	3	14
480	30-Apr-10	6.079	3	6	1	10	1	6	6	10	8	2	20	2	2	5	9	14	11	6	11	3	14
481	7-May-10	5.560	3	6	1	6	1	6	6	10	8	2	20	2	2	5	9	14	11	6	2	3	14
482	14-May-10	5.603	3	6	1	6	1	6	1	10	8	2	20	2	2	3	9	11	11	6	2	3	14
483	21-May-10	5.396	9	6	8	10	1	6	1	8	9	20	20	2	2	3	9	2	11	7	2	2	14

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
484	28-May-10	5.549	7	6	1	10	1	6	1	8	9	20	20	2	2	3	9	11	11	7	2	2	14
485	4-Jun-10	5.569	7	6	1	10	1	6	1	8	9	20	20	2	2	5	9	11	11	7	2	2	14
486	11-Jun-10	5.563	7	6	1	10	1	6	1	8	9	20	20	2	2	5	9	11	11	7	2	2	14
487	18-Jun-10	5.480	7	6	1	10	1	1	1	8	9	20	20	2	2	5	9	11	11	7	2	2	14
488	25-Jun-10	5.440	7	6	8	10	1	1	1	8	9	20	13	2	13	5	9	14	11	7	2	2	14
489	2-Jul-10	5.335	7	6	20	10	1	6	1	6	9	2	20	2	13	5	9	14	11	7	2	2	20
490	9-Jul-10	5.213	7	6	20	10	1	6	1	6	9	2	13	2	2	5	9	14	11	7	2	2	20
491	16-Jul-10	5.161	7	6	2	10	1	6	1	8	9	2	13	2	13	5	9	14	11	7	2	2	20
492	23-Jul-10	5.139	10	6	2	10	1	1	1	8	9	2	13	2	2	5	9	14	11	6	2	2	20
493	30-Jul-10	5.030	7	6	2	10	1	1	1	8	9	2	14	2	13	5	9	14	11	6	2	2	20
494	6-Aug-10	4.965	10	6	2	10	1	1	1	8	9	2	14	2	2	5	9	20	11	6	2	2	20
495	13-Aug-10	4.869	7	6	2	10	1	1	1	8	9	2	14	2	2	5	9	20	11	6	2	2	20
496	20-Aug-10	4.865	7	6	2	10	1	1	1	8	9	2	14	2	2	5	9	20	11	6	2	2	14
497	27-Aug-10	4.779	7	6	2	10	1	1	6	1	9	2	14	2	2	5	9	14	11	6	2	2	2
498	3-Sep-10	4.699	7	6	2	10	1	1	1	1	9	2	14	2	2	5	9	14	11	6	2	2	2
499	10-Sep-10	4.764	7	6	12	10	1	1	6	6	9	2	14	2	2	5	9	20	11	6	2	2	2
500	17-Sep-10	4.882	7	6	22	10	1	1	6	6	9	2	4	2	2	5	9	20	11	6	2	2	20
501	24-Sep-10	4.903	7	6	22	10	1	1	6	1	9	2	4	2	2	5	9	20	11	6	2	9	20
502	1-Oct-10	4.812	7	6	2	10	1	1	6	1	9	2	4	2	2	5	9	20	11	6	2	9	2
503	8-Oct-10	4.665	10	6	22	10	8	1	1	1	9	2	4	20	2	5	9	14	11	6	2	9	2
504	15-Oct-10	4.662	7	6	22	10	1	1	6	1	9	2	4	20	22	5	9	14	11	6	2	9	2
505	22-Oct-10	4.630	7	6	22	10	1	1	6	6	9	2	4	20	2	1	9	14	11	6	2	9	2
506	29-Oct-10	4.555	7	6	22	10	1	1	6	6	9	2	4	20	22	5	9	14	11	6	2	9	2
507	5-Nov-10	4.612	7	6	22	10	1	1	6	1	9	2	4	20	22	5	9	14	11	7	2	9	2
508	12-Nov-10	4.574	7	6	22	10	1	1	6	1	9	2	4	20	20	5	9	14	11	7	2	9	20
509	19-Nov-10	4.552	7	6	22	10	1	1	6	1	9	2	14	2	22	5	9	14	11	7	2	9	2
510	26-Nov-10	4.450	7	6	22	10	1	1	6	10	2	2	14	20	22	5	9	14	11	7	2	9	20
511	3-Dec-10	4.552	7	6	22	10	1	1	6	1	9	2	14	2	22	5	9	14	11	7	2	9	2
512	10-Dec-10	4.529	7	6	22	10	1	1	6	10	2	2	14	20	22	5	9	14	11	7	2	9	2
513	17-Dec-10	4.538	7	6	2	10	1	1	6	10	2	14	20	20	22	5	9	14	11	7	2	9	2
514	24-Dec-10	4.708	7	6	2	10	1	1	6	10	2	14	20	14	22	5	9	14	11	7	2	9	2
515	31-Dec-10	4.721	7	6	2	10	1	1	6	10	2	14	20	14	22	5	9	14	11	7	2	9	2

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	7-Jan-00	8.476	5	19	12	6	1	2	16	1	21	14	1	8	17	5	6	15	22	8	14	9	13
2	14-Jan-00	8.549	5	19	12	6	1	2	16	1	21	14	1	8	17	5	5	15	22	8	14	9	13
3	21-Jan-00	8.729	5	19	12	6	1	2	16	1	21	14	1	8	17	5	5	15	22	8	14	9	13
4	28-Jan-00	8.836	5	19	12	6	1	2	16	1	21	14	1	21	6	5	6	14	22	8	14	9	13
5	4-Feb-00	8.924	9	19	12	6	1	2	16	1	21	14	1	21	17	5	6	15	22	8	14	2	13
6	11-Feb-00	9.188	5	19	12	6	1	3	16	1	21	14	20	21	17	5	6	15	22	8	14	9	13
7	18-Feb-00	9.720	5	12	12	6	1	3	16	1	21	14	20	21	17	5	6	5	22	8	14	9	13
8	25-Feb-00	9.916	5	19	12	6	1	3	16	1	21	14	20	21	17	5	6	5	22	8	14	2	13
9	3-Mar-00	10.198	5	12	12	6	1	3	16	1	21	14	20	21	17	5	6	5	22	3	14	2	13
10	10-Mar-00	10.561	5	12	12	6	1	2	16	1	21	14	20	21	17	5	6	5	22	3	14	2	13
11	17-Mar-00	10.885	5	12	12	6	1	2	16	1	21	14	20	21	6	5	6	14	22	3	14	2	13
12	24-Mar-00	11.151	5	12	12	6	1	2	16	1	21	14	20	21	6	5	6	14	22	3	14	2	13
13	31-Mar-00	11.490	5	12	12	6	1	2	16	1	6	14	20	8	6	5	6	14	22	3	14	2	13
14	7-Apr-00	11.473	5	12	12	6	1	2	16	1	1	14	20	21	6	5	6	14	22	3	14	2	13
15	14-Apr-00	11.742	5	12	12	6	1	2	16	1	1	14	20	21	6	5	6	14	22	9	14	2	13
16	21-Apr-00	11.088	1	12	12	6	1	16	16	16	9	14	20	21	6	5	5	14	22	3	14	6	13
17	28-Apr-00	11.261	1	12	12	16	1	16	16	16	9	14	20	21	6	5	6	14	22	3	14	6	13
18	5-May-00	11.616	1	12	12	16	1	16	16	16	9	14	20	21	6	5	6	14	22	3	14	6	13
19	12-May-00	11.924	1	12	12	6	1	16	16	16	9	14	20	21	6	5	5	14	22	3	11	6	13
20	19-May-00	11.987	6	19	12	16	1	16	16	16	9	14	20	21	6	5	6	14	22	1	11	6	13
21	26-May-00	12.046	5	19	12	16	1	16	16	16	9	14	20	21	6	5	6	14	22	1	11	6	13
22	2-Jun-00	12.256	5	19	12	16	1	16	16	16	9	14	2	21	20	5	6	14	22	1	12	6	13
23	9-Jun-00	11.432	5	19	8	16	1	8	6	16	9	14	20	21	6	5	8	14	22	1	14	2	13
24	16-Jun-00	11.642	5	19	2	16	1	8	6	16	9	14	20	21	6	6	8	14	22	1	14	2	13
25	23-Jun-00	11.964	1	19	8	16	1	8	6	16	9	14	20	21	6	6	8	14	22	1	14	9	13
26	30-Jun-00	12.113	1	19	2	16	1	8	1	16	9	14	20	21	6	6	6	14	22	1	14	9	13
27	7-Jul-00	12.452	1	19	12	16	1	8	6	16	9	14	20	21	6	6	6	14	22	1	14	9	13
28	14-Jul-00	12.730	1	19	15	16	1	8	6	16	9	14	20	21	6	16	6	14	22	1	14	9	13
29	21-Jul-00	12.968	1	19	15	16	1	8	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
30	28-Jul-00	13.119	1	19	15	6	1	8	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
31	4-Aug-00	12.951	1	19	15	6	1	8	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
32	11-Aug-00	13.262	1	19	15	6	1	8	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
33	18-Aug-00	13.430	1	19	15	6	1	8	1	16	9	14	20	21	6	6	6	14	22	1	14	9	13
34	25-Aug-00	13.716	1	19	16	6	1	6	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
35	1-Sep-00	14.019	1	19	16	6	1	6	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
36	8-Sep-00	14.162	1	19	16	9	1	6	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
37	15-Sep-00	13.687	1	19	16	9	1	6	1	6	9	14	20	2	6	16	9	14	22	1	14	9	13
38	22-Sep-00	13.602	1	19	16	9	1	6	1	6	9	14	20	21	6	16	9	14	22	1	14	9	13
39	29-Sep-00	13.508	1	19	16	9	1	1	1	16	9	14	20	21	6	16	6	14	22	1	14	9	13
40	6-Oct-00	13.814	1	19	16	9	1	1	1	6	9	14	20	21	6	16	9	14	22	1	14	9	13
41	13-Oct-00	13.960	1	19	16	9	1	1	1	6	9	14	20	21	6	16	9	14	22	1	14	9	13
42	20-Oct-00	13.161	1	19	14	9	1	1	1	16	9	14	20	22	6	16	6	14	22	1	14	9	4
43	27-Oct-00	13.591	1	19	16	6	1	1	6	16	9	14	20	21	6	16	6	14	22	1	14	9	4
44	3-Nov-00	13.830	1	19	16	6	1	1	1	16	9	14	20	2	2	16	6	14	22	1	11	9	8
45	10-Nov-00	13.686	1	19	14	15	1	1	1	6	9	14	20	22	6	16	9	14	22	1	14	9	8
46	17-Nov-00	13.799	1	19	14	15	1	1	6	6	9	14	20	2	2	16	9	14	22	1	11	9	4
47	24-Nov-00	13.995	1	19	14	15	1	1	6	6	9	14	20	22	2	16	9	14	22	1	11	9	8
48	1-Dec-00	14.028	6	19	14	15	1	1	6	6	9	14	20	22	2	16	9	14	22	1	11	9	8
49	8-Dec-00	14.238	1	19	6	15	1	1	6	6	9	14	20	2	6	16	9	14	22	1	14	9	8
50	15-Dec-00	14.193	1	8	11	9	1	8	6	6	9	14	20	2	6	16	9	14	22	1	14	9	8
51	22-Dec-00	14.456	1	8	11	15	1	6	1	6	9	14	20	2	6	16	9	14	22	1	14	6	8
52	29-Dec-00	14.635	1	19	14	16	1	6	1	6	9	6	20	2	11	16	9	14	22	1	14	6	4
53	5-Jan-01	14.604	1	8	14	16	8	6	1	8	9	6	20	2	11	16	9	14	22	1	14	9	4
54	12-Jan-01	14.633	1	8	14	16	8	6	1	6	9	14	20	2	2	16	9	14	22	1	14	9	14
55	19-Jan-01	15.023	1	8	14	16	8	6	1	6	9	14	20	22	2	5	9	14	22	1	14	9	14
56	26-Jan-01	15.226	14	1	14	16	1	6	6	8	9	14	20	22	16	5	9	14	22	1	14	9	14
57	2-Feb-01	15.407	1	1	14	16	1	6	6	8	9	14	20	22	2	5	9	14	22	1	14	9	14
58	9-Feb-01	15.455	1	1	14	16	1	6	6	8	9	14	20	22	2	5	9	14	22	1	14	9	14
59	16-Feb-01	15.291	1	1	14	15	1	6	6	6	9	14	20	22	2	16	9	14	22	1	14	9	14
60	23-Feb-01	15.442	1	1	14	15	1	6	6	8	9	14	20	22	2	16	9	14	19	1	14	9	14

APPENDIX - C4
CHAPTER 3 - CONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
61	2-Mar-01	14.887	1	1	14	15	1	6	6	8	9	14	20	22	2	16	9	14	19	1	14	9	14
62	9-Mar-01	14.983	1	1	14	15	8	6	1	6	9	14	20	22	2	16	9	11	19	1	14	9	14
63	16-Mar-01	15.282	1	1	2	16	8	6	1	6	9	14	20	22	2	16	9	11	1	1	14	9	14
64	23-Mar-01	12.986	1	1	2	8	8	6	1	6	9	14	20	2	20	8	9	11	22	1	2	9	14
65	30-Mar-01	13.046	1	1	2	8	8	6	1	6	9	14	20	2	20	8	9	14	22	1	6	9	14
66	6-Apr-01	13.151	1	1	2	8	8	6	1	6	9	14	20	2	20	8	9	14	22	1	2	9	14
67	13-Apr-01	13.443	1	1	2	8	8	6	1	8	9	14	20	9	20	8	9	14	22	1	2	9	14
68	20-Apr-01	13.603	1	1	20	8	8	6	1	8	9	9	20	9	11	8	9	14	22	1	14	9	14
69	27-Apr-01	13.646	1	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	22	1	14	9	14
70	4-May-01	13.815	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	1	14	9	14
71	11-May-01	14.018	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	8	14	9	14
72	18-May-01	14.183	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	1	14	9	14
73	25-May-01	14.346	8	1	20	15	1	6	6	8	9	14	20	22	9	16	9	14	19	1	14	9	14
74	1-Jun-01	14.492	8	1	20	15	1	6	6	8	9	14	20	22	9	16	9	14	19	1	14	9	14
75	8-Jun-01	14.542	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	1	14	9	14
76	15-Jun-01	14.619	8	1	20	15	1	6	6	8	9	14	20	22	2	16	9	14	19	1	11	9	14
77	22-Jun-01	14.663	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	1	11	9	14
78	29-Jun-01	14.913	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	6	11	9	14
79	6-Jul-01	15.176	8	1	20	15	1	6	6	8	9	9	20	22	11	16	9	14	19	6	11	9	14
80	13-Jul-01	14.707	8	1	20	6	8	6	1	8	9	9	20	22	11	5	9	14	19	6	11	9	14
81	20-Jul-01	15.063	8	1	20	15	1	6	6	8	9	9	20	22	11	16	1	14	19	6	11	9	14
82	27-Jul-01	15.334	8	1	20	15	1	6	6	8	9	9	20	12	11	16	1	14	19	6	11	9	14
83	3-Aug-01	15.633	8	1	20	15	8	6	1	8	9	9	20	22	11	16	1	14	19	8	11	9	14
84	10-Aug-01	15.778	19	1	20	15	1	6	6	8	9	9	20	22	11	16	1	14	15	7	11	9	14
85	17-Aug-01	15.819	19	1	20	15	1	6	6	8	9	8	20	22	11	16	1	14	15	8	14	9	14
86	24-Aug-01	15.770	19	1	20	15	1	6	6	8	9	8	20	22	11	16	9	14	15	6	14	9	14
87	31-Aug-01	15.978	19	1	20	15	1	6	6	8	9	14	20	12	2	16	9	14	15	6	14	9	14
88	7-Sep-01	15.813	19	1	20	15	1	6	6	8	9	14	20	12	2	16	9	14	9	6	14	9	14
89	14-Sep-01	14.907	19	1	20	8	1	6	6	8	9	8	20	12	2	5	8	11	9	6	11	9	11
90	21-Sep-01	12.087	19	1	20	8	1	6	6	8	9	8	20	22	20	5	8	11	9	6	1	9	14
91	28-Sep-01	11.262	7	1	20	16	1	6	6	8	9	8	20	20	20	16	8	11	9	6	7	6	11
92	5-Oct-01	11.290	6	6	8	16	1	1	6	8	9	8	20	20	20	16	8	20	15	7	8	10	14
93	12-Oct-01	11.523	7	1	20	16	1	6	6	8	9	8	20	20	20	5	8	20	15	1	8	10	14
94	19-Oct-01	11.571	7	1	6	16	1	8	6	8	9	8	20	20	20	5	8	14	3	1	8	10	14
95	26-Oct-01	11.708	7	1	6	16	1	8	6	8	9	8	20	20	20	5	8	9	3	6	8	10	14
96	2-Nov-01	12.033	7	20	20	16	1	8	6	8	9	8	20	20	20	5	8	9	1	6	8	10	14
97	9-Nov-01	12.216	7	1	6	16	1	1	6	8	9	8	20	20	20	16	8	20	1	6	8	10	14
98	16-Nov-01	12.370	7	1	6	1	1	1	6	8	9	8	20	20	20	16	6	20	1	6	8	10	14
99	23-Nov-01	12.412	6	1	6	1	1	6	6	8	9	8	20	20	20	16	6	20	11	6	8	10	14
100	30-Nov-01	12.513	6	1	6	8	1	6	6	8	9	8	20	20	20	16	6	20	11	6	8	10	14
101	7-Dec-01	12.755	6	20	6	8	1	6	6	8	9	8	20	20	20	16	6	9	11	6	8	10	14
102	14-Dec-01	12.359	6	1	6	8	1	6	6	8	9	8	20	20	22	22	6	9	11	6	8	10	20
103	21-Dec-01	12.507	6	1	6	8	1	6	6	8	9	8	20	20	20	22	8	9	1	6	8	10	20
104	28-Dec-01	12.811	6	2	20	8	1	6	6	8	9	8	20	20	20	16	6	14	11	6	8	9	14
105	4-Jan-02	12.901	6	2	20	8	1	6	6	8	9	8	20	20	20	16	8	14	11	1	8	9	14
106	11-Jan-02	12.850	6	2	20	8	1	6	6	8	9	8	20	20	20	16	8	14	11	1	8	9	14
107	18-Jan-02	12.783	8	2	8	8	1	6	6	8	9	8	20	20	20	5	6	11	11	1	8	9	14
108	25-Jan-02	12.939	8	2	8	8	1	6	6	8	9	8	20	20	20	5	8	11	11	1	8	9	14
109	1-Feb-02	13.096	8	2	8	8	1	6	6	8	9	8	20	20	20	5	9	11	10	1	8	6	14
110	8-Feb-02	13.320	8	7	8	8	1	6	6	8	9	8	20	20	20	5	9	8	10	6	8	6	14
111	15-Feb-02	13.390	6	4	19	8	1	6	6	8	9	8	20	20	20	5	9	8	10	6	8	8	14
112	22-Feb-02	13.583	6	4	19	6	1	6	6	8	9	8	20	20	20	16	9	11	10	6	8	8	14
113	1-Mar-02	13.669	6	4	19	6	1	6	6	8	9	8	20	20	22	16	8	11	10	1	8	8	20
114	8-Mar-02	13.676	7	4	19	8	1	6	6	8	9	7	20	20	22	16	8	8	10	1	6	6	20
115	15-Mar-02	13.291	7	11	19	6	1	6	6	8	9	1	20	20	22	5	8	8	17	1	6	10	20
116	22-Mar-02	13.553	6	11	19	6	1	6	6	8	9	1	20	20	22	5	8	8	17	1	6	6	20
117	29-Mar-02	13.824	1	11	19	8	1	6	6	8	6	8	20	20	22	5	8	8	17	1	6	9	20
118	5-Apr-02	14.008	6	11	19	8	1	6	6	8	9	8	20	20	22	5	8	8	17	1	6	10	20
119	12-Apr-02	14.197	6	11	19	8	1	6	6	8	8	8	20	20	22	5	8	8	17	1	8	10	20
120	19-Apr-02	14.415	6	11	19	8	1	6	6	8	8	8	20	20	22	16	8	8	17	1	8	10	20

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
121	26-Apr-02	14.443	1	11	20	9	1	6	6	8	8	1	20	20	22	16	8	8	17	1	8	10	20
122	3-May-02	14.506	1	11	20	9	1	6	6	8	8	1	20	20	22	16	8	11	17	1	1	8	20
123	10-May-02	14.762	1	11	20	8	1	6	6	8	8	7	20	20	22	9	8	8	17	7	8	10	20
124	17-May-02	14.834	1	11	20	9	1	6	6	8	8	7	20	20	22	16	8	8	17	7	8	10	20
125	24-May-02	14.825	6	11	20	9	1	6	6	8	8	7	20	20	6	21	8	8	20	7	1	10	20
126	31-May-02	14.802	6	11	20	9	1	6	6	8	8	7	20	20	6	16	8	8	20	7	1	10	20
127	7-Jun-02	14.927	6	11	20	9	1	6	6	8	8	7	20	20	9	16	9	8	20	6	1	10	20
128	14-Jun-02	14.710	6	11	20	9	1	6	6	8	8	7	20	20	9	16	9	8	20	6	8	8	20
129	21-Jun-02	14.405	6	7	20	6	1	6	6	6	8	6	22	20	9	16	9	8	20	7	1	9	14
130	28-Jun-02	14.587	6	7	20	9	1	6	6	8	8	8	20	20	9	7	9	8	15	7	11	9	14
131	5-Jul-02	14.658	10	7	20	9	1	6	6	6	8	9	22	20	9	7	9	8	7	1	11	8	14
132	12-Jul-02	14.866	10	7	20	9	1	6	6	8	8	9	22	20	9	8	9	8	1	1	11	8	14
133	19-Jul-02	15.170	10	19	20	16	1	6	6	6	8	8	22	20	16	8	9	8	1	1	11	5	14
134	26-Jul-02	15.223	10	7	20	16	1	6	6	19	9	8	13	20	22	8	20	8	7	1	11	5	20
135	2-Aug-02	13.268	10	1	20	8	1	6	1	19	8	8	16	20	16	8	5	8	1	6	11	5	14
136	9-Aug-02	13.625	10	1	20	8	1	6	1	19	6	8	5	20	20	8	8	8	1	6	11	5	14
137	16-Aug-02	13.678	10	8	20	8	1	6	1	19	6	8	5	20	20	8	8	8	1	6	11	5	14
138	23-Aug-02	13.956	10	1	20	8	1	6	1	19	6	8	2	20	20	8	8	8	8	7	11	16	14
139	30-Aug-02	14.252	10	1	20	8	1	6	6	19	6	8	2	20	20	8	8	8	1	7	11	5	14
140	6-Sep-02	14.437	10	8	20	8	1	6	1	19	6	8	1	20	20	8	8	8	1	7	11	16	14
141	13-Sep-02	14.078	10	8	20	8	1	6	6	19	6	8	1	20	22	8	8	8	8	7	11	8	20
142	20-Sep-02	14.426	10	8	20	8	1	6	6	19	6	8	1	20	22	8	8	8	8	7	11	16	20
143	27-Sep-02	13.865	10	8	20	8	1	6	6	19	6	8	1	20	22	8	8	8	8	7	11	16	20
144	4-Oct-02	14.005	10	8	20	8	1	6	6	19	8	8	1	20	22	7	1	11	8	7	11	8	20
145	11-Oct-02	14.161	10	8	20	8	1	6	6	6	8	8	1	20	22	7	1	8	8	6	11	8	20
146	18-Oct-02	14.578	10	2	8	14	1	6	6	6	8	1	22	20	22	7	1	11	17	6	11	8	20
147	25-Oct-02	13.810	10	2	8	14	1	6	6	6	8	1	3	20	22	7	1	11	3	6	11	8	20
148	1-Nov-02	14.029	10	2	8	2	1	6	6	6	8	10	3	20	22	7	1	11	3	6	11	8	20
149	8-Nov-02	14.219	10	1	8	2	1	6	6	6	8	10	3	20	22	7	1	11	17	6	11	16	20
150	15-Nov-02	14.494	10	1	8	2	1	6	6	6	8	20	3	20	22	7	1	11	17	6	10	8	20
151	22-Nov-02	14.638	10	1	8	2	1	6	6	6	8	20	1	20	22	7	1	14	17	6	10	8	20
152	29-Nov-02	14.670	10	2	1	2	1	6	6	6	8	10	1	20	22	7	1	14	17	6	11	8	20
153	6-Dec-02	14.804	10	2	1	2	1	6	6	6	8	10	1	20	22	7	1	14	17	6	11	16	20
154	13-Dec-02	15.097	10	22	8	2	1	6	6	6	8	10	1	20	11	6	1	14	17	6	11	16	14
155	20-Dec-02	15.342	10	5	8	2	1	6	6	6	8	7	1	22	22	7	1	14	17	6	10	16	11
156	27-Dec-02	15.410	10	5	8	2	1	6	6	6	8	7	5	22	22	7	1	14	17	6	10	16	11
157	3-Jan-03	15.837	10	5	6	2	1	6	6	6	8	7	5	22	11	7	1	1	5	6	10	16	14
158	10-Jan-03	15.755	10	5	1	2	1	6	6	6	8	7	5	20	11	7	1	14	17	6	10	16	14
159	17-Jan-03	15.877	10	5	1	2	1	6	6	6	9	9	3	20	22	6	1	14	5	6	10	16	11
160	24-Jan-03	16.022	10	22	1	2	1	6	6	6	8	9	3	20	22	6	1	14	13	6	22	16	11
161	31-Jan-03	15.831	10	22	1	9	1	6	6	6	8	9	3	20	11	6	1	14	13	6	10	16	14
162	7-Feb-03	15.780	10	22	1	9	1	1	6	6	8	9	3	20	22	6	1	20	13	7	10	16	2
163	14-Feb-03	15.880	10	22	1	9	1	1	6	6	9	9	3	20	22	7	1	20	13	8	10	16	2
164	21-Feb-03	16.055	10	22	16	9	1	1	6	6	9	9	3	20	22	7	1	20	13	6	22	8	2
165	28-Feb-03	16.200	10	22	16	9	1	6	6	6	9	9	3	22	22	7	1	20	13	8	10	14	2
166	7-Mar-03	16.370	10	22	16	9	1	1	6	6	9	9	3	20	22	7	1	20	13	8	22	16	2
167	14-Mar-03	16.258	22	22	1	9	1	1	6	6	9	9	3	20	11	7	9	20	13	6	22	16	14
168	21-Mar-03	16.592	10	2	14	9	1	1	6	6	9	9	3	20	11	9	1	14	13	6	22	16	14
169	28-Mar-03	16.100	10	2	20	9	1	1	9	7	9	9	3	20	20	9	1	20	13	8	10	16	14
170	4-Apr-03	16.013	10	2	14	16	1	6	9	7	9	9	3	20	11	9	1	20	13	8	14	16	14
171	11-Apr-03	15.948	10	2	1	16	1	6	19	8	9	9	3	20	11	9	1	20	13	7	14	16	14
172	18-Apr-03	16.172	10	2	20	16	1	6	19	7	8	9	3	20	8	9	1	20	13	7	11	16	14
173	25-Apr-03	15.938	10	2	20	16	1	6	6	7	8	9	2	22	8	8	1	20	2	7	11	16	14
174	2-May-03	15.814	10	2	20	16	1	6	6	7	8	20	14	22	8	8	1	20	14	7	22	16	14
175	9-May-03	15.073	10	2	20	16	1	6	6	7	8	9	14	22	8	8	6	20	14	7	11	16	14
176	16-May-03	15.149	10	2	20	16	1	6	6	7	8	6	14	22	8	8	6	20	14	7	11	6	14
177	23-May-03	15.395	10	10	20	16	1	6	6	7	8	6	14	22	8	8	6	20	14	6	11	16	14
178	30-May-03	15.696	10	10	20	16	1	6	6	7	8	20	14	22	8	8	6	20	14	6	14	16	14
179	6-Jun-03	15.658	10	2	9	16	1	6	6	8	8	20	14	22	8	8	6	20	14	7	14	6	14
180	13-Jun-03	15.296	10	2	7	16	1	6	6	8	8	20	14	22	8	8	6	20	14	6	10	16	14

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
181	20-Jun-03	15.367	10	2	20	16	1	1	6	8	8	20	14	22	8	8	6	20	14	6	10	16	14
182	27-Jun-03	15.582	10	2	20	8	1	1	6	8	8	6	14	22	8	8	6	20	14	6	11	16	14
183	4-Jul-03	15.545	10	2	20	8	1	6	6	8	8	6	14	22	8	6	6	20	14	6	11	16	14
184	11-Jul-03	15.609	10	2	20	9	1	6	6	8	8	6	14	22	8	6	6	20	14	6	11	16	14
185	18-Jul-03	15.690	10	2	20	9	1	6	6	8	8	6	14	22	8	6	5	20	14	6	11	16	14
186	25-Jul-03	15.986	10	2	20	8	1	6	6	8	7	6	14	22	8	6	6	20	14	6	11	16	14
187	1-Aug-03	15.957	10	2	20	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	1	16	14
188	8-Aug-03	16.113	10	2	20	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	1	16	14
189	15-Aug-03	16.300	10	2	20	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	1	16	14
190	22-Aug-03	16.165	10	2	20	9	1	6	6	8	7	20	14	22	8	8	6	20	14	6	6	16	14
191	29-Aug-03	16.138	10	10	20	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	22	16	14
192	5-Sep-03	16.620	10	10	17	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	22	16	14
193	12-Sep-03	16.330	10	10	17	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	22	6	14
194	19-Sep-03	16.523	10	10	1	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	1	16	14
195	26-Sep-03	16.549	10	10	11	9	1	6	6	8	7	20	14	22	8	6	6	20	14	6	1	16	14
196	3-Oct-03	16.307	10	10	11	9	1	6	6	8	6	20	20	22	8	6	6	9	14	6	22	16	14
197	10-Oct-03	16.048	10	10	11	9	1	6	6	8	6	20	20	22	8	6	8	9	14	6	22	6	14
198	17-Oct-03	15.668	10	10	20	9	1	6	6	8	6	20	20	22	8	6	8	9	14	6	22	6	14
199	24-Oct-03	15.871	10	10	20	9	1	6	6	8	6	20	20	22	8	7	8	9	14	6	22	6	14
200	31-Oct-03	15.989	10	10	20	9	1	6	6	8	6	20	20	22	8	7	8	9	13	6	22	6	14
201	7-Nov-03	16.006	10	10	11	9	1	6	6	8	6	20	20	22	8	7	8	9	13	6	22	6	14
202	14-Nov-03	16.122	10	10	11	9	1	6	6	8	6	20	20	22	8	6	8	9	13	6	22	6	14
203	21-Nov-03	16.412	10	10	20	9	1	6	6	8	6	20	20	22	8	6	8	9	13	6	22	6	14
204	28-Nov-03	16.327	10	10	20	9	1	6	6	8	6	20	20	22	8	5	8	9	13	6	14	6	14
205	5-Dec-03	16.113	10	19	11	9	1	6	6	8	6	20	20	22	8	6	8	9	13	6	1	6	14
206	12-Dec-03	16.184	10	19	20	9	1	6	6	8	6	20	20	22	8	6	8	1	19	6	1	9	14
207	19-Dec-03	16.439	10	19	11	9	1	6	6	8	6	20	20	22	8	5	8	1	19	6	1	9	14
208	26-Dec-03	16.639	10	6	11	9	1	6	6	8	6	20	20	22	8	5	8	1	19	6	1	9	14
209	2-Jan-04	16.612	10	6	20	6	1	6	6	8	6	20	20	22	8	5	8	1	19	6	1	9	14
210	9-Jan-04	15.947	10	6	7	6	1	6	6	8	6	20	20	22	8	6	1	1	19	6	1	9	14
211	16-Jan-04	15.426	10	7	7	6	1	6	6	8	6	20	20	22	8	7	1	1	3	6	1	9	14
212	23-Jan-04	15.672	10	6	7	6	1	6	6	1	6	20	20	22	8	3	1	1	3	6	1	9	14
213	30-Jan-04	15.727	6	6	7	6	1	6	6	1	6	20	20	22	8	10	1	1	3	6	1	9	14
214	6-Feb-04	15.300	6	6	7	6	1	6	6	1	6	20	20	22	8	10	1	1	3	6	1	9	14
215	13-Feb-04	15.430	6	6	7	6	1	6	6	1	6	20	20	22	8	5	1	1	3	6	1	9	14
216	20-Feb-04	15.409	6	6	7	6	1	6	6	1	6	20	20	22	1	5	1	1	19	6	1	9	14
217	27-Feb-04	15.932	6	19	7	8	1	6	6	1	8	20	20	22	8	7	1	1	13	6	1	9	14
218	5-Mar-04	16.158	6	19	7	10	1	6	6	1	2	20	1	22	8	5	1	20	6	6	1	9	14
219	12-Mar-04	16.292	6	19	7	10	1	6	6	1	8	20	1	22	8	2	8	20	6	6	1	9	14
220	19-Mar-04	14.875	6	19	7	10	1	6	6	8	8	20	1	22	8	13	8	10	13	6	1	9	14
221	26-Mar-04	15.299	7	19	8	10	1	6	6	8	8	6	6	22	8	13	8	14	13	6	11	9	14
222	2-Apr-04	15.502	7	19	8	10	1	6	6	8	8	6	6	22	8	13	8	20	13	6	11	9	14
223	9-Apr-04	14.855	7	6	8	10	1	6	6	8	8	20	6	22	8	13	8	20	13	6	1	9	6
224	16-Apr-04	15.019	7	8	8	10	1	6	6	8	8	20	6	22	8	13	8	20	13	6	6	9	6
225	23-Apr-04	15.008	7	8	1	10	1	6	6	8	8	20	6	2	8	13	8	20	13	6	6	9	6
226	30-Apr-04	15.264	7	19	8	10	1	6	6	8	8	20	6	22	8	13	8	20	3	6	6	9	6
227	7-May-04	14.324	7	19	1	10	1	6	6	6	9	6	6	22	9	22	10	10	13	8	11	9	6
228	14-May-04	14.432	6	8	1	10	1	6	6	6	9	6	6	22	9	5	10	2	13	6	11	9	6
229	21-May-04	13.727	6	8	1	10	1	6	6	6	6	20	1	14	1	13	10	14	13	6	1	6	14
230	28-May-04	13.904	6	8	1	10	1	6	6	6	6	20	6	14	1	13	10	14	13	6	1	6	6
231	4-Jun-04	13.699	6	8	20	6	1	6	6	6	6	6	1	14	1	17	10	14	13	8	11	6	6
232	11-Jun-04	13.950	6	7	20	9	1	6	6	6	6	1	14	14	1	22	10	14	13	6	11	6	14
233	18-Jun-04	14.339	8	8	1	9	1	6	6	1	6	7	14	11	1	22	9	2	6	6	11	6	14
234	25-Jun-04	14.522	7	7	20	9	1	6	1	1	6	20	14	11	1	3	9	2	22	6	1	6	14
235	2-Jul-04	14.752	8	6	20	9	1	6	1	1	6	20	14	11	1	3	9	2	19	6	1	6	14
236	9-Jul-04	15.003	8	1	20	10	1	6	1	6	1	20	22	11	1	3	9	14	15	6	1	6	14
237	16-Jul-04	15.273	3	1	20	10	1	6	1	1	6	20	20	20	1	3	9	14	15	6	2	6	14
238	23-Jul-04	15.440	3	1	20	10	1	6	1	1	6	20	20	20	1	3	9	14	20	6	2	6	14
239	30-Jul-04	15.242	6	6	20	2	1	6	1	1	1	20	20	20	1	3	9	14	6	6	2	1	14
240	6-Aug-04	15.507	6	6	20	8	1	6	1	8	1	20	22	22	1	3	9	14	19	6	1	1	14

								From Top Row Node to Row-Obs.th Node															
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
241	13-Aug-04	15.515	3	6	20	8	1	6	1	8	1	20	22	22	22	3	9	14	2	6	2	1	1
242	20-Aug-04	15.718	6	6	20	8	1	6	1	8	1	20	22	22	22	3	9	2	19	6	2	1	1
243	27-Aug-04	15.838	6	6	20	9	1	6	1	1	1	20	22	22	22	13	9	8	19	6	2	1	1
244	3-Sep-04	16.058	6	6	20	10	1	6	1	1	1	20	22	22	22	13	9	8	19	6	2	1	1
245	10-Sep-04	16.288	6	6	20	10	1	6	1	1	1	20	20	22	22	13	9	8	19	6	7	1	1
246	17-Sep-04	16.290	6	6	20	10	1	6	1	1	1	20	20	22	22	13	9	8	3	6	1	1	1
247	24-Sep-04	16.381	6	6	20	10	1	6	1	1	1	20	20	20	22	13	9	8	15	6	8	1	1
248	1-Oct-04	16.782	6	6	20	10	1	6	1	1	6	20	20	20	1	10	9	8	15	6	8	1	14
249	8-Oct-04	16.473	6	6	20	8	1	6	6	1	6	20	20	20	1	10	9	8	15	6	1	1	14
250	15-Oct-04	16.681	6	6	20	8	1	6	6	8	6	20	20	20	1	10	9	1	12	6	1	8	14
251	22-Oct-04	16.534	10	6	20	8	1	6	6	8	6	20	20	22	1	10	9	1	5	6	1	8	14
252	29-Oct-04	16.797	10	6	20	9	8	6	1	1	6	20	20	22	1	10	8	1	5	6	1	8	14
253	5-Nov-04	16.761	10	6	20	8	1	6	6	1	6	20	20	20	1	10	8	1	5	6	1	8	14
254	12-Nov-04	15.760	6	6	1	8	1	6	6	1	6	20	20	22	1	2	8	1	5	6	1	8	14
255	19-Nov-04	15.796	6	6	1	8	1	6	6	1	6	20	1	20	1	2	8	1	5	6	1	1	14
256	26-Nov-04	16.109	6	6	1	8	1	6	6	1	6	20	1	20	1	10	8	8	5	6	8	8	14
257	3-Dec-04	16.174	6	6	1	8	1	6	6	1	6	20	1	20	1	2	8	22	20	6	1	8	14
258	10-Dec-04	16.275	6	8	8	8	8	6	1	1	6	20	1	20	1	2	8	22	20	6	8	8	14
259	17-Dec-04	15.826	6	8	8	8	8	6	1	1	2	20	1	20	1	22	8	14	20	6	8	1	14
260	24-Dec-04	15.989	7	7	1	8	8	8	1	1	2	20	1	20	1	22	8	14	12	6	8	1	14
261	31-Dec-04	15.691	8	8	1	8	8	8	1	1	2	8	1	20	1	6	8	2	12	6	7	1	14
262	7-Jan-05	15.923	8	8	8	8	1	8	6	1	2	8	1	20	1	6	8	2	12	6	7	8	14
263	14-Jan-05	15.192	10	8	8	8	1	8	6	8	8	8	20	20	8	6	8	2	5	6	7	1	14
264	21-Jan-05	15.611	8	8	8	8	1	8	6	1	2	8	20	20	1	6	10	14	5	6	7	1	14
265	28-Jan-05	15.846	10	8	8	8	1	8	6	8	16	8	20	20	1	6	6	14	5	6	7	1	14
266	4-Feb-05	16.251	10	7	7	8	1	6	6	8	8	8	1	20	1	6	6	14	13	6	1	1	14
267	11-Feb-05	16.095	10	8	7	9	1	8	6	8	8	8	20	20	1	6	1	14	5	6	1	1	14
268	18-Feb-05	16.254	10	8	8	8	1	6	6	8	6	8	20	20	1	6	6	14	5	6	1	1	14
269	25-Feb-05	16.214	10	1	8	8	1	6	6	8	6	8	1	20	1	6	9	14	5	6	1	8	14
270	4-Mar-05	16.379	10	1	8	8	1	1	6	8	6	8	1	20	1	6	9	14	5	6	7	8	14
271	11-Mar-05	16.471	10	6	8	8	1	6	6	8	6	19	1	11	1	6	9	2	5	6	1	8	14
272	18-Mar-05	16.648	10	6	8	9	1	1	6	8	6	19	1	11	1	16	9	14	5	6	1	8	14
273	25-Mar-05	16.585	10	1	8	9	1	1	6	8	6	19	20	11	1	9	9	14	16	6	1	8	14
274	1-Apr-05	15.439	10	1	8	9	1	1	6	8	6	19	1	11	1	7	7	8	16	6	2	8	14
275	8-Apr-05	15.758	10	6	8	7	1	6	6	8	6	8	1	11	1	7	7	8	16	6	1	8	14
276	15-Apr-05	15.997	6	6	8	8	1	6	6	8	2	19	1	11	1	5	8	8	8	6	1	1	14
277	22-Apr-05	15.331	6	6	8	8	1	6	6	8	2	19	1	11	1	10	9	2	8	6	1	1	14
278	29-Apr-05	15.593	10	6	8	9	1	6	6	6	6	19	1	11	1	10	9	8	8	6	1	1	14
279	6-May-05	15.853	10	6	8	9	1	6	6	8	6	19	20	11	1	10	9	2	8	6	2	9	14
280	13-May-05	15.849	10	1	8	9	1	6	6	8	6	19	1	11	1	10	9	8	8	6	7	9	14
281	20-May-05	15.666	10	1	8	7	1	6	6	8	6	19	1	11	1	9	9	8	8	6	1	9	14
282	27-May-05	15.894	10	1	8	10	1	6	6	8	6	7	1	11	1	10	9	8	8	6	2	8	14
283	3-Jun-05	15.969	10	1	8	8	1	6	6	8	6	7	1	11	1	10	9	8	7	8	7	8	14
284	10-Jun-05	16.352	10	1	8	10	1	6	6	8	8	7	20	11	1	10	9	8	7	8	7	8	14
285	17-Jun-05	16.594	10	1	8	16	1	8	6	8	8	7	20	11	1	5	9	8	7	6	7	8	14
286	24-Jun-05	16.632	10	1	8	16	1	6	6	8	8	7	1	11	1	5	9	8	8	6	7	20	14
287	1-Jul-05	16.858	10	1	10	16	1	6	6	8	6	20	1	11	1	5	9	10	7	6	7	8	14
288	8-Jul-05	17.028	10	1	10	16	1	8	6	8	7	20	1	11	1	10	9	2	7	8	7	8	14
289	15-Jul-05	17.339	8	1	1	16	1	8	6	6	6	20	1	20	1	10	9	2	7	6	7	8	14
290	22-Jul-05	17.169	8	1	1	16	1	8	6	6	6	20	1	11	8	10	9	2	7	8	7	8	14
291	29-Jul-05	17.009	8	1	8	9	1	1	6	6	6	20	1	20	8	10	9	2	8	6	8	8	14
292	5-Aug-05	17.173	8	1	8	16	1	6	6	6	6	20	1	20	8	10	9	2	8	6	8	8	14
293	12-Aug-05	17.382	8	1	8	6	1	6	6	6	6	20	1	20	8	10	9	2	7	6	8	8	14
294	19-Aug-05	17.197	8	1	1	16	1	6	6	6	6	8	20	20	8	5	9	8	7	6	2	8	14
295	26-Aug-05	16.690	8	1	8	6	1	6	6	6	6	8	1	20	8	5	9	8	7	6	8	8	14
296	2-Sep-05	16.947	8	1	6	1	1	6	6	6	2	8	1	20	8	5	9	2	7	6	2	8	14
297	9-Sep-05	16.432	8	1	6	6	1	6	6	6	6	8	1	20	8	5	9	2	7	6	2	8	14
298	16-Sep-05	16.513	8	1	8	6	1	6	6	8	6	8	8	20	8	5	9	2	7	6	2	8	14
299	23-Sep-05	16.890	8	1	16	16	1	6	6	6	6	8	8	20	8	5	9	2	7	6	2	8	14
300	30-Sep-05	16.950	8	1	16	16	1	6	6	8	6	7	8	20	8	5	9	2	8	6	2	8	8

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CHAPTER 3 - CONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
301	7-Oct-05	16.656	8	1	6	16	1	6	6	8	6	8	8	20	8	5	9	2	7	6	2	8	8
302	14-Oct-05	16.274	10	1	16	16	1	6	6	6	7	7	8	20	6	5	9	2	8	6	8	8	8
303	21-Oct-05	16.152	10	1	16	10	1	6	6	6	7	7	8	20	6	5	9	2	8	6	8	8	8
304	28-Oct-05	15.902	10	1	16	10	1	6	6	6	7	7	8	20	1	5	9	2	8	6	8	19	8
305	4-Nov-05	16.247	10	1	6	10	1	6	6	6	7	2	8	20	6	5	9	10	8	8	8	19	8
306	11-Nov-05	15.929	10	1	6	10	1	6	6	6	7	10	8	20	6	5	9	10	20	6	6	19	6
307	18-Nov-05	16.301	10	7	6	10	1	6	6	1	7	7	8	20	1	10	9	10	20	8	6	19	1
308	25-Nov-05	16.454	10	6	6	10	1	6	6	1	7	2	8	20	1	10	9	10	20	6	6	19	8
309	2-Dec-05	16.657	10	6	6	10	1	6	6	1	6	10	8	20	1	10	9	10	20	6	6	19	8
310	9-Dec-05	16.889	6	6	6	10	1	6	6	6	6	10	8	20	1	10	9	1	20	6	6	19	8
311	16-Dec-05	17.141	6	6	6	10	1	6	6	6	6	2	8	20	1	10	9	2	6	6	8	19	8
312	23-Dec-05	17.141	6	6	6	10	1	6	6	6	6	2	8	20	1	10	9	2	6	6	8	19	8
313	30-Dec-05	17.640	10	6	6	10	1	6	6	6	6	2	8	20	6	10	9	14	6	6	8	6	8
314	6-Jan-06	18.014	10	6	6	10	1	6	6	6	7	6	8	20	8	10	9	6	14	8	8	8	14
315	13-Jan-06	15.797	10	6	6	7	1	6	6	6	7	6	8	20	8	10	9	6	6	6	6	16	8
316	20-Jan-06	16.134	10	6	6	7	1	6	6	6	7	6	8	20	8	10	9	6	6	6	6	16	8
317	27-Jan-06	16.070	10	6	6	10	1	6	6	6	7	6	8	20	8	10	9	8	6	6	6	16	8
318	3-Feb-06	15.681	10	6	6	10	1	6	6	6	6	9	19	20	8	10	9	6	20	6	6	12	14
319	10-Feb-06	15.801	10	6	6	7	1	6	6	6	6	9	19	20	8	10	9	6	20	6	6	12	8
320	17-Feb-06	16.002	10	6	1	7	8	6	1	6	6	9	19	20	8	5	6	6	20	6	6	16	8
321	24-Feb-06	16.333	10	6	1	6	8	6	1	6	6	9	19	20	8	10	6	8	4	6	6	16	8
322	3-Mar-06	16.523	10	6	1	7	8	6	1	6	6	6	19	20	8	10	6	14	20	6	6	12	1
323	10-Mar-06	16.523	10	6	1	7	8	6	1	6	6	6	19	20	8	10	6	14	20	6	6	12	1
324	17-Mar-06	16.523	10	6	1	7	8	6	1	6	6	6	19	20	8	10	6	14	20	6	6	12	1
325	24-Mar-06	16.523	10	6	1	7	8	6	1	6	6	6	19	20	8	10	6	14	20	6	6	12	1
326	31-Mar-06	16.536	10	7	1	16	8	6	1	6	7	16	19	12	8	10	7	8	3	7	6	12	1
327	7-Apr-06	16.820	10	6	6	16	8	6	1	6	7	16	19	12	8	10	7	6	3	6	6	12	14
328	14-Apr-06	16.971	10	6	20	7	8	6	1	6	7	2	19	12	8	10	6	8	11	7	6	12	14
329	21-Apr-06	17.323	10	6	20	10	8	6	1	6	7	2	19	12	8	10	6	8	11	6	6	12	14
330	28-Apr-06	16.826	10	6	1	10	1	6	6	6	7	2	19	12	8	10	6	8	7	6	6	12	14
331	5-May-06	17.130	10	6	1	7	1	6	6	6	7	14	19	12	8	10	6	8	7	6	6	12	14
332	12-May-06	16.673	10	6	6	7	8	6	1	6	7	7	1	20	8	10	6	6	1	6	6	12	8
333	19-May-06	16.533	10	6	6	9	8	6	1	1	7	7	19	12	8	10	6	8	2	6	8	12	14
334	26-May-06	13.399	19	6	6	7	8	6	1	1	7	7	19	19	8	7	6	8	2	6	8	19	8
335	2-Jun-06	13.973	19	6	3	7	8	6	1	1	7	7	19	19	2	7	3	8	13	7	8	19	14
336	9-Jun-06	14.333	19	7	6	7	8	6	1	1	7	7	19	12	2	7	6	8	13	7	8	19	14
337	16-Jun-06	14.333	19	7	6	7	8	6	1	1	7	7	19	12	2	7	6	8	13	7	8	19	14
338	23-Jun-06	12.666	19	6	6	6	1	6	6	1	7	7	19	19	16	7	6	6	22	6	6	19	3
339	30-Jun-06	13.000	19	6	6	6	1	6	6	1	7	7	19	19	22	7	6	6	3	6	22	19	3
340	7-Jul-06	12.301	19	6	3	6	1	6	6	1	7	7	19	19	22	7	6	6	3	6	6	2	3
341	14-Jul-06	12.546	7	6	6	6	1	6	6	1	7	7	19	19	22	7	3	6	3	6	6	2	3
342	21-Jul-06	11.910	7	6	3	6	1	6	6	6	7	7	19	19	22	7	8	6	3	6	6	16	6
343	28-Jul-06	12.208	7	6	3	6	1	6	6	6	3	7	19	19	22	3	6	6	3	6	6	16	6
344	4-Aug-06	11.899	3	6	3	6	1	6	6	6	6	7	2	19	22	7	6	6	3	6	6	16	3
345	11-Aug-06	12.116	19	6	3	6	1	6	6	6	6	7	3	19	22	7	6	6	16	6	6	16	3
346	18-Aug-06	12.470	3	6	10	6	1	6	6	6	6	16	3	19	22	7	6	6	16	6	6	16	20
347	25-Aug-06	12.553	3	6	3	6	1	6	6	6	7	16	3	2	22	6	6	6	22	6	6	16	20
348	1-Sep-06	12.728	3	6	3	6	1	6	6	6	7	16	3	19	22	7	6	6	16	6	6	16	20
349	8-Sep-06	12.793	7	6	3	6	1	6	6	6	7	7	3	2	22	6	6	6	16	6	6	16	20
350	15-Sep-06	12.867	7	6	3	6	1	6	6	6	7	7	3	2	22	6	6	8	22	6	8	16	20
351	22-Sep-06	13.175	3	6	3	6	1	6	6	8	7	7	3	19	22	6	1	6	16	6	6	16	20
352	29-Sep-06	13.586	3	6	3	6	1	6	6	8	7	7	22	19	22	6	8	6	16	6	6	8	20
353	6-Oct-06	13.722	3	6	3	6	1	6	6	8	7	7	3	19	22	6	8	6	16	6	6	8	20
354	13-Oct-06	13.985	3	6	3	9	1	6	6	8	3	7	22	19	3	6	8	6	16	6	8	8	20
355	20-Oct-06	14.133	3	6	3	9	1	6	6	8	3	7	22	7	3	6	8	6	16	6	8	8	20
356	27-Oct-06	14.290	7	6	3	9	1	6	6	8	6	7	22	7	3	6	8	6	16	6	8	8	20
357	3-Nov-06	14.416	7	6	3	9	1	6	6	8	6	7	22	7	3	6	6	6	16	6	8	8	20
358	10-Nov-06	14.749	7	6	3	7	1	6	6	8	6	7	22	2	3	7	8	6	16	6	8	8	20
359	17-Nov-06	14.944	3	6	3	7	1	6	6	8	3	7	22	6	3	8	1	6	16	6	8	16	20
360	24-Nov-06	15.217	3	6	3	7	1	6	6	8	6	22	22	8	3	8	8	6	22	6	8	16	20

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CHAPTER 3 - CONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
361	1-Dec-06	15.217	3	6	3	7	1	6	6	8	6	22	22	8	3	8	8	6	22	6	8	16	20
362	8-Dec-06	15.692	3	6	3	8	1	6	6	8	6	8	22	3	3	8	7	3	22	6	8	16	20
363	15-Dec-06	15.837	7	6	3	8	1	6	6	8	6	19	22	3	22	8	8	3	22	6	8	16	20
364	22-Dec-06	15.953	7	6	3	8	1	6	6	8	6	1	6	3	1	8	8	3	2	6	8	16	20
365	29-Dec-06	16.154	7	6	3	8	1	6	6	6	6	1	6	3	1	8	8	3	2	6	8	16	20
366	5-Jan-07	15.993	3	6	3	8	1	6	6	6	6	6	6	16	1	8	6	3	16	6	8	7	20
367	12-Jan-07	15.958	3	6	3	6	1	6	6	6	6	1	22	22	1	8	6	3	16	6	8	7	20
368	19-Jan-07	16.158	7	6	3	6	1	6	6	6	6	20	22	22	1	8	6	3	16	6	8	12	20
369	26-Jan-07	16.269	7	6	3	6	1	6	6	6	6	20	11	12	3	6	6	3	2	6	8	12	20
370	2-Feb-07	16.613	7	6	3	6	1	6	6	6	6	20	11	20	3	6	6	3	11	6	8	12	20
371	9-Feb-07	16.295	7	6	3	6	1	6	6	6	6	20	11	20	3	6	6	3	11	8	8	12	12
372	16-Feb-07	16.579	7	6	3	6	1	6	6	6	6	20	11	20	3	6	6	3	2	8	8	12	12
373	23-Feb-07	16.624	7	6	3	6	1	6	6	6	6	20	20	20	3	6	6	6	2	8	8	12	12
374	2-Mar-07	16.882	7	6	19	6	1	6	6	6	6	20	11	20	3	6	6	6	2	6	8	12	12
375	9-Mar-07	13.446	7	6	6	6	1	6	6	6	6	1	22	8	1	6	6	3	2	6	8	13	20
376	16-Mar-07	13.680	7	6	6	6	1	6	6	6	6	1	22	8	1	6	6	6	2	8	8	13	20
377	23-Mar-07	13.773	1	6	6	6	1	6	6	6	6	8	22	8	1	6	6	6	2	8	8	7	2
378	30-Mar-07	12.577	1	6	6	6	1	6	6	6	6	1	22	8	8	6	6	6	1	6	8	7	2
379	6-Apr-07	12.848	1	6	6	6	1	6	6	6	6	8	22	8	8	6	6	6	2	6	8	7	2
380	13-Apr-07	12.608	1	6	6	6	1	6	6	6	6	8	20	8	8	6	6	6	6	6	8	8	2
381	20-Apr-07	12.775	8	6	6	6	1	6	6	6	6	1	20	8	8	6	6	6	2	6	8	8	20
382	27-Apr-07	12.991	8	6	6	6	1	6	6	6	6	8	20	8	8	8	8	6	2	6	8	8	20
383	4-May-07	13.256	7	6	6	6	1	6	6	6	6	1	20	8	8	6	8	6	8	6	8	8	20
384	11-May-07	13.466	1	8	6	6	1	6	6	6	6	1	20	8	8	8	6	6	8	6	8	8	20
385	18-May-07	13.753	6	8	6	6	1	6	6	6	6	1	20	8	2	8	6	6	2	6	8	8	20
386	25-May-07	13.949	6	8	6	6	1	6	6	6	6	8	20	8	2	8	6	6	2	6	8	8	20
387	1-Jun-07	14.315	6	8	6	6	1	6	6	6	6	1	20	6	8	8	8	6	8	6	8	6	20
388	8-Jun-07	14.191	6	8	6	8	1	6	6	6	6	1	20	6	8	8	8	6	13	6	6	6	20
389	15-Jun-07	13.824	1	8	6	8	1	6	6	6	6	1	8	7	2	8	8	1	13	6	1	6	20
390	22-Jun-07	13.824	1	8	6	8	1	6	6	6	6	1	8	7	2	8	8	1	13	6	1	6	20
391	29-Jun-07	13.824	1	8	6	8	1	6	6	6	6	1	8	7	2	8	8	1	13	6	1	6	20
392	6-Jul-07	14.307	1	8	6	8	1	6	6	6	6	20	8	20	2	1	8	1	13	6	1	6	11
393	13-Jul-07	14.142	1	8	6	6	1	6	6	6	6	1	8	20	16	1	6	1	13	6	1	6	11
394	20-Jul-07	14.074	1	6	6	6	1	6	6	6	6	1	8	20	10	1	6	1	8	6	1	6	11
395	27-Jul-07	14.422	1	6	1	6	1	6	6	6	1	1	20	20	10	1	6	1	13	6	1	6	11
396	3-Aug-07	12.219	1	6	1	6	1	6	6	6	7	1	20	20	10	1	6	1	13	6	1	16	2
397	10-Aug-07	12.434	1	6	1	6	1	6	6	6	1	1	20	20	10	1	6	1	13	6	1	9	2
398	17-Aug-07	12.395	1	6	1	6	1	6	6	8	6	1	20	20	1	1	6	1	13	6	1	9	2
399	24-Aug-07	11.015	5	6	6	6	1	6	6	8	6	2	20	20	2	6	6	2	13	6	2	9	2
400	31-Aug-07	9.834	5	6	6	6	1	6	6	8	6	2	20	20	2	6	6	2	11	6	2	9	2
401	7-Sep-07	10.037	5	6	6	6	1	6	6	8	6	2	20	20	2	6	6	2	11	6	2	16	2
402	14-Sep-07	10.405	5	6	1	6	7	1	6	6	1	2	20	20	2	1	6	2	11	6	2	9	2
403	21-Sep-07	10.664	5	6	1	6	1	6	6	6	1	2	20	20	2	1	6	2	11	6	2	9	2
404	28-Sep-07	10.376	5	6	1	6	1	6	6	6	1	2	2	2	2	1	6	2	11	6	2	9	2
405	5-Oct-07	10.423	5	6	8	6	1	6	6	6	6	2	2	2	2	6	6	2	11	6	2	9	2
406	12-Oct-07	10.491	5	7	8	6	1	6	6	6	6	2	13	2	2	6	6	2	11	6	2	9	2
407	19-Oct-07	10.688	5	6	1	6	1	6	6	6	6	2	2	2	2	6	7	2	11	6	2	9	2
408	26-Oct-07	10.902	5	6	7	6	1	6	6	6	6	2	2	2	2	6	7	2	11	6	2	6	2
409	2-Nov-07	10.962	5	6	7	6	1	6	6	6	6	2	2	2	2	6	7	2	11	6	2	6	2
410	9-Nov-07	11.333	5	6	7	6	1	6	6	6	6	2	2	2	2	6	7	2	11	6	2	6	2
411	16-Nov-07	11.335	6	6	7	6	1	6	6	7	6	2	2	2	2	6	7	2	11	6	2	6	2
412	23-Nov-07	11.564	11	7	6	6	7	1	6	6	7	1	2	2	2	6	9	2	11	6	2	6	2
413	30-Nov-07	11.815	10	7	5	2	7	1	6	6	7	2	2	2	2	2	9	2	11	6	2	10	2
414	7-Dec-07	11.793	11	7	9	2	7	1	6	7	1	1	2	2	2	2	9	2	11	6	2	6	2
415	14-Dec-07	11.953	11	7	9	2	7	1	6	7	1	1	2	2	2	2	9	2	11	6	2	6	2
416	21-Dec-07	11.953	11	7	9	2	7	1	6	7	1	1	2	2	2	2	9	2	11	6	2	6	2
417	28-Dec-07	11.828	7	7	5	2	7	1	6	6	1	2	2	2	2	2	9	2	11	6	2	6	2
418	4-Jan-08	11.843	7	7	5	2	1	6	6	7	1	2	2	2	2	2	9	2	10	6	2	6	2
419	11-Jan-08	11.836	1	7	2	2	1	6	6	7	1	2	2	2	2	2	9	2	10	6	2	6	2
420	18-Jan-08	11.992	20	7	2	6	7	1	6	7	1	2	13	2	2	2	9	20	13	6	1	6	2

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
421	25-Jan-08	10.772	7	7	5	6	1	1	6	6	1	2	2	2	2	2	9	20	10	6	2	6	2
422	1-Feb-08	11.227	7	7	6	2	1	1	6	7	7	2	2	2	2	2	9	20	8	6	2	6	14
423	8-Feb-08	11.411	7	7	6	9	1	1	6	7	7	2	2	2	2	2	9	20	11	6	2	6	14
424	15-Feb-08	10.996	7	7	6	9	1	1	6	7	7	2	2	2	2	2	9	20	13	6	2	6	14
425	22-Feb-08	11.080	7	7	6	9	1	1	6	7	7	2	2	2	2	2	9	20	13	6	11	6	14
426	29-Feb-08	11.366	7	7	11	16	1	1	6	7	7	2	2	2	2	1	9	20	13	6	11	6	14
427	7-Mar-08	11.621	7	7	11	16	1	1	6	7	7	2	2	2	2	6	9	20	13	6	11	6	14
428	14-Mar-08	11.316	10	7	11	1	1	1	6	7	7	2	2	2	2	6	9	20	13	6	11	6	14
429	21-Mar-08	11.459	10	7	11	1	1	1	6	7	7	2	13	14	2	6	9	20	13	6	11	8	14
430	28-Mar-08	11.782	10	7	11	7	1	1	6	6	7	2	13	2	2	7	9	20	13	6	2	6	14
431	4-Apr-08	12.031	7	1	11	7	1	1	6	6	7	2	13	14	2	7	9	20	13	6	11	6	14
432	11-Apr-08	11.843	7	1	11	7	1	1	6	6	7	2	13	4	2	7	9	20	13	6	11	8	14
433	18-Apr-08	12.006	7	1	11	7	1	1	6	7	7	2	13	4	2	7	9	20	13	6	11	6	14
434	25-Apr-08	12.084	10	1	11	7	1	1	6	7	7	2	13	4	2	7	9	20	13	6	11	8	14
435	2-May-08	12.300	7	1	11	7	1	1	6	7	7	2	13	4	2	1	9	11	14	6	11	6	14
436	9-May-08	12.487	7	1	11	7	1	1	6	7	7	2	13	4	2	1	9	11	14	6	11	6	14
437	16-May-08	12.766	10	1	11	7	1	6	6	7	1	2	13	4	11	1	9	20	14	6	11	8	14
438	23-May-08	12.570	10	1	11	7	1	6	6	7	1	2	13	4	11	1	9	20	14	6	11	8	14
439	30-May-08	12.630	10	1	11	7	1	6	6	7	1	2	13	4	11	1	9	20	14	6	11	8	14
440	6-Jun-08	12.920	10	1	11	7	1	6	6	7	1	2	13	4	20	1	9	20	14	6	11	8	14
441	13-Jun-08	12.973	10	1	11	7	1	6	6	7	1	2	13	4	20	1	9	11	14	6	11	8	14
442	20-Jun-08	12.214	19	1	11	7	1	6	6	7	1	2	13	4	20	1	9	11	11	6	11	8	14
443	27-Jun-08	12.437	19	1	8	7	1	6	6	7	1	2	13	4	20	1	9	11	11	6	11	8	14
444	4-Jul-08	12.490	19	1	8	7	1	6	6	7	1	2	13	4	20	1	9	11	11	6	11	8	14
445	11-Jul-08	12.099	6	1	8	1	1	6	6	7	1	2	13	4	11	1	6	11	11	6	11	8	6
446	18-Jul-08	12.257	6	6	8	1	1	6	6	7	1	2	13	4	11	1	6	20	11	6	11	8	14
447	25-Jul-08	12.391	10	1	8	1	1	6	6	7	1	2	13	14	11	1	6	20	11	6	11	22	14
448	1-Aug-08	12.457	10	1	11	1	1	6	6	7	1	2	13	14	11	1	6	11	11	6	11	22	14
449	8-Aug-08	12.696	1	1	11	1	1	6	6	7	1	20	13	14	11	1	1	20	11	6	2	22	14
450	15-Aug-08	12.882	10	1	11	1	1	6	6	6	1	20	13	11	11	10	1	20	11	6	2	22	14
451	22-Aug-08	12.820	10	1	6	1	1	6	6	6	1	20	13	11	11	10	1	20	11	6	2	22	14
452	29-Aug-08	13.028	1	1	11	1	1	6	6	6	1	20	13	11	11	10	1	11	11	6	2	10	14
453	5-Sep-08	13.420	1	1	6	1	1	6	6	6	1	2	13	11	20	10	1	11	11	6	11	10	14
454	12-Sep-08	11.291	1	1	11	1	1	6	6	6	1	20	13	11	22	10	1	11	11	6	2	10	2
455	19-Sep-08	11.576	1	1	11	1	1	6	6	6	1	20	13	11	22	10	9	11	11	6	2	10	2
456	26-Sep-08	11.850	1	1	11	1	1	6	6	6	2	20	13	11	22	10	9	2	11	6	2	22	1
457	3-Oct-08	12.019	8	1	11	1	7	1	6	1	1	20	13	11	22	2	9	2	2	6	3	22	2
458	10-Oct-08	9.748	8	1	11	10	1	6	6	8	8	20	13	11	2	10	9	2	2	6	3	8	14
459	17-Oct-08	5.776	8	1	3	10	1	6	6	16	8	20	10	11	2	8	8	2	11	6	3	14	2
460	24-Oct-08	5.993	8	1	1	10	1	6	6	8	8	20	10	11	20	8	8	2	11	6	1	14	20
461	31-Oct-08	5.331	6	1	11	8	3	6	7	6	9	20	11	11	20	16	8	2	11	6	8	14	20
462	7-Nov-08	5.369	6	1	11	8	1	6	7	6	6	20	13	11	20	8	8	2	13	6	8	14	20
463	14-Nov-08	5.546	6	1	11	8	1	6	7	7	6	20	13	11	20	8	8	2	13	6	8	15	20
464	21-Nov-08	5.568	6	1	11	8	1	6	7	7	6	20	3	11	20	8	8	2	13	6	8	14	20
465	28-Nov-08	5.377	6	1	11	8	1	8	6	7	6	20	3	11	20	8	8	2	13	6	8	14	20
466	5-Dec-08	5.344	6	1	20	8	1	6	6	7	6	8	3	11	20	8	8	2	13	6	11	14	2
467	12-Dec-08	5.526	6	1	20	8	1	6	6	8	6	20	3	20	20	8	8	2	13	6	8	14	2
468	19-Dec-08	5.614	3	1	20	8	1	6	6	7	7	20	3	20	20	8	8	2	13	6	8	14	20
469	26-Dec-08	5.656	6	1	20	8	1	6	6	7	7	20	3	20	20	8	8	2	13	6	8	14	20
470	2-Jan-09	5.838	6	2	11	8	1	6	6	7	7	20	3	20	20	8	8	2	13	6	8	14	20
471	9-Jan-09	5.865	6	2	11	8	1	6	6	7	7	20	15	20	20	8	8	2	13	6	8	22	20
472	16-Jan-09	6.139	7	2	11	7	1	1	6	8	7	20	15	20	20	8	8	2	13	6	8	22	20
473	23-Jan-09	6.192	7	2	20	7	1	6	6	8	7	20	15	20	20	8	8	2	13	6	8	22	20
474	30-Jan-09	6.236	6	1	11	10	1	6	6	8	2	8	15	20	20	8	8	2	13	6	11	22	20
475	6-Feb-09	6.328	6	1	11	10	1	1	6	16	2	20	15	20	20	8	8	2	13	6	8	22	20
476	13-Feb-09	6.534	6	1	11	10	1	1	6	8	2	8	2	20	20	8	8	2	13	2	11	22	20
477	20-Feb-09	6.674	6	1	11	10	1	1	6	8	1	8	2	20	20	5	8	2	13	2	11	22	20
478	27-Feb-09	6.431	6	1	20	10	1	1	6	8	1	8	2	20	20	8	8	2	13	2	11	14	20
479	6-Mar-09	6.549	6	1	20	10	1	6	6	8	6	8	2	20	20	8	8	2	13	2	11	14	20
480	13-Mar-09	6.660	6	6	20	10	1	1	6	8	6	6	2	20	20	8	8	2	13	2	11	14	20

								From Top Row Node to Row-Obs.th Node															
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
481	20-Mar-09	6.602	6	6	20	10	1	1	6	16	6	6	2	20	20	8	8	2	13	6	11	14	20
482	27-Mar-09	6.581	6	6	20	10	1	1	6	16	6	20	2	20	20	8	8	6	13	6	2	14	20
483	3-Apr-09	6.547	10	6	20	10	1	1	6	16	1	20	2	20	20	2	8	6	13	6	2	14	20
484	10-Apr-09	6.560	10	6	20	10	1	1	6	16	1	20	2	20	20	2	8	2	13	6	2	14	20
485	17-Apr-09	6.637	10	6	20	10	1	1	6	16	1	20	2	20	20	2	8	2	13	6	2	14	20
486	24-Apr-09	6.765	10	6	20	10	1	1	6	16	1	20	20	20	20	2	8	2	13	6	2	14	20
487	1-May-09	6.951	1	6	20	10	1	1	6	16	1	20	20	20	20	2	8	2	13	6	2	14	20
488	8-May-09	7.042	1	6	20	1	1	1	6	16	1	20	20	20	20	2	8	2	13	6	2	14	20
489	15-May-09	7.056	10	6	14	1	1	1	6	16	1	20	15	20	8	2	8	2	13	6	2	14	14
490	22-May-09	7.146	1	6	14	1	1	1	6	16	2	20	15	20	8	2	8	2	13	6	2	14	14
491	29-May-09	7.236	10	6	1	1	1	1	6	16	1	20	15	20	8	1	8	2	13	6	2	8	14
492	5-Jun-09	7.365	10	6	1	10	1	1	6	16	6	20	15	20	8	1	8	2	22	6	2	8	2
493	12-Jun-09	7.480	1	6	1	10	1	1	6	16	6	20	2	20	8	1	8	2	22	6	2	8	14
494	19-Jun-09	7.671	10	6	1	10	1	1	6	16	6	20	15	20	8	1	8	2	22	6	2	8	6
495	26-Jun-09	7.620	10	6	1	10	1	1	6	16	6	20	15	20	8	8	8	2	22	6	2	8	6
496	3-Jul-09	7.759	1	6	1	10	1	6	6	16	6	20	20	20	8	1	8	2	22	6	2	8	20
497	10-Jul-09	7.869	10	6	1	10	1	6	6	16	6	20	20	20	8	1	8	2	22	6	2	8	14
498	17-Jul-09	7.896	10	6	1	10	1	6	6	16	6	20	20	20	8	1	8	2	22	6	2	8	14
499	24-Jul-09	7.731	10	6	1	10	1	6	6	16	6	20	20	20	8	20	8	2	22	6	2	8	14
500	31-Jul-09	7.645	10	6	1	10	1	6	6	8	6	20	20	20	8	20	8	2	22	6	2	8	14
501	7-Aug-09	7.667	1	6	1	10	1	6	6	8	6	20	20	20	20	20	8	2	22	6	2	8	14
502	14-Aug-09	7.905	1	6	1	6	1	6	6	8	6	20	20	2	2	2	9	2	22	6	2	8	20
503	21-Aug-09	8.063	1	6	1	6	1	6	6	8	6	20	20	1	2	1	9	2	22	6	2	8	20
504	28-Aug-09	8.165	10	6	1	6	1	6	6	8	6	20	20	2	2	1	9	2	22	6	2	8	20
505	4-Sep-09	8.320	1	6	1	10	1	6	6	8	1	20	20	2	2	1	9	2	22	6	2	8	20
506	11-Sep-09	8.489	1	6	1	10	1	6	6	8	1	20	20	2	2	1	9	2	22	6	2	1	20
507	18-Sep-09	8.417	10	6	1	10	1	6	6	8	1	20	20	2	2	1	9	2	22	6	2	20	20
508	25-Sep-09	8.567	10	6	1	10	1	1	6	8	1	20	2	2	2	1	9	2	11	6	2	14	20
509	2-Oct-09	8.705	1	6	1	10	1	6	6	8	1	20	2	2	2	1	9	2	11	6	2	14	20
510	9-Oct-09	8.880	1	6	1	10	1	6	6	8	1	20	2	2	2	1	9	2	22	6	2	2	20
511	16-Oct-09	8.727	1	6	1	10	1	6	6	8	1	20	20	2	2	1	9	2	22	6	2	2	20
512	23-Oct-09	8.807	1	6	1	10	1	1	6	8	1	20	20	2	2	1	9	2	22	6	2	2	20
513	30-Oct-09	8.998	1	6	1	10	1	1	6	8	1	2	20	2	2	1	9	2	11	6	2	2	20
514	6-Nov-09	8.692	1	6	1	10	1	1	6	1	1	2	20	2	2	1	9	2	11	6	2	2	20
515	13-Nov-09	8.775	1	6	1	10	1	1	6	6	1	2	20	2	2	6	8	2	15	6	2	2	20
516	20-Nov-09	8.885	1	6	1	10	1	1	6	6	1	2	20	2	2	6	8	2	15	6	2	2	20
517	27-Nov-09	9.072	1	6	1	10	1	1	6	6	9	2	20	2	2	6	8	2	15	6	2	2	20
518	4-Dec-09	9.198	1	6	1	10	1	1	6	6	9	2	20	2	2	6	8	2	11	6	2	2	20
519	11-Dec-09	9.236	1	6	1	10	1	1	6	6	9	2	20	2	2	6	8	2	11	6	2	2	20
520	18-Dec-09	9.392	1	6	1	10	1	6	6	10	1	2	20	2	2	9	8	2	11	6	2	2	20
521	25-Dec-09	9.512	1	6	1	10	1	6	6	10	1	2	20	2	2	9	8	2	11	6	2	2	20
522	1-Jan-10	9.532	1	6	1	10	1	6	6	10	1	2	20	2	2	9	8	2	11	6	2	2	20
523	8-Jan-10	9.602	1	6	1	10	1	6	6	10	1	2	2	2	2	1	8	2	11	6	2	2	2
524	15-Jan-10	9.782	1	6	1	10	1	6	6	10	1	2	2	2	2	1	8	2	11	6	2	2	2
525	22-Jan-10	10.068	1	6	1	6	1	6	6	10	1	2	2	2	2	1	8	2	11	6	2	2	2
526	29-Jan-10	9.707	1	6	1	6	1	6	6	10	1	2	2	2	2	1	8	2	11	6	2	2	2
527	5-Feb-10	9.574	1	6	1	6	1	6	6	10	1	2	20	2	2	1	8	2	11	6	2	2	2
528	12-Feb-10	9.470	1	6	1	6	1	6	6	1	9	2	20	2	2	1	9	2	11	6	2	2	2
529	19-Feb-10	9.657	1	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
530	26-Feb-10	9.748	1	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
531	5-Mar-10	9.982	1	6	1	6	1	6	6	8	9	2	2	2	2	1	9	2	11	6	2	2	2
532	12-Mar-10	9.994	1	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
533	19-Mar-10	10.080	1	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
534	26-Mar-10	10.348	6	6	2	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
535	2-Apr-10	10.580	6	6	2	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
536	9-Apr-10	10.577	6	6	2	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
537	16-Apr-10	10.785	6	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
538	23-Apr-10	10.966	6	6	1	6	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2
539	30-Apr-10	11.150	6	6	1	6	1	6	6	10	1	2	20	2	2	1	9	2	11	6	2	2	2
540	7-May-10	11.243	1	6	1	1	1	6	6	8	9	2	20	2	2	1	9	2	11	6	2	2	2

APPENDIX - C4

CHAPTER 3 - CONDITIONAL CORRELATION BASED MST STRUCTURE

			From Top Row Node to Row-Obs.th Node																				
Obs.	End of Period	MST_Length	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
541	14-May-10	8.937	1	6	2	1	1	6	6	8	9	2	20	2	2	1	9	2	7	6	2	2	2
542	21-May-10	9.002	1	6	2	1	1	6	6	8	9	2	2	2	2	1	9	2	7	6	2	2	2
543	28-May-10	8.361	19	6	2	7	1	6	6	8	9	2	2	2	2	1	9	2	7	7	2	2	2
544	4-Jun-10	8.629	7	6	2	7	1	6	6	8	9	2	2	2	2	1	9	2	7	7	2	2	2
545	11-Jun-10	8.862	7	6	2	7	1	1	6	8	9	2	2	2	2	1	9	2	7	7	2	2	2
546	18-Jun-10	9.117	7	6	2	7	1	1	6	8	9	2	20	2	2	1	9	2	7	7	2	2	2
547	25-Jun-10	9.099	7	6	2	7	1	1	6	8	9	2	20	2	2	7	9	14	7	6	2	2	2
548	2-Jul-10	9.380	7	6	2	7	1	1	6	8	9	2	20	2	2	1	9	2	2	7	2	2	2
549	9-Jul-10	9.178	10	6	2	7	1	1	6	1	9	2	20	2	2	1	9	2	2	7	2	9	2
550	16-Jul-10	8.978	10	6	2	7	1	1	6	7	9	2	20	2	2	1	9	2	2	7	2	9	2
551	23-Jul-10	9.187	10	6	2	2	1	1	6	6	9	2	20	2	2	1	9	2	2	6	2	9	2
552	30-Jul-10	9.271	10	6	2	7	1	1	6	6	9	2	20	2	2	1	9	2	16	6	2	2	2
553	6-Aug-10	9.442	10	6	2	7	1	1	6	1	9	2	20	2	2	1	9	2	7	6	2	2	2
554	13-Aug-10	9.550	10	6	2	2	1	1	6	1	9	2	20	2	2	1	9	2	2	6	2	2	2
555	20-Aug-10	9.427	10	6	2	2	1	1	6	1	9	2	20	2	2	7	9	2	2	6	2	2	2
556	27-Aug-10	9.733	7	6	2	10	1	6	6	1	9	2	20	2	2	1	9	2	2	6	2	2	2
557	3-Sep-10	9.962	7	6	2	2	1	6	6	1	9	2	20	2	2	1	9	2	2	6	2	2	2
558	10-Sep-10	9.835	7	6	2	2	1	6	6	6	9	2	20	2	2	1	9	2	2	6	2	9	2
559	17-Sep-10	9.989	7	6	2	2	1	6	6	6	9	2	13	2	2	1	9	2	2	6	2	2	2
560	24-Sep-10	10.103	7	6	2	2	1	6	6	6	9	2	13	2	2	1	9	2	2	6	2	2	2
561	1-Oct-10	10.184	7	6	2	2	1	6	6	6	9	2	13	2	2	1	9	2	2	6	2	9	2
562	8-Oct-10	10.404	7	6	2	10	1	6	6	6	9	2	13	2	2	1	9	2	2	6	2	9	2
563	15-Oct-10	10.493	7	6	2	10	1	6	6	6	9	2	13	2	2	1	9	2	2	6	2	9	2
564	22-Oct-10	10.651	7	6	2	10	1	6	6	6	9	2	13	2	2	1	9	2	11	6	2	9	2
565	29-Oct-10	10.892	7	6	2	10	1	1	6	6	2	2	13	2	2	8	9	2	11	7	2	9	2
566	5-Nov-10	11.173	7	6	2	10	1	6	6	6	2	2	13	2	2	16	9	2	11	6	2	9	2
567	12-Nov-10	10.704	7	6	2	10	1	1	6	6	2	2	13	2	2	7	9	2	11	7	2	6	2
568	19-Nov-10	10.650	7	6	2	2	1	1	6	6	2	2	13	2	2	7	9	2	11	6	2	2	2
569	26-Nov-10	10.903	7	6	2	10	1	1	6	6	2	7	13	2	2	9	9	2	11	7	2	6	2
570	3-Dec-10	10.924	7	6	2	1	1	1	6	1	2	7	13	2	2	9	9	2	11	7	2	9	2
571	10-Dec-10	10.866	7	6	2	1	1	1	6	1	9	7	13	2	2	9	9	2	11	7	2	2	2
572	17-Dec-10	11.184	9	6	2	10	1	1	6	1	2	7	13	2	2	9	9	2	11	7	2	9	2
573	24-Dec-10	11.435	9	6	2	10	1	1	6	1	2	7	13	2	2	9	9	2	11	6	2	9	2
574	31-Dec-10	11.632	9	6	2	10	1	1	6	1	2	7	13	2	2	9	9	2	11	7	2	9	2

APPENDIX - C5
DATA FOR CHAPTER 4

Year	FDI Flows (millions US$)	FDI Flows % of GDP	FDI Stock (millions US$)	Exchange Rate IDS/US$	Discount Rate	Export (FOB) (millions US$)	Oil & Gas Export (millions US$)	Crude Oil Export (millions US$)	Import (CIF) (millions US$)	Unemploy. (thousands)	Labor Force (thousands)	Employ. (thousands)	GDP (billions IDR)	GDP (millions US$)	GDP Def. (2005=100)
1970	145.38	11.59	145.38	378.00	n.a.	1,152.00	446.30	408.50	893.30	n.a.	n.a.	n.a.	3,340.20	8,836.51	0.82
1971	299.07	20.21	444.45	415.00	n.a.	1,246.00	564.80	467.90	1,173.90	n.a.	n.a.	n.a.	3,672.00	8,848.19	0.84
1972	253.52	12.28	697.97	415.00	n.a.	1,535.00	913.10	833.60	1,458.00	n.a.	n.a.	n.a.	4,564.00	10,997.59	0.95
1973	581.00	19.96	1,278.97	415.00	n.a.	3,062.00	1,608.70	1,358.50	2,346.60	n.a.	n.a.	n.a.	6,753.40	16,273.25	1.27
1974	182.12	4.21	1,461.09	415.00	n.a.	7,449.00	5,211.40	4,680.30	3,754.10	n.a.	n.a.	n.a.	10,708.00	25,802.41	1.87
1975	1,292.06	20.85	2,753.15	415.00	n.a.	7,104.00	5,310.80	4,933.10	4,712.40	n.a.	n.a.	n.a.	12,642.50	30,463.86	2.10
1976	747.59	9.68	3,500.74	415.00	n.a.	8,549.00	6,004.10	5,652.00	5,673.10	n.a.	n.a.	n.a.	15,466.70	37,269.16	2.40
1977	234.93	2.55	3,735.67	415.00	n.a.	10,853.00	7,297.80	6,826.60	6,230.30	n.a.	n.a.	n.a.	19,010.70	45,808.92	2.71
1978	417.71	3.95	4,153.38	625.00	n.a.	11,643.00	7,438.50	7,014.60	6,690.40	n.a.	n.a.	n.a.	22,746.00	36,393.60	3.01
1979	226.47	2.10	4,379.85	627.00	n.a.	15,591.00	8,870.80	8,124.20	7,202.30	n.a.	n.a.	n.a.	32,025.40	51,077.19	3.99
1980	180.00	1.19	4,559.85	626.75	n.a.	21,908.00	12,850.30	11,671.30	10,834.40	n.a.	55,482.39	n.a.	45,445.70	72,510.09	5.15
1981	133.00	0.59	4,692.85	644.00	n.a.	22,262.00	14,389.80	13,182.60	13,271.70	n.a.	56,761.12	n.a.	58,127.20	90,259.63	6.11
1982	225.00	0.94	4,917.85	692.50	n.a.	22,264.00	14,861.40	14,001.80	16,858.40	n.a.	58,362.72	n.a.	62,475.70	90,217.62	6.42
1983	292.00	1.36	5,209.85	994.00	n.a.	21,196.00	13,477.50	11,645.80	16,331.70	n.a.	59,620.41	n.a.	77,623.00	78,091.55	7.66
1984	222.00	1.13	5,431.85	1,074.00	n.a.	21,903.00	12,097.10	10,214.20	13,882.20	n.a.	60,893.70	n.a.	89,885.00	83,691.81	8.29
1985	308.00	1.53	5,739.85	1,125.00	n.a.	18,590.00	7,670.20	7,217.40	10,261.50	1,369.00	62,178.53	62,457.00	98,406.00	87,472.00	8.86
1986	258.00	1.34	5,997.85	1,641.00	n.a.	14,805.00	5,166.60	4,721.10	10,718.40	1,855.00	68,160.92	68,338.00	110,697.00	67,457.04	9.41
1987	385.00	2.04	6,382.85	1,650.00	n.a.	17,133.00	5,919.40	4,590.20	12,890.70	1,843.00	70,326.64	70,402.00	128,630.00	77,957.58	10.42
1988	576.00	2.53	6,958.85	1,731.00	n.a.	19,465.00	n.a.	14,279.10	13,485.60	2,106.00	72,527.97	72,518.00	149,395.00	86,305.60	11.44
1989	682.00	2.53	7,640.85	1,797.00	n.a.	22,159.50	4,964.30	4,348.60	16,572.10	2,083.00	73,625.27	73,425.00	179,608.00	99,948.80	12.80
1990	1,092.00	3.37	8,732.85	1,901.00	18.83	25,673.90	6,480.60	5,313.00	21,767.80	1,952.00	75,187.34	75,850.00	210,866.00	110,923.72	14.01
1991	1,482.00	4.28	10,214.85	1,992.00	18.47	29,543.00	5,745.00	4,998.50	26,012.70	2,032.00	76,740.29	76,423.20	249,969.00	125,486.45	15.53
1992	1,861.34	5.19	12,076.19	2,062.00	13.50	33,088.00	5,850.00	4,648.00	27,311.00	2,198.80	78,282.39	78,104.10	282,395.00	136,951.99	16.48
1993	2,003.00	4.82	14,079.19	2,110.00	8.82	36,824.60	5,009.00	4,259.00	28,328.40	2,246.00	80,089.13	79,201.00	*329,776.00*	156,291.94	18.07
1994	2,191.00	4.49	16,270.19	2,200.00	12.44	40,053.40	6,006.00	5,072.00	31,988.70	3,738.00	81,822.29	82,037.00	382,220.00	173,736.36	19.48
1995	4,427.88	7.71	20,698.07	2,308.00	13.99	45,417.00	6,441.00	5,146.00	40,655.00	n.a.	84,614.23	80,110.00	454,514.00	196,929.81	21.40
1996	6,245.00	9.28	26,943.07	2,383.00	12.80	49,814.00	7,243.00	5,712.00	42,929.00	4,286.63	87,362.36	85,701.80	532,568.00	223,486.36	23.26
1997	4,729.00	7.74	31,672.07	4,650.00	20.00	56,297.00	6,822.02	5,478.67	51,307.00	4,197.31	89,190.92	87,050.00	627,695.00	134,988.17	26.19
1998	- 207.00	- 0.85	31,465.07	8,025.00	38.44	50,369.00	4,263.97	3,348.63	35,279.00	5,062.48	90,046.92	87,673.60	955,753.00	119,096.95	45.90
1999	- 1,838.00	- 6.38	29,627.07	7,085.00	12.51	51,244.00	5,688.32	4,776.16	33,321.00	6,030.32	95,461.06	88,816.90	1,099,730.00	155,219.48	52.40
2000	- 4,495.00	- 13.67	25,132.07	9,595.00	14.53	65,404.30	7,953.74	6,279.45	43,075.30	5,813.23	97,239.63	89,837.70	1,389,770.00	144,843.15	63.11
2001	- 2,841.68	- 8.96	15,359.22	10,400.00	17.62	57,362.40	6,818.41	5,519.51	38,431.70	8,005.03	98,951.41	90,807.40	1,646,320.00	158,300.00	72.13
2002	233.16	0.61	7,260.34	8,940.00	12.93	58,773.80	6,550.18	5,272.73	37,730.40	9,132.10	100,592.92	91,647.20	1,821,830.00	203,784.12	76.38
2003	- 507.00	- 1.11	10,328.20	8,465.00	8.31	64,109.20	7,349.02	5,721.26	41,567.70	9,939.30	102,539.26	92,810.80	2,013,670.00	237,881.87	80.58
2004	1,896.00	3.29	15,857.86	9,290.00	7.43	72,164.40	7,620.20	6,241.39	55,008.10	10,251.40	104,795.96	93,722.00	2,295,830.00	247,129.17	87.46
2005	8,336.00	12.33	41,187.00	9,830.00	12.75	86,720.70	9,522.70	7,259.14	75,630.60	11,899.30	107,058.40	93,958.40	2,774,280.00	282,225.84	100.00
2006	4,914.00	5.59	54,534.00	9,020.00	9.75	103,493.00	10,905.60	7,904.67	80,658.60	10,932.00	109,048.63	95,456.90	3,339,220.00	370,201.77	114.09
2007	6,928.00	6.44	79,927.00	9,419.00	8.00	118,014.00	12,496.20	9,379.54	93,100.60	10,279.50	110,989.48	99,930.20	3,950,890.00	419,459.60	126.93
2008	9,318.00	6.60	67,964.00	10,950.00	10.83	139,606.00	15,387.40	11,442.40	127,451.00	9,411.05	112,855.28	102,553.00	4,951,360.00	452,179.00	150.06
2009	4,877.40	12.20	72,841.40	9,400.00	6.46	119,483.00	11,236.00	8,428.44	92,672.00	9,109.48	115,595.97	n.a.	5,613,440.00	597,174.47	162.73

APPENDIX - C6
DATA FOR CHAPTER 5

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
1997:07:16	904.03	3,867.50	15,055.70	20,196.00	1,968.90	4,751.40	824.11	13,260.00	1,199.06	730.16	1,084.88	4,559.20
1997:07:23	907.54	4,027.00	14,703.70	19,697.00	1,983.00	4,762.40	845.62	13,609.00	1,120.84	738.14	1,033.24	4,836.50
1997:07:30	936.59	4,223.70	15,446.00	20,359.00	1,917.90	4,964.20	826.37	12,640.00	1,190.83	723.50	1,004.09	4,787.40
1997:08:06	936.56	4,384.80	15,738.80	20,131.00	1,974.70	4,874.50	821.70	12,427.00	1,198.86	718.19	1,034.07	4,742.10
1997:08:13	952.29	4,458.70	15,983.20	20,213.00	1,966.40	4,927.30	847.24	13,019.00	1,179.42	721.98	1,024.74	4,974.20
1997:08:20	960.32	4,364.30	16,541.60	19,702.00	1,958.60	5,026.20	857.44	12,523.00	1,171.94	699.86	951.74	5,212.90
1997:08:27	922.02	4,237.10	16,482.90	19,009.00	1,875.40	5,003.60	836.94	11,851.00	1,120.13	658.60	908.83	5,016.60
1997:09:03	939.35	4,251.90	15,855.70	19,252.00	1,943.90	4,958.40	866.47	10,849.00	1,144.64	593.17	929.57	5,124.20
1997:09:10	913.70	3,992.00	15,534.00	18,442.00	1,916.00	4,906.90	861.85	11,719.00	1,198.51	555.46	847.92	4,912.90
1997:09:17	927.86	4,062.10	14,714.00	18,735.00	1,820.20	4,976.90	834.18	11,119.00	1,240.82	512.39	750.76	4,888.80
1997:09:24	919.03	4,028.00	14,805.40	18,705.00	1,944.60	4,905.20	808.26	11,361.00	1,256.04	575.02	863.08	4,822.10
1997:10:01	943.00	3,970.40	14,419.50	17,683.00	1,910.20	5,013.10	821.58	11,524.00	1,167.56	526.74	811.12	5,009.60
1997:10:08	944.48	4,151.00	14,205.40	18,420.00	1,900.50	5,077.20	817.31	11,482.00	1,110.01	553.65	779.41	5,210.60
1997:10:15	955.41	4,263.00	15,128.00	17,842.00	1,941.70	5,317.10	832.34	12,173.00	1,098.90	536.99	795.83	5,354.40
1997:10:22	973.84	4,267.40	14,838.50	17,619.00	1,882.00	5,262.10	830.51	12,433.00	1,134.87	518.94	836.60	5,300.80
1997:10:29	965.72	4,168.60	13,384.20	17,331.00	1,855.00	5,263.70	832.94	12,830.00	1,125.78	518.91	801.52	5,345.20
1997:11:05	968.49	4,124.90	11,637.80	17,688.00	1,731.70	5,148.80	862.59	12,956.00	1,177.52	505.23	731.17	5,299.20
1997:11:12	919.16	3,806.70	10,765.30	16,857.00	1,541.40	4,871.80	694.60	9,818.00	1,194.09	472.05	662.48	4,795.00
1997:11:19	942.76	3,841.40	10,681.80	16,448.00	1,700.00	4,908.30	681.12	9,988.00	1,194.04	490.85	733.76	4,823.70
1997:11:26	905.96	3,697.50	9,607.90	15,434.00	1,685.80	4,720.40	576.32	7,822.00	1,185.02	449.64	684.49	4,334.80
1997:12:03	944.59	3,876.90	10,154.40	15,842.00	1,681.00	4,830.10	620.88	9,332.00	1,181.63	415.65	603.49	4,679.20
1997:12:10	951.64	3,926.90	10,590.10	16,046.00	1,653.60	4,891.20	648.53	9,373.00	1,143.82	398.54	526.12	4,897.00
1997:12:17	976.77	4,074.60	11,207.60	16,586.00	1,696.30	4,970.70	705.36	9,992.00	1,122.55	389.68	548.06	5,127.90
1997:12:24	969.79	4,117.27	11,022.40	16,478.00	1,703.50	5,130.70	672.77	9,462.00	1,157.84	415.94	636.36	5,045.40
1997:12:31	965.54	4,154.60	10,692.70	16,541.00	1,569.50	5,190.80	669.06	9,854.00	1,146.52	368.68	556.79	5,112.00
1998:01:07	932.70	4,266.00	10,342.40	14,925.00	1,573.00	5,013.90	641.24	9,707.00	1,169.66	396.53	550.35	4,912.70
1998:01:14	970.43	4,364.30	10,722.80	14,957.00	1,529.80	5,135.50	694.01	10,480.00	1,194.10	410.01	594.44	5,229.40
1998:01:21	964.00	4,340.00	9,538.60	15,028.00	1,368.10	5,224.10	647.93	9,879.00	1,244.07	394.24	521.00	4,942.90
1998:01:28	957.94	4,145.40	9,226.60	15,122.00	1,243.30	5,106.90	609.79	9,349.00	1,202.21	403.98	536.68	4,650.10
1998:02:04	970.81	4,250.50	9,246.80	16,684.00	1,311.40	5,272.30	615.54	9,385.00	1,200.20	466.00	590.55	4,617.70
1998:02:11	977.46	4,385.30	10,578.60	16,974.00	1,433.00	5,372.60	629.70	9,773.00	1,200.20	485.94	701.31	4,546.30
1998:02:18	1,006.90	4,509.30	10,302.60	16,883.00	1,425.20	5,595.80	662.02	9,971.00	1,248.04	519.93	690.76	4,787.40
1998:02:25	1,020.01	4,552.50	10,793.40	17,175.00	1,621.30	5,607.90	677.83	10,485.00	1,250.24	487.61	739.87	4,729.30
1998:03:04	1,032.08	4,611.70	10,671.00	16,614.00	1,539.00	5,723.40	666.76	10,322.00	1,229.83	472.68	704.90	4,550.20
1998:03:11	1,042.90	4,704.60	10,886.70	16,361.00	1,583.20	5,745.10	690.64	10,546.00	1,194.67	483.41	712.81	4,740.20
1998:03:18	1,047.33	4,690.50	11,350.80	17,096.00	1,571.50	5,733.10	676.28	10,899.00	1,213.25	502.91	705.94	4,804.10
1998:03:25	1,068.47	4,862.40	11,118.90	16,756.00	1,577.80	5,829.80	670.26	11,223.00	1,190.04	491.87	709.91	4,742.30
1998:04:01	1,085.52	4,908.60	11,121.70	16,620.00	1,645.30	5,903.60	674.53	11,894.00	1,193.91	504.00	706.55	4,844.40
1998:04:08	1,101.93	5,114.10	11,810.60	16,658.00	1,667.20	5,967.80	698.69	11,756.00	1,191.55	504.10	736.78	4,997.10
1998:04:15	1,108.15	5,135.40	11,331.40	16,242.00	1,600.10	6,017.60	710.66	11,837.00	1,254.96	523.95	700.05	4,999.10
1998:04:22	1,101.65	5,267.40	11,314.50	16,377.00	1,573.10	6,055.20	660.83	11,975.00	1,322.79	530.04	664.28	4,921.20
1998:04:29	1,119.32	5,359.20	11,371.10	16,299.00	1,543.90	6,074.10	683.06	12,299.00	1,324.71	513.45	644.62	4,991.00
1998:05:06	1,130.54	5,312.30	10,977.50	15,762.00	1,475.50	5,931.10	710.66	11,703.00	1,322.18	500.64	619.67	5,164.70
1998:05:13	1,094.62	5,108.48	10,471.15	15,641.26	1,502.11	5,833.10	692.44	11,528.00	1,332.50	465.25	622.83	5,028.65
1998:05:20	1,104.92	5,229.80	10,109.14	15,243.84	1,448.40	5,992.40	701.59	11,165.00	1,348.41	414.62	584.62	4,927.93
1998:05:27	1,118.86	5,376.88	9,469.29	15,343.81	1,331.98	5,972.90	671.03	10,779.00	1,369.26	402.06	548.33	4,756.60
1998:06:03	1,119.06	5,510.98	9,549.18	15,652.95	1,273.78	5,907.40	642.45	10,408.00	1,357.43	424.01	569.19	4,607.34
1998:06:10	1,092.23	5,490.64	8,983.43	15,664.29	1,295.53	5,870.20	603.07	9,748.00	1,399.54	416.97	552.28	4,480.36
1998:06:17	1,082.73	5,613.76	8,819.22	15,347.00	1,219.80	5,898.40	598.31	9,856.00	1,420.00	392.61	526.36	4,455.24
1998:06:24	1,112.28	5,754.46	7,979.37	15,339.26	1,067.81	5,987.40	574.04	9,868.00	1,368.30	408.08	489.86	4,396.80
1998:07:01	1,107.11	5,709.36	8,004.35	14,715.38	1,107.70	5,832.70	571.23	9,897.00	1,348.94	419.44	450.88	4,340.98
1998:07:08	1,132.88	5,779.91	8,296.77	15,123.18	1,074.85	5,804.90	555.50	9,856.00	1,401.74	430.96	455.37	4,378.26
1998:07:15	1,148.56	5,906.85	8,866.16	16,362.89	1,095.10	5,919.90	572.39	9,915.00	1,316.44	456.54	471.23	4,422.09
1998:07:22	1,166.38	6,013.14	8,629.18	16,530.97	1,107.78	6,009.60	616.71	10,336.00	1,338.98	472.98	455.28	4,573.28
1998:07:29	1,174.81	6,108.24	8,456.22	16,614.14	1,056.01	6,151.50	621.70	10,649.00	1,335.47	467.34	433.54	4,593.78
1998:08:05	1,164.08	6,110.73	8,420.72	16,293.06	1,052.66	5,989.60	615.75	10,912.00	1,299.15	483.05	421.91	4,564.75
1998:08:12	1,125.21	5,853.63	7,808.83	16,158.09	1,053.98	5,844.10	596.72	10,542.00	1,311.94	485.10	385.97	4,340.34
1998:08:19	1,081.43	5,632.51	7,466.43	15,992.16	1,052.13	5,632.50	552.57	9,828.00	1,307.44	441.78	380.29	4,055.32
1998:08:26	1,084.22	5,402.37	6,859.48	15,378.97	995.77	5,462.20	485.23	8,417.00	1,190.55	408.64	342.19	3,561.50
1998:09:02	1,098.06	5,596.41	7,622.58	15,406.34	923.04	5,694.30	470.74	8,542.00	1,126.08	405.89	343.47	3,604.36
1998:09:09	1,084.19	5,231.61	7,834.40	14,866.03	925.85	5,545.40	404.01	7,348.00	1,160.29	360.93	324.49	3,254.44
1998:09:16	990.48	4,970.50	7,355.67	14,376.62	827.85	5,235.80	390.40	6,805.00	1,136.89	329.62	294.59	3,178.56
1998:09:23	1,006.20	5,040.87	7,905.45	14,755.54	885.46	5,311.30	348.11	5,655.00	1,190.68	325.76	389.65	3,167.26
1998:09:30	1,045.48	4,857.97	7,860.68	14,197.70	946.75	5,291.70	368.60	6,760.00	1,252.14	290.92	394.04	3,395.48
1998:10:07	1,066.09	4,699.39	7,504.39	14,205.78	900.99	5,214.70	399.13	7,280.00	1,229.86	262.25	376.26	3,902.19
1998:10:14	1,017.01	4,474.51	7,883.46	13,406.39	939.65	5,064.40	380.28	6,593.00	1,242.90	276.15	373.52	3,569.88
1998:10:21	970.68	4,087.83	7,744.72	13,825.61	921.57	4,828.90	360.44	6,157.00	1,213.79	266.17	370.90	3,375.44
1998:10:28	1,005.53	4,318.52	8,840.01	13,070.73	985.78	5,038.40	396.21	6,445.00	1,240.60	303.19	384.22	3,595.42
1998:11:04	1,069.92	4,523.24	9,662.12	14,216.33	1,140.91	5,206.60	443.92	7,350.00	1,207.83	322.32	424.37	3,850.45
1998:11:11	1,068.09	4,536.34	9,931.46	13,516.07	1,180.22	5,293.90	442.27	6,827.00	1,225.93	312.29	410.49	3,843.68
1998:11:18	1,118.67	4,841.72	10,508.25	14,527.81	1,301.05	5,622.90	492.86	7,656.00	1,235.80	330.46	431.70	4,267.73
1998:11:25	1,120.97	4,717.70	10,137.32	14,428.02	1,236.82	5,476.80	477.53	7,763.00	1,286.20	363.01	476.12	4,117.69
1998:12:02	1,144.48	4,698.72	10,213.42	14,599.23	1,271.70	5,474.00	477.93	8,547.00	1,285.50	369.99	458.34	4,059.24
1998:12:09	1,186.87	4,944.37	10,720.99	15,073.47	1,390.51	5,755.30	518.78	8,910.00	1,263.85	387.38	502.15	4,007.92
1998:12:16	1,171.25	4,691.69	10,055.78	14,986.62	1,383.59	5,507.20	484.88	8,449.00	1,236.97	396.96	526.75	3,815.39
1998:12:23	1,183.49	4,663.68	10,361.29	14,931.90	1,424.59	5,669.10	446.31	7,573.00	1,224.09	398.78	522.18	3,805.52
1998:12:30	1,161.94	4,663.45	9,939.39	14,096.30	1,359.10	5,630.40	427.60	6,619.00	1,183.06	412.69	542.99	3,741.25
1999:01:06	1,228.54	4,951.77	10,158.75	13,706.73	1,384.53	5,908.80	440.77	7,176.00	1,172.51	400.52	551.11	3,930.29
1999:01:13	1,231.93	5,002.39	10,121.44	13,842.17	1,394.70	5,882.60	430.06	6,784.00	1,142.73	398.04	574.56	3,960.78
1999:01:20	1,272.34	5,443.62	10,233.80	13,468.46	1,464.97	6,148.80	444.10	7,331.00	1,132.59	427.08	586.48	3,745.15
1999:01:27	1,234.40	4,931.80	10,273.77	13,403.60	1,506.06	5,850.10	356.16	5,617.00	1,148.15	419.10	594.04	3,300.42
1999:02:03	1,256.62	5,143.06	10,314.91	14,028.05	1,548.27	6,105.60	380.95	7,674.00	1,151.37	382.48	614.52	3,775.41
1999:02:10	1,243.17	5,061.18	9,719.66	14,450.06	1,457.44	5,876.40	368.47	7,687.00	1,146.49	410.25	605.18	3,815.35
1999:02:17	1,272.07	5,085.66	9,419.85	14,161.31	1,366.79	5,940.30	396.45	8,676.00	1,116.87	410.56	568.84	4,060.56
1999:02:24	1,223.55	4,796.82	9,076.33	13,952.40	1,286.56	5,770.20	381.91	8,853.00	1,116.87	398.68	546.15	3,941.49

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
1999:03:03	1,224.03	4,810.09	9,254.12	14,158.67	1,335.01	6,078.40	382.10	8,974.00	1,116.87	397.98	566.29	4,076.34
1999:03:10	1,253.41	5,062.31	9,677.57	14,355.45	1,410.98	6,307.60	379.04	8,953.00	1,097.97	402.00	553.13	4,269.12
1999:03:17	1,227.70	4,697.67	9,922.40	14,170.36	1,415.81	6,048.30	374.78	9,155.00	1,128.74	395.81	513.23	4,127.38
1999:03:24	1,286.84	4,721.41	10,749.01	15,480.00	1,469.53	6,241.50	403.56	9,778.00	1,132.74	373.80	528.12	4,728.27
1999:03:31	1,297.82	5,077.43	10,940.07	16,268.11	1,470.16	6,140.60	411.96	10,635.00	1,159.10	387.88	511.85	4,855.17
1999:04:07	1,268.59	4,780.13	10,711.34	15,515.47	1,482.36	6,016.70	399.44	10,429.00	1,169.03	391.35	494.57	4,819.49
1999:04:14	1,286.37	4,884.20	10,942.20	15,836.59	1,518.31	6,295.30	419.78	10,696.00	1,158.05	394.43	502.82	4,930.37
1999:04:21	1,326.89	5,052.27	11,614.87	16,554.50	1,622.32	6,473.20	449.97	11,530.00	1,201.63	395.91	556.57	5,123.13
1999:04:28	1,328.44	5,182.16	11,834.13	16,764.68	1,702.73	6,493.60	444.50	11,306.00	1,181.52	435.56	578.11	5,297.35
1999:05:05	1,336.12	5,163.29	12,543.76	16,495.02	1,842.33	6,311.00	511.42	11,084.00	1,144.07	480.62	616.70	5,284.47
1999:05:12	1,350.91	5,348.61	13,133.39	16,942.24	1,837.16	6,598.80	506.49	11,127.00	1,091.09	481.34	661.63	5,458.16
1999:05:19	1,347.31	5,307.22	13,586.21	17,300.61	1,965.18	6,401.70	597.58	11,578.00	1,116.93	563.84	710.59	5,802.47
1999:05:26	1,364.00	5,248.02	13,012.97	16,947.36	1,889.02	6,343.10	538.05	12,148.00	1,100.00	576.50	723.98	5,877.28
1999:06:02	1,344.23	5,184.51	12,403.14	16,128.18	1,911.50	6,266.70	527.90	12,118.00	1,109.09	593.60	775.73	5,731.20
1999:06:09	1,304.76	5,160.44	12,409.16	16,230.52	1,893.73	6,236.80	518.88	11,245.00	1,236.05	605.79	753.82	5,618.35
1999:06:16	1,294.81	4,997.83	12,458.64	16,417.99	1,927.36	6,302.20	522.05	10,997.00	1,287.93	574.32	749.46	5,400.20
1999:06:23	1,318.64	5,253.89	12,874.42	16,622.50	2,006.54	6,453.00	522.77	10,890.00	1,348.61	678.97	757.50	5,398.42
1999:06:30	1,330.41	5,381.25	13,155.12	17,210.18	2,043.80	6,504.90	518.14	11,644.00	1,460.17	661.85	791.91	5,628.53
1999:07:07	1,333.06	5,399.11	13,976.04	17,586.75	2,167.47	6,496.50	544.65	11,792.00	1,606.50	700.67	794.83	5,637.35
1999:07:14	1,372.71	5,378.52	13,532.14	17,529.74	2,167.70	6,318.50	498.72	11,627.00	1,689.43	662.03	811.10	5,829.51
1999:07:21	1,395.86	5,588.50	14,257.44	17,958.90	2,144.53	6,597.40	519.63	11,745.00	1,568.65	665.77	839.52	5,931.24
1999:07:28	1,398.17	5,610.89	13,575.57	18,357.86	2,178.63	6,473.10	472.60	11,349.00	1,559.52	664.88	851.21	5,834.89
1999:08:04	1,379.29	5,414.17	13,419.66	18,257.52	2,097.34	6,329.80	483.22	11,303.00	1,609.81	641.11	836.65	5,857.63
1999:08:11	1,365.40	5,229.56	13,140.42	17,579.91	2,077.65	6,297.20	469.49	10,691.00	1,597.20	599.26	782.38	5,483.75
1999:08:18	1,305.33	5,119.37	13,591.02	17,685.38	2,144.00	6,235.40	461.94	10,172.00	1,649.13	614.40	719.52	5,142.91
1999:08:25	1,301.93	5,019.69	12,437.80	17,211.16	1,987.53	6,014.40	473.43	10,137.00	1,583.40	554.26	688.50	5,180.88
1999:09:01	1,332.84	5,230.47	12,993.10	17,892.26	2,048.88	6,201.80	472.46	9,689.00	1,581.93	561.36	760.80	5,167.72
1999:09:08	1,381.79	5,400.32	13,479.13	17,855.16	2,136.36	6,369.50	512.68	10,650.00	1,625.77	585.26	768.43	5,379.85
1999:09:15	1,331.07	5,317.12	13,544.19	17,802.48	2,122.34	6,276.20	515.05	10,902.00	1,599.55	571.78	752.91	5,019.35
1999:09:22	1,344.15	5,400.70	13,356.63	17,641.38	2,097.40	6,253.60	512.22	11,090.00	1,571.60	520.62	755.06	4,854.28
1999:09:29	1,317.97	5,387.18	13,430.60	17,291.59	2,120.58	6,067.70	525.27	11,263.00	1,662.80	548.61	717.74	4,970.24
1999:10:06	1,310.51	5,238.76	13,187.62	17,325.76	2,067.66	5,913.90	509.81	11,531.00	1,617.06	545.45	721.17	4,991.76
1999:10:13	1,268.37	5,135.62	12,834.89	17,282.28	2,017.57	6,020.60	530.50	11,434.00	1,584.95	526.47	683.51	5,079.75
1999:10:20	1,325.40	5,353.32	13,017.98	17,896.42	2,100.71	6,097.50	535.97	11,345.00	1,534.52	588.75	714.19	5,116.25
1999:10:27	1,285.55	5,295.43	12,475.87	17,754.49	2,095.60	6,113.40	510.49	11,298.00	1,507.42	571.95	737.28	5,076.14
1999:11:03	1,289.43	5,291.23	12,498.56	17,534.71	2,025.48	6,006.70	523.83	11,275.00	1,485.83	584.42	736.36	5,122.39
1999:11:10	1,296.71	5,363.86	12,709.07	17,382.36	1,988.98	6,045.70	537.58	11,531.00	1,536.82	576.52	738.27	5,142.22
1999:11:17	1,354.93	5,560.87	13,257.33	18,348.13	2,087.99	6,280.80	565.60	12,347.00	1,475.68	603.59	730.62	5,793.85
1999:11:24	1,373.46	5,742.42	13,975.54	18,567.87	2,138.86	6,447.00	570.67	13,101.00	1,450.15	638.91	728.81	5,863.84
1999:12:01	1,410.71	5,870.17	14,704.48	18,274.82	2,228.86	6,555.70	530.27	12,813.00	1,462.79	641.47	719.73	6,103.62
1999:12:08	1,417.08	5,818.73	15,307.28	18,896.21	2,190.72	6,561.80	544.28	13,393.00	1,454.58	599.72	740.82	6,182.04
1999:12:15	1,397.72	5,933.84	15,422.52	18,495.95	2,208.63	6,646.00	543.51	13,874.00	1,447.12	597.54	732.87	6,201.14
1999:12:22	1,403.88	6,115.59	15,989.38	18,401.20	2,351.33	6,619.40	553.59	14,410.00	1,424.85	620.98	729.68	6,665.03
1999:12:29	1,413.33	6,232.75	15,825.31	18,138.36	2,329.42	6,633.80	536.71	14,322.00	1,451.06	652.38	767.98	6,772.15
2000:01:05	1,436.13	6,492.53	16,192.40	18,461.93	2,383.66	6,728.60	549.17	15,916.00	1,387.51	661.05	787.91	6,835.28
2000:01:12	1,463.46	6,859.58	16,660.82	18,810.58	2,472.69	6,835.90	544.95	16,773.00	1,356.93	674.88	804.74	7,121.79
2000:01:19	1,402.11	6,502.07	15,846.72	18,542.55	2,391.03	6,535.90	532.68	16,245.00	1,409.68	678.09	815.80	6,764.31
2000:01:26	1,432.25	6,912.81	15,714.20	18,677.42	2,427.56	6,532.80	518.70	16,617.00	1,438.02	690.16	869.62	7,174.10
2000:02:02	1,455.90	7,091.04	15,275.34	18,897.75	2,254.87	6,445.40	581.52	17,470.00	1,440.72	655.99	933.38	7,171.20
2000:02:09	1,404.09	6,969.37	15,427.72	19,111.19	2,259.50	6,375.60	581.90	17,105.00	1,481.12	643.39	940.95	6,918.94
2000:02:16	1,409.12	7,171.95	15,789.82	19,578.91	2,271.40	6,302.80	576.68	16,868.00	1,481.12	603.58	942.85	6,769.81
2000:02:23	1,411.71	7,629.11	16,819.46	20,007.77	2,227.32	6,315.40	619.34	18,361.00	1,673.94	632.45	991.85	7,469.16
2000:03:01	1,387.67	7,490.32	17,043.39	19,599.18	2,212.32	6,147.40	629.52	18,112.00	1,693.11	621.90	998.77	7,600.72
2000:03:08	1,360.69	7,698.97	16,376.79	19,519.55	2,137.70	6,144.10	626.69	17,833.00	1,594.93	584.43	1,009.21	7,462.12
2000:03:15	1,379.19	7,727.93	16,843.59	20,081.67	2,114.05	6,364.90	627.41	17,953.00	1,704.85	565.48	969.96	7,614.83
2000:03:22	1,366.70	7,987.00	17,951.43	19,766.80	2,072.58	6,411.20	617.20	18,283.00	1,726.03	570.05	930.72	8,295.20
2000:03:29	1,392.14	7,414.46	16,747.20	19,078.60	2,022.11	6,447.00	606.13	17,382.00	1,681.47	586.87	920.49	7,987.85
2000:04:05	1,500.64	7,798.62	17,547.04	19,733.59	2,133.64	6,609.60	597.66	18,314.00	1,720.45	586.86	949.11	7,782.61
2000:04:12	1,508.52	7,864.76	18,096.37	20,706.65	2,181.46	6,598.80	583.42	18,053.00	1,788.81	591.68	985.13	7,885.23
2000:04:19	1,487.37	7,330.77	16,318.44	20,462.77	2,055.30	6,379.30	548.27	16,714.00	1,771.20	564.18	955.06	7,272.84
2000:04:26	1,467.17	7,443.07	16,577.09	20,833.21	2,135.39	6,350.80	553.37	16,323.00	1,807.33	564.74	940.60	7,016.69
2000:05:03	1,427.47	7,216.71	15,427.20	19,086.62	2,058.91	6,184.90	508.88	14,926.00	1,828.71	526.30	896.30	6,446.67
2000:05:10	1,460.99	7,388.55	15,227.39	18,134.31	2,108.80	6,256.50	514.01	15,446.00	1,832.78	524.08	899.00	6,751.07
2000:05:17	1,415.10	7,376.93	15,577.47	18,199.96	2,145.23	6,184.80	491.87	15,109.00	1,836.64	535.31	904.55	6,415.51
2000:05:24	1,383.05	7,120.86	14,492.92	17,701.47	2,057.22	6,100.60	457.86	14,434.00	1,752.69	548.24	932.47	6,083.98
2000:05:31	1,447.80	7,211.51	14,827.81	17,404.03	2,011.83	6,196.20	461.48	14,871.00	1,725.40	514.85	922.30	6,189.09
2000:06:07	1,399.05	6,834.88	13,933.98	16,044.44	1,871.94	6,118.60	445.60	14,166.00	1,855.49	493.20	903.80	5,800.03
2000:06:14	1,420.60	7,109.67	14,713.86	16,332.45	1,795.13	6,359.30	464.30	14,957.00	1,894.55	454.33	911.51	5,961.14
2000:06:21	1,471.36	7,285.93	15,900.06	17,144.96	2,034.87	6,503.80	491.04	16,272.00	1,935.03	459.46	855.24	6,238.41
2000:06:28	1,470.54	7,350.94	15,857.07	16,654.42	2,036.18	6,536.30	502.20	16,366.00	1,932.29	475.93	862.12	6,667.20
2000:07:05	1,479.13	7,100.09	16,238.14	17,210.08	2,029.34	6,477.80	484.77	17,254.00	1,913.13	494.49	835.19	6,687.00
2000:07:12	1,454.82	7,054.30	16,438.42	17,370.17	2,061.16	6,313.50	486.61	16,842.00	1,947.78	510.12	841.54	6,676.64
2000:07:19	1,446.23	6,961.73	16,474.27	17,435.95	2,080.33	6,382.50	522.58	17,135.00	1,909.19	512.47	818.69	7,372.59
2000:07:26	1,492.92	7,065.97	17,552.26	17,342.13	2,113.37	6,518.50	544.79	17,053.00	1,973.37	510.99	859.34	7,416.34
2000:08:02	1,481.96	7,366.57	17,710.07	16,983.57	2,137.21	6,465.40	524.44	16,928.00	1,998.43	513.78	840.85	6,863.27
2000:08:09	1,452.42	7,268.00	17,620.23	16,502.61	2,079.17	6,387.10	514.64	17,121.00	2,012.32	496.69	814.96	6,748.48
2000:08:16	1,438.70	7,112.45	17,277.39	16,206.19	2,065.92	6,391.00	488.85	16,314.00	2,030.68	490.44	802.53	6,543.93
2000:08:23	1,472.87	7,226.71	17,181.99	16,034.60	2,084.33	6,414.00	496.46	16,534.00	2,061.18	483.35	819.11	6,519.00
2000:08:30	1,479.85	7,315.27	17,734.15	16,356.03	2,185.87	6,532.00	473.31	17,331.00	2,083.47	496.40	810.47	6,477.98
2000:09:06	1,505.97	7,232.78	17,427.40	16,436.65	2,190.45	6,566.20	467.64	17,450.00	2,057.92	503.40	809.05	6,367.00
2000:09:13	1,502.59	7,192.69	17,095.88	16,901.67	2,165.34	6,615.10	475.96	17,414.00	2,076.14	469.06	795.84	6,572.91
2000:09:20	1,492.25	7,329.90	17,605.23	16,399.87	2,163.39	6,694.70	496.26	17,590.00	1,925.91	475.55	749.55	6,789.73
2000:09:27	1,484.91	7,006.26	16,395.43	16,190.52	2,082.09	6,478.20	484.54	16,999.00	1,988.94	442.09	745.07	6,833.04
2000:10:04	1,451.34	6,765.23	15,665.62	16,458.31	2,006.59	6,279.90	475.55	16,078.00	1,922.29	419.35	750.04	6,752.47
2000:10:11	1,426.57	6,814.06	15,444.13	15,639.95	1,970.29	6,269.30	473.09	15,848.00	1,914.09	410.31	728.46	6,368.54

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2000:10:18	1,434.32	6,823.43	15,878.89	16,149.08	1,976.69	6,334.90	476.77	15,876.00	1,915.35	418.83	707.90	6,345.53
2000:10:25	1,364.59	6,554.14	15,127.00	15,513.57	1,846.56	6,117.60	442.49	15,526.00	1,933.73	412.33	714.25	5,946.93
2000:11:01	1,342.13	6,470.06	14,458.52	14,872.48	1,828.56	6,148.20	414.29	14,421.00	1,922.84	416.95	772.03	5,769.02
2000:11:08	1,364.90	6,748.22	15,061.14	14,840.47	1,922.28	6,367.80	396.55	13,665.00	1,977.25	414.16	796.22	6,003.68
2000:11:15	1,421.22	7,059.07	15,349.01	14,872.39	2,040.01	6,457.60	430.90	14,791.00	1,977.36	409.36	758.12	6,409.04
2000:11:22	1,409.28	7,010.20	15,654.13	15,399.64	2,016.52	6,477.40	424.79	14,656.00	2,012.91	426.08	758.23	6,376.75
2000:11:29	1,389.81	6,961.09	15,127.40	14,799.14	1,957.68	6,432.30	436.89	14,490.00	2,081.91	418.72	737.68	6,153.33
2000:12:06	1,322.36	6,510.54	14,772.51	14,301.31	1,911.07	6,221.40	413.84	14,577.00	2,113.30	431.70	720.67	5,923.92
2000:12:13	1,341.93	6,598.32	14,169.06	14,507.64	1,960.71	6,164.90	410.63	13,788.00	2,064.79	425.30	732.25	5,907.24
2000:12:20	1,351.46	6,622.25	15,098.95	14,889.37	1,974.83	6,273.30	410.43	13,945.00	2,075.63	433.72	741.00	5,787.35
2000:12:27	1,359.99	6,620.21	15,621.73	15,168.68	2,013.66	6,403.00	416.15	15,291.00	2,056.12	420.44	719.25	5,699.76
2001:01:03	1,264.74	6,248.76	14,930.72	13,914.43	1,929.32	6,176.70	404.68	14,622.00	2,071.27	414.87	705.51	5,231.85
2001:01:10	1,328.92	6,328.16	14,748.36	13,981.49	1,900.53	6,218.20	419.97	15,186.00	2,058.24	410.20	666.63	5,568.27
2001:01:17	1,347.56	6,434.96	14,589.58	13,691.49	1,861.52	6,039.90	448.89	16,599.00	2,123.90	405.83	657.52	5,857.45
2001:01:24	1,313.27	6,320.07	15,435.79	13,432.65	1,969.91	6,060.60	494.45	16,919.00	2,125.61	417.52	679.79	5,814.98
2001:01:31	1,329.47	6,653.38	15,261.48	13,667.63	1,907.18	6,197.40	510.58	17,191.00	2,034.58	414.67	679.65	6,078.25
2001:02:07	1,364.30	6,706.67	16,099.82	13,893.58	1,905.89	6,264.40	532.88	17,772.00	2,034.58	416.97	715.06	6,311.85
2001:02:14	1,366.01	6,795.14	16,102.35	13,843.55	1,991.29	6,297.50	532.80	17,673.00	2,008.03	425.61	727.73	6,496.89
2001:02:21	1,340.89	6,578.96	16,049.47	13,366.01	1,942.65	6,225.60	503.92	16,812.00	1,979.94	444.33	729.10	6,350.35
2001:02:28	1,315.92	6,479.87	15,860.42	13,284.06	1,966.10	6,176.20	494.92	17,120.00	1,963.20	423.21	714.54	6,360.09
2001:03:07	1,255.27	6,347.99	15,351.51	13,100.08	1,961.22	5,972.40	450.14	15,594.00	1,909.33	439.90	711.52	6,007.67
2001:03:14	1,239.94	6,208.24	14,787.87	12,883.54	1,947.40	5,917.90	435.85	15,891.00	1,959.18	428.30	709.39	6,032.10
2001:03:21	1,261.89	6,305.64	14,177.36	12,723.89	1,910.74	6,001.80	479.02	16,395.00	1,991.18	430.55	701.65	6,331.32
2001:03:28	1,166.71	5,794.12	13,330.84	11,843.59	1,792.18	5,625.90	449.60	15,245.00	2,018.62	389.19	682.33	5,813.84
2001:04:04	1,122.14	5,622.09	13,154.44	13,103.94	1,728.00	5,540.70	428.08	14,853.00	2,066.39	369.08	673.24	5,636.48
2001:04:11	1,153.29	5,817.52	12,851.41	13,765.51	1,654.32	5,614.00	453.97	14,632.00	2,106.87	375.18	660.82	5,700.37
2001:04:18	1,103.25	5,597.66	12,063.71	13,242.78	1,621.99	5,535.70	431.03	13,855.00	2,090.72	367.41	594.26	5,573.72
2001:04:25	1,165.89	5,951.16	12,706.43	13,174.93	1,616.20	5,788.10	456.16	14,819.00	2,131.40	367.16	567.88	6,002.90
2001:05:02	1,238.16	6,164.88	12,972.80	13,641.79	1,605.98	5,890.20	467.15	14,955.00	2,172.56	356.23	570.02	6,143.86
2001:05:09	1,228.75	6,115.19	13,249.55	13,827.50	1,670.83	5,827.50	420.78	14,163.00	2,119.18	353.18	573.00	5,933.71
2001:05:16	1,267.43	6,213.84	13,814.24	14,421.64	1,737.66	5,904.20	433.40	14,897.00	2,137.99	362.72	611.42	6,109.20
2001:05:23	1,255.54	6,063.94	13,585.14	14,084.85	1,682.34	5,893.70	431.28	14,779.00	2,132.89	372.11	572.91	6,106.42
2001:05:30	1,284.99	6,148.44	13,335.95	13,694.27	1,656.73	5,884.00	429.72	14,714.00	2,199.50	376.23	565.15	6,033.97
2001:06:06	1,289.05	6,215.25	13,839.10	14,067.70	1,686.96	5,897.40	440.68	14,692.00	2,197.59	380.68	560.79	6,782.51
2001:06:13	1,248.08	6,041.22	13,420.13	13,493.35	1,662.74	5,796.90	427.92	14,489.00	2,211.20	408.93	570.68	6,586.93
2001:06:20	1,270.03	6,192.44	13,576.01	13,174.84	1,679.13	5,901.50	439.19	15,329.00	2,238.50	397.60	564.08	6,790.98
2001:06:27	1,241.60	6,111.94	13,523.31	12,823.45	1,696.00	5,820.20	445.75	15,403.00	2,242.42	417.08	598.72	6,802.37
2001:07:04	1,223.14	5,876.04	12,918.71	12,674.64	1,684.80	5,699.60	419.55	14,571.00	2,163.12	432.32	586.11	6,455.15
2001:07:11	1,211.07	5,833.10	13,004.21	12,828.98	1,703.38	5,607.90	417.16	14,308.00	2,229.83	436.12	590.65	6,587.68
2001:07:18	1,219.24	6,015.72	13,207.53	12,629.02	1,693.71	5,600.50	385.96	14,056.00	2,202.06	429.01	598.14	6,868.89
2001:07:25	1,180.18	5,801.80	12,527.90	12,005.11	1,661.39	5,391.90	339.36	13,812.00	2,168.74	437.43	618.01	6,564.14
2001:08:01	1,207.71	5,728.37	12,427.19	11,892.58	1,627.82	5,404.60	325.25	13,791.00	2,146.54	453.30	647.72	6,388.26
2001:08:08	1,190.49	5,582.76	12,039.82	11,891.61	1,632.51	5,275.70	330.26	13,956.00	2,112.26	470.23	643.77	6,411.53
2001:08:15	1,215.93	5,835.23	12,478.74	11,959.33	1,684.83	5,546.90	307.08	13,743.00	1,986.93	443.19	662.96	6,573.10
2001:08:22	1,183.53	5,614.51	11,958.01	12,163.67	1,641.91	5,476.50	319.14	13,919.00	1,895.17	443.19	656.82	6,651.44
2001:08:29	1,178.02	5,455.44	12,141.63	11,755.40	1,644.69	5,461.60	326.85	13,659.00	1,947.36	443.19	656.26	6,542.15
2001:09:05	1,165.31	5,220.21	11,188.57	11,396.43	1,632.40	5,408.70	328.37	12,952.00	1,903.45	443.19	657.11	6,333.14
2001:09:12	1,148.56	5,305.00	11,242.41	10,979.76	1,634.83	5,417.60	325.35	13,077.00	1,847.54	441.16	689.05	6,324.91
2001:09:19	1,131.74	5,048.08	10,943.14	10,598.79	1,622.52	5,316.00	313.33	12,591.00	1,868.27	442.23	688.90	6,088.45
2001:09:26	1,038.77	4,369.57	9,493.62	9,610.10	1,450.45	4,882.10	265.09	11,113.00	1,852.60	429.85	664.52	5,531.02
2001:10:03	1,016.10	4,041.80	9,558.15	9,939.60	1,342.16	4,721.70	252.47	10,745.00	1,822.69	422.45	633.52	5,256.00
2001:10:10	1,007.04	4,095.32	9,371.75	9,641.70	1,277.71	4,696.10	244.65	10,006.00	1,767.81	401.02	602.51	5,324.84
2001:10:17	1,072.28	4,436.66	9,897.14	9,924.23	1,335.26	4,881.80	214.55	10,233.00	1,726.53	371.49	616.72	5,407.54
2001:10:24	1,080.99	4,613.19	10,298.24	9,964.88	1,365.56	5,153.10	224.06	10,462.00	1,686.61	368.30	603.90	5,684.90
2001:10:31	1,077.09	4,644.82	10,260.81	10,755.45	1,442.07	5,203.40	251.61	11,271.00	1,643.07	381.37	621.58	5,541.88
2001:11:07	1,085.20	4,811.82	10,243.46	10,802.15	1,417.20	5,167.60	246.61	11,468.00	1,718.06	385.96	616.40	5,708.28
2001:11:14	1,059.78	4,559.13	10,073.97	10,366.34	1,367.84	5,039.70	224.75	11,365.00	1,689.17	383.73	600.07	5,537.04
2001:11:21	1,115.80	4,860.66	10,269.79	10,284.98	1,328.50	5,216.30	236.92	12,616.00	1,594.05	377.05	592.26	5,638.04
2001:11:28	1,141.21	4,953.53	10,950.04	10,086.76	1,432.17	5,240.70	221.48	12,826.00	1,617.10	372.79	632.50	5,751.72
2001:12:05	1,137.03	5,087.03	11,173.92	10,661.08	1,465.20	5,313.80	205.28	12,794.00	1,705.66	382.09	632.91	5,674.41
2001:12:12	1,128.52	4,915.95	11,066.19	10,624.81	1,476.53	5,205.20	211.98	13,019.00	1,735.00	382.90	641.06	5,848.21
2001:12:19	1,170.35	5,262.75	11,678.44	10,713.81	1,593.19	5,333.50	229.18	13,382.00	1,745.23	377.94	653.01	6,099.28
2001:12:26	1,137.07	5,062.56	11,847.06	10,801.52	1,594.59	5,120.00	241.37	13,563.00	1,715.17	372.85	669.22	6,075.06
2002:01:02	1,149.56	4,984.69	11,565.23	10,471.93	1,595.44	5,120.60	272.76	13,290.00	1,672.70	375.07	662.45	6,250.74
2002:01:09	1,149.37	5,117.13	11,359.50	10,192.57	1,586.97	5,213.20	295.39	13,358.00	1,633.64	377.97	679.30	6,371.84
2002:01:16	1,154.67	5,167.88	11,350.85	10,871.49	1,625.69	5,218.30	323.69	13,872.00	1,611.39	383.46	682.83	6,410.05
2002:01:23	1,155.14	5,288.21	11,440.72	10,663.98	1,686.20	5,228.50	323.69	14,021.00	1,561.35	391.50	700.47	6,560.58
2002:01:30	1,127.57	4,984.20	10,964.09	10,177.58	1,674.54	5,127.60	371.20	13,084.00	1,479.62	423.58	700.62	6,579.35
2002:02:06	1,128.18	5,163.03	10,762.14	10,040.91	1,666.36	5,180.60	438.89	13,232.00	1,444.96	433.98	688.56	6,782.78
2002:02:13	1,113.57	5,052.20	10,756.96	9,919.48	1,755.61	5,089.30	454.26	12,532.00	1,396.60	444.42	710.00	6,750.80
2002:02:20	1,083.51	4,804.41	10,592.39	9,420.85	1,748.61	5,073.80	471.34	12,751.00	1,485.80	446.21	715.22	6,786.74
2002:02:27	1,118.51	4,935.35	10,961.88	9,968.35	1,774.63	5,153.90	385.24	12,961.00	1,485.80	436.79	714.81	6,715.55
2002:03:06	1,097.98	4,780.24	10,749.06	9,834.13	1,729.35	5,024.10	388.89	13,303.00	1,530.28	458.46	722.79	6,583.99
2002:03:13	1,109.89	4,960.22	10,648.71	10,573.09	1,702.37	5,178.40	379.98	14,212.00	1,538.32	454.50	703.92	6,795.90
2002:03:20	1,162.77	5,285.26	11,003.00	11,358.53	1,799.59	5,245.50	382.92	13,839.00	1,569.21	476.96	737.05	7,154.14
2002:03:27	1,154.09	5,245.99	11,217.50	11,415.31	1,785.67	5,272.00	403.05	14,244.00	1,623.43	474.00	754.51	7,218.51
2002:04:03	1,151.85	5,364.70	11,036.60	11,526.78	1,801.88	5,266.90	412.04	14,090.00	1,682.51	477.29	754.95	7,384.13
2002:04:10	1,144.58	5,348.00	10,987.88	11,323.68	1,795.16	5,214.70	436.13	13,425.00	1,654.23	481.29	756.51	7,361.86
2002:04:17	1,125.40	5,281.84	10,833.96	11,400.71	1,782.99	5,247.80	431.40	13,085.00	1,594.51	488.16	755.47	7,191.94
2002:04:24	1,130.47	5,265.36	10,643.14	11,218.58	1,715.35	5,229.10	391.05	13,416.00	1,677.66	533.81	774.58	7,517.68
2002:05:01	1,126.07	5,318.55	11,090.58	11,543.71	1,771.34	5,263.90	368.74	13,732.00	1,644.40	542.27	792.14	7,574.35
2002:05:08	1,093.14	5,160.14	11,396.57	11,672.88	1,734.72	5,218.20	389.37	13,381.00	1,611.05	544.26	799.51	7,504.73
2002:05:15	1,086.46	4,964.56	11,780.11	11,552.79	1,740.35	5,125.50	409.11	12,538.00	1,611.05	534.72	795.35	7,486.86
2002:05:22	1,088.85	5,028.59	11,768.31	11,520.75	1,735.43	5,209.10	398.87	12,617.00	1,652.37	547.74	794.47	7,517.84
2002:05:29	1,091.07	5,072.39	11,838.36	11,642.97	1,747.32	5,259.10	370.20	12,350.00	1,598.35	538.89	786.75	7,402.80

APPENDIX - C6
DATA FOR CHAPTER 5

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2002:06:05	1,086.02	4,919.50	11,795.20	11,961.98	1,737.50	5,151.90	351.62	12,368.00	1,564.49	511.63	772.94	7,385.15
2002:06:12	1,067.66	4,881.80	11,430.66	11,853.00	1,684.42	5,083.00	339.34	12,985.00	1,524.81	520.69	763.14	7,130.71
2002:06:19	1,049.90	4,624.31	11,402.38	11,663.87	1,654.00	4,989.10	292.38	12,590.00	1,462.00	520.47	746.93	6,974.92
2002:06:26	1,020.26	4,510.19	11,147.97	11,327.06	1,645.99	4,851.70	275.72	12,133.00	1,524.84	523.97	750.57	6,801.65
2002:07:03	1,019.99	4,354.82	10,673.11	10,476.18	1,564.55	4,652.40	300.50	11,493.00	1,507.67	534.52	743.90	6,691.04
2002:07:10	973.53	4,099.05	10,355.92	10,074.56	1,532.15	4,531.00	334.63	10,691.00	1,712.91	503.50	705.04	6,171.63
2002:07:17	953.99	4,138.15	10,579.19	10,812.30	1,583.14	4,392.60	371.48	10,636.00	1,730.92	478.53	739.35	6,326.49
2002:07:24	920.47	4,190.22	10,787.54	10,752.66	1,631.94	4,420.10	385.01	10,556.00	1,701.82	477.38	743.17	6,371.27
2002:07:31	906.04	4,092.82	10,335.12	10,296.02	1,583.30	4,190.60	375.31	10,755.00	1,701.72	479.38	731.17	6,403.28
2002:08:07	843.43	3,632.66	9,971.99	9,947.72	1,522.80	3,777.10	364.22	9,937.00	1,672.40	460.03	715.10	6,010.42
2002:08:14	911.62	3,700.14	10,267.36	9,877.94	1,508.36	4,246.20	359.32	9,763.00	1,651.59	463.67	721.59	6,021.84
2002:08:21	876.77	3,465.54	9,977.74	9,834.40	1,494.69	4,094.40	356.58	9,870.00	1,668.06	447.06	721.65	5,855.90
2002:08:28	919.62	3,589.92	9,961.35	9,638.41	1,527.03	4,171.10	368.85	9,343.00	1,646.72	447.68	729.99	6,053.60
2002:09:04	949.36	3,868.17	10,402.26	9,642.61	1,533.47	4,364.80	384.88	9,438.00	1,673.55	457.22	730.79	6,267.88
2002:09:11	917.87	3,682.84	10,130.25	9,766.73	1,504.90	4,274.00	376.93	10,380.00	1,676.77	442.97	724.72	6,115.56
2002:09:18	893.40	3,425.90	9,820.33	9,075.09	1,457.48	4,026.90	373.72	9,997.00	1,663.97	420.44	707.85	6,114.35
2002:09:25	909.45	3,584.69	9,882.35	9,400.08	1,448.48	4,210.70	386.14	10,182.00	1,620.35	430.12	689.70	6,260.61
2002:10:02	869.46	3,124.92	9,474.07	9,472.06	1,431.25	3,865.40	378.02	9,505.00	1,594.58	419.12	677.21	5,960.38
2002:10:09	839.66	2,962.50	9,124.91	9,165.41	1,342.62	3,696.20	380.12	9,228.00	1,597.84	408.65	636.75	5,808.44
2002:10:16	827.91	2,926.74	9,109.35	9,049.33	1,355.43	3,905.20	392.06	8,820.00	1,562.99	409.50	646.47	5,827.71
2002:10:23	776.76	2,597.88	8,977.35	8,539.34	1,376.58	3,742.40	396.60	8,715.00	1,535.37	391.84	641.53	5,762.40
2002:10:30	860.02	3,008.93	9,459.14	8,884.87	1,439.05	4,057.70	438.02	8,371.00	1,537.39	357.38	634.46	5,924.94
2002:11:06	896.14	3,015.42	9,804.65	8,714.52	1,463.33	4,006.90	433.79	9,840.00	1,548.96	354.85	652.77	6,000.62
2002:11:13	890.71	3,113.59	9,560.46	8,756.59	1,458.96	4,002.70	430.83	10,069.00	1,509.71	361.12	657.74	5,963.83
2002:11:20	923.76	3,298.84	9,773.98	8,953.29	1,447.74	4,103.70	443.02	9,703.00	1,552.56	369.40	658.65	6,064.00
2002:11:27	882.53	3,066.42	9,616.62	8,438.52	1,394.75	4,029.40	456.92	9,764.00	1,490.46	367.10	646.94	5,813.36
2002:12:04	914.15	3,212.99	9,971.15	8,459.62	1,383.31	4,094.90	460.07	10,088.00	1,425.84	371.59	637.17	5,859.05
2002:12:11	938.87	3,346.14	9,944.59	8,875.88	1,394.94	4,144.20	509.64	10,226.00	1,378.75	383.04	632.42	6,129.25
2002:12:18	917.58	3,320.75	9,995.73	9,006.73	1,366.00	4,048.60	515.07	10,640.00	1,414.45	397.08	618.37	6,187.67
2002:12:25	904.96	3,196.05	9,784.57	8,727.66	1,374.38	3,974.90	490.02	10,614.00	1,379.19	391.74	635.17	6,135.39
2003:01:01	891.12	3,022.69	9,548.65	8,344.01	1,334.66	3,835.20	487.56	10,985.00	1,411.72	406.39	635.81	6,089.66
2003:01:08	889.66	2,840.00	9,445.26	8,501.14	1,331.45	3,829.40	519.07	11,318.00	1,421.52	424.95	648.07	6,182.91
2003:01:15	909.03	3,105.04	9,365.52	8,713.33	1,335.98	4,009.50	520.55	11,603.00	1,320.63	409.12	632.43	6,225.40
2003:01:22	909.93	2,993.00	9,688.21	8,517.80	1,332.32	3,924.80	569.90	11,786.00	1,372.07	389.41	625.13	6,266.48
2003:01:29	918.22	3,049.40	9,873.49	8,611.75	1,386.62	3,887.80	586.95	11,971.00	1,459.92	405.60	668.21	6,398.90
2003:02:05	878.36	2,803.25	9,560.29	8,611.04	1,369.13	3,678.00	568.71	11,142.00	1,460.53	405.70	672.41	6,024.09
2003:02:12	864.36	2,706.57	9,240.79	8,331.08	1,302.85	3,483.80	557.43	10,863.00	1,499.81	391.53	665.44	5,937.97
2003:02:19	843.59	2,725.88	9,180.47	8,549.85	1,291.89	3,678.70	562.23	10,592.00	1,480.17	392.31	668.18	5,894.27
2003:02:26	818.68	2,571.25	9,314.90	8,664.17	1,268.33	3,616.10	582.04	10,510.00	1,510.67	395.47	656.54	5,763.87
2003:03:05	845.13	2,624.65	9,427.63	8,678.44	1,315.53	3,658.30	580.47	10,252.00	1,510.80	401.95	660.96	5,857.35
2003:03:12	827.55	2,450.20	9,116.28	8,356.81	1,287.14	3,593.30	585.82	9,995.00	1,513.18	397.54	650.71	5,869.79
2003:03:19	829.85	2,498.02	9,109.18	8,472.62	1,265.50	3,563.50	595.17	10,306.00	1,517.18	391.18	643.07	5,914.41
2003:03:26	804.19	2,202.96	8,874.99	7,943.04	1,233.68	3,287.00	554.78	10,577.00	1,475.01	387.25	629.10	5,809.97
2003:04:02	874.02	2,615.22	9,158.59	8,051.04	1,285.01	3,765.40	564.58	11,006.00	1,469.96	385.48	627.94	6,017.43
2003:04:09	869.95	2,579.33	9,047.09	8,351.92	1,325.00	3,793.10	568.43	11,206.00	1,456.27	401.04	632.99	5,952.38
2003:04:16	880.90	2,589.35	8,706.19	8,069.85	1,299.77	3,753.40	561.55	11,872.00	1,521.32	398.05	628.97	6,008.51
2003:04:23	865.99	2,734.10	8,636.85	8,057.61	1,292.85	3,861.40	564.60	11,759.00	1,543.67	430.28	634.41	6,212.14
2003:04:30	879.91	2,824.68	8,675.14	7,879.49	1,292.35	3,854.90	600.62	12,043.00	1,606.24	442.72	633.77	6,306.60
2003:05:07	919.02	2,974.40	8,519.60	7,793.38	1,266.08	3,966.50	670.03	12,394.00	1,541.96	447.69	629.62	6,385.11
2003:05:14	916.92	2,942.04	8,717.22	7,831.42	1,281.33	3,926.00	635.95	12,557.00	1,521.44	450.86	630.37	6,509.88
2003:05:21	929.62	3,005.64	8,901.05	8,109.77	1,307.52	3,992.90	639.89	12,956.00	1,531.87	473.13	632.28	6,575.29
2003:05:28	939.28	2,926.03	9,103.69	8,244.91	1,311.00	3,975.00	630.59	13,459.00	1,522.92	467.94	636.26	6,549.79
2003:06:04	923.42	2,827.25	9,059.80	8,018.51	1,290.73	3,936.40	634.08	13,034.00	1,533.48	466.29	640.37	6,410.82
2003:06:11	953.22	2,919.54	9,510.62	8,234.18	1,338.60	4,071.90	678.03	13,294.00	1,551.81	492.82	664.00	6,667.35
2003:06:18	986.24	3,080.02	9,639.01	8,557.86	1,401.20	4,126.60	701.77	13,718.00	1,574.11	504.53	672.84	6,889.76
2003:06:25	997.48	3,178.15	9,662.06	8,890.30	1,448.79	4,150.10	736.89	13,877.00	1,565.84	515.71	688.61	6,979.68
2003:07:02	1,010.09	3,304.15	9,970.30	9,092.97	1,486.70	4,207.00	770.70	13,511.00	1,553.88	503.23	683.76	7,125.41
2003:07:09	975.32	3,198.82	9,628.99	8,932.26	1,462.57	4,067.90	792.60	13,026.00	1,502.08	500.28	682.32	7,078.36
2003:07:16	993.75	3,241.04	9,602.62	9,592.24	1,477.17	4,006.90	749.02	13,310.00	1,499.68	506.07	703.26	7,164.02
2003:07:23	1,002.21	3,322.43	10,027.41	9,990.95	1,523.15	4,054.70	706.02	13,501.00	1,503.31	519.81	725.67	7,171.89
2003:07:30	994.09	3,387.64	10,207.17	9,735.97	1,595.92	4,077.10	698.26	13,487.00	1,529.49	524.26	724.35	7,023.94
2003:08:06	988.61	3,304.48	9,900.56	9,615.34	1,556.82	4,086.50	747.45	13,799.00	1,502.15	512.62	712.87	7,280.65
2003:08:13	987.49	3,429.03	10,121.22	9,632.66	1,578.19	4,141.20	763.38	13,475.00	1,479.65	508.22	720.71	7,260.20
2003:08:20	967.08	3,375.66	9,987.54	9,323.91	1,510.18	4,070.40	737.74	12,888.00	1,486.25	494.44	718.91	7,230.07
2003:08:27	984.03	3,398.89	10,301.47	9,752.75	1,591.48	4,180.70	718.75	13,682.00	1,465.83	511.23	724.23	7,368.92
2003:09:03	1,000.30	3,501.23	10,475.33	10,292.06	1,611.97	4,217.40	674.63	14,467.00	1,441.66	518.78	732.24	7,460.15
2003:09:10	996.79	3,483.08	10,678.55	10,308.99	1,594.52	4,206.40	713.04	15,143.00	1,425.36	530.86	744.62	7,502.08
2003:09:17	1,026.27	3,647.51	11,102.36	10,715.69	1,605.00	4,262.10	733.75	15,634.00	1,447.85	558.25	745.17	7,719.12
2003:09:24	1,010.92	3,536.87	10,810.31	10,856.32	1,566.71	4,252.10	762.61	15,983.00	1,423.18	572.85	736.23	7,734.72
2003:10:01	1,025.97	3,561.03	11,140.05	10,990.11	1,602.75	4,293.00	799.96	16,492.00	1,389.82	585.91	747.00	7,746.54
2003:10:08	1,009.38	3,307.34	11,295.89	10,502.29	1,634.03	4,236.40	811.65	16,058.00	1,394.23	605.62	744.99	7,788.08
2003:10:15	1,018.22	3,329.83	11,546.12	10,361.24	1,630.72	4,169.20	827.91	16,579.00	1,394.23	606.04	737.64	7,937.18
2003:10:22	1,033.78	3,395.33	11,720.80	10,542.20	1,733.91	4,268.60	845.60	17,805.00	1,371.69	624.33	759.62	7,812.07
2003:10:29	1,046.76	3,570.58	12,056.18	10,899.95	1,748.96	4,368.80	869.60	17,942.00	1,383.10	650.44	783.21	7,843.70
2003:11:05	1,030.36	3,490.60	12,238.63	10,889.62	1,771.26	4,285.60	891.87	18,235.00	1,398.01	646.16	805.11	7,914.14
2003:11:12	1,048.11	3,615.42	12,130.51	10,739.22	1,722.29	4,265.70	942.99	17,945.00	1,361.49	624.56	809.97	7,925.20
2003:11:19	1,051.81	3,717.70	12,438.92	10,837.54	1,777.25	4,303.40	965.91	18,307.00	1,385.11	635.82	813.49	8,232.06
2003:11:26	1,058.53	3,748.34	11,971.48	10,226.22	1,717.36	4,371.20	924.37	18,794.00	1,317.79	619.87	790.31	8,539.31
2003:12:03	1,042.44	3,652.29	11,872.99	9,614.60	1,677.35	4,327.40	921.09	18,807.00	1,338.87	601.94	765.95	8,351.29
2003:12:10	1,058.45	3,712.98	12,086.67	10,144.83	1,688.41	4,370.30	990.02	19,695.00	1,411.91	629.94	778.37	8,385.40
2003:12:17	1,064.73	3,875.66	12,361.18	10,326.39	1,737.46	4,392.00	1,013.12	20,540.00	1,445.03	643.86	795.57	8,553.74
2003:12:24	1,059.05	3,820.92	12,398.38	9,910.56	1,711.15	4,335.40	984.66	20,973.00	1,469.42	645.96	794.51	8,342.11
2003:12:31	1,076.48	3,847.57	12,193.12	10,092.64	1,723.57	4,354.20	999.19	21,199.00	1,453.99	655.70	775.13	8,416.07
2004:01:07	1,094.04	3,952.72	12,456.70	10,371.27	1,725.87	4,444.70	1,036.36	21,807.00	1,513.82	693.03	777.37	8,636.05
2004:01:14	1,111.92	4,018.50	12,575.94	10,825.17	1,764.52	4,476.90	1,071.95	22,445.00	1,497.04	704.50	793.94	8,795.28

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2004:01:21	1,126.33	4,004.40	13,157.68	10,757.82	1,835.96	4,473.00	1,162.80	23,320.00	1,587.20	709.37	805.76	9,098.22
2004:01:28	1,130.52	4,055.21	13,320.88	10,863.00	1,860.53	4,461.40	1,202.25	23,399.00	1,592.42	756.56	815.98	9,171.66
2004:02:04	1,147.62	4,138.04	13,750.58	11,002.39	1,889.56	4,511.20	1,223.77	23,302.00	1,592.42	776.30	827.87	9,427.80
2004:02:11	1,128.48	4,150.24	13,431.78	10,852.47	1,862.84	4,468.10	1,181.51	23,852.00	1,628.84	767.11	819.85	9,551.13
2004:02:18	1,126.52	4,028.37	13,086.73	10,447.25	1,834.64	4,398.50	1,134.34	21,685.00	1,685.16	730.28	804.83	9,674.18
2004:02:25	1,157.76	4,122.16	13,524.76	10,459.26	1,868.51	4,396.00	1,029.93	23,197.00	1,677.76	769.79	818.22	9,875.32
2004:03:03	1,151.82	4,095.34	13,928.38	10,676.81	1,888.51	4,442.90	1,127.73	22,000.00	1,717.10	785.91	857.15	10,125.04
2004:03:10	1,143.67	3,995.34	13,599.47	10,658.73	1,868.28	4,507.50	1,178.43	21,609.00	1,647.38	777.05	872.03	9,926.67
2004:03:17	1,151.03	4,071.70	13,454.09	11,351.92	1,880.58	4,525.10	1,203.43	22,550.00	1,661.81	776.83	877.20	10,053.18
2004:03:24	1,123.89	4,044.70	13,214.20	11,433.24	1,875.02	4,545.30	1,239.67	21,670.00	1,678.07	760.33	875.83	9,978.71
2004:03:31	1,123.75	3,896.79	12,975.72	11,436.86	1,833.57	4,456.80	1,254.50	21,901.00	1,745.10	730.59	890.14	9,959.41
2004:04:07	1,091.33	3,726.07	12,678.13	11,364.99	1,835.29	4,309.40	1,239.81	20,985.00	1,740.05	738.79	895.31	10,161.65
2004:04:14	1,126.21	3,856.70	12,681.67	11,715.39	1,858.92	4,385.70	1,201.66	22,142.00	1,741.62	735.68	901.85	10,517.50
2004:04:21	1,140.53	4,001.16	12,920.05	12,019.62	1,884.43	4,468.70	1,182.36	22,443.00	1,774.55	774.40	882.34	10,746.58
2004:04:28	1,128.17	4,012.77	12,669.86	12,098.18	1,869.67	4,485.40	1,192.15	22,312.00	1,697.16	777.99	866.29	10,609.92
2004:05:05	1,124.09	4,026.15	12,227.30	11,944.30	1,848.41	4,539.90	1,084.78	21,142.00	1,651.58	814.20	864.02	10,539.40
2004:05:12	1,122.41	4,065.74	12,165.31	12,004.29	1,847.76	4,524.50	1,133.22	20,474.00	1,606.80	817.93	861.57	10,240.91
2004:05:19	1,121.53	4,022.10	11,950.46	11,571.34	1,879.44	4,569.50	1,082.93	20,026.00	1,560.21	758.08	846.68	10,114.49
2004:05:26	1,097.28	3,776.24	11,528.18	11,153.58	1,802.17	4,412.90	940.39	18,326.00	1,603.77	744.29	818.72	9,690.67
2004:06:02	1,088.68	3,872.26	11,469.41	10,967.74	1,765.26	4,471.80	896.11	18,688.00	1,558.29	706.80	793.83	9,767.63
2004:06:09	1,114.94	3,867.52	11,983.90	11,152.09	1,776.70	4,438.30	942.27	19,069.00	1,524.44	718.01	799.25	10,062.58
2004:06:16	1,124.99	3,888.31	12,201.75	11,242.34	1,780.88	4,422.80	977.37	19,717.00	1,567.07	719.04	806.36	9,981.89
2004:06:23	1,131.33	3,997.76	12,339.94	11,449.74	1,820.12	4,489.50	904.22	19,865.00	1,468.07	709.75	818.40	10,219.03
2004:06:30	1,133.56	4,003.24	12,161.78	11,641.72	1,831.31	4,491.10	909.30	20,460.00	1,475.42	707.89	818.16	10,151.60
2004:07:07	1,144.06	3,945.10	11,849.77	11,580.56	1,794.65	4,486.70	960.85	20,836.00	1,440.73	699.76	822.09	10,137.88
2004:07:14	1,140.84	4,052.73	12,285.75	11,858.87	1,838.00	4,464.10	945.45	21,149.00	1,399.16	732.40	819.86	10,281.82
2004:07:21	1,118.33	3,930.58	12,320.26	11,384.86	1,873.75	4,358.40	969.95	21,171.00	1,438.40	771.66	855.08	10,042.02
2004:07:28	1,111.47	3,898.84	11,932.83	11,356.65	1,870.90	4,372.60	972.36	21,673.00	1,403.76	744.32	845.02	9,843.02
2004:08:04	1,093.88	3,877.48	12,395.11	11,433.86	1,873.17	4,377.30	981.91	21,810.00	1,448.04	761.24	840.88	9,987.06
2004:08:11	1,095.42	3,807.21	12,320.27	11,204.37	1,875.25	4,356.20	949.15	22,168.00	1,388.81	760.20	838.64	10,090.56
2004:08:18	1,098.63	3,823.74	12,280.26	11,010.02	1,903.85	4,408.10	983.80	22,178.00	1,404.51	758.30	824.88	10,075.80
2004:08:25	1,075.79	3,678.91	12,343.13	11,049.46	1,896.19	4,312.20	957.02	21,570.00	1,384.96	763.95	821.45	9,849.93
2004:09:01	1,095.17	3,726.50	12,228.54	10,774.26	1,890.68	4,355.20	952.78	22,779.00	1,358.22	754.25	809.56	10,080.55
2004:09:08	1,104.96	3,788.88	12,793.03	11,130.02	1,917.09	4,411.60	942.03	23,058.00	1,339.78	731.72	807.56	10,237.89
2004:09:15	1,105.91	3,817.62	13,023.87	11,127.35	1,929.48	4,502.00	962.66	22,513.00	1,321.46	775.10	828.38	10,329.75
2004:09:22	1,116.27	3,884.16	13,049.96	11,279.19	1,959.13	4,558.40	986.74	22,534.00	1,309.33	789.14	850.11	10,537.96
2004:09:29	1,120.37	3,941.75	13,084.40	11,158.58	2,003.99	4,548.40	1,026.41	22,344.00	1,355.23	815.49	853.24	10,660.91
2004:10:06	1,113.56	3,942.35	13,272.23	11,019.41	1,993.55	4,592.30	1,085.81	22,749.00	1,420.15	818.23	856.30	10,777.23
2004:10:13	1,114.80	3,920.36	13,120.03	10,786.10	1,974.35	4,588.10	1,147.12	23,208.00	1,420.01	812.89	846.72	10,980.32
2004:10:20	1,142.05	4,049.66	13,271.57	11,385.38	2,016.04	4,706.30	1,128.00	24,027.00	1,422.93	856.06	861.54	11,090.92
2004:10:27	1,113.65	3,976.03	13,171.58	11,195.99	1,971.15	4,634.80	1,165.66	23,289.00	1,386.72	863.17	853.31	10,942.36
2004:11:03	1,103.66	3,912.40	12,999.13	10,882.18	1,953.00	4,616.40	1,215.24	22,873.00	1,330.58	840.79	848.65	11,076.85
2004:11:10	1,125.40	3,929.03	12,838.71	10,691.95	1,959.05	4,630.10	1,286.08	23,171.00	1,342.80	849.18	851.17	11,517.71
2004:11:17	1,143.20	4,039.04	13,397.67	10,946.27	2,017.43	4,718.50	1,289.42	23,660.00	1,326.75	890.36	878.45	11,765.77
2004:11:24	1,162.91	4,089.13	13,672.37	10,994.96	2,022.99	4,734.50	1,297.23	23,455.00	1,354.39	918.71	882.29	11,794.02
2004:12:01	1,181.94	4,183.41	13,824.98	11,131.29	2,046.40	4,795.90	1,262.14	24,170.00	1,356.14	934.03	901.66	12,020.38
2004:12:08	1,181.76	4,125.30	13,997.02	10,872.33	2,040.19	4,719.40	1,182.17	24,368.00	1,359.12	961.32	905.22	11,907.32
2004:12:15	1,191.37	4,186.03	14,162.80	10,784.25	2,038.84	4,735.70	1,220.95	25,235.00	1,334.94	986.20	914.62	12,233.91
2004:12:22	1,182.81	4,201.35	14,022.32	10,941.37	2,020.66	4,703.90	1,219.00	24,968.00	1,326.44	979.22	902.30	12,113.58
2004:12:29	1,205.72	4,213.69	14,078.54	10,956.46	2,048.79	4,728.20	1,253.47	25,576.00	1,313.05	939.15	904.76	12,493.85
2005:01:05	1,209.57	4,241.28	14,151.08	11,209.44	2,055.77	4,777.40	1,322.37	25,723.00	1,307.57	985.18	903.30	12,712.20
2005:01:12	1,213.45	4,247.75	14,266.38	11,381.56	2,057.82	4,819.80	1,389.53	26,161.00	1,274.31	1,004.43	907.58	13,031.57
2005:01:19	1,183.74	4,258.24	13,764.36	11,437.52	2,071.04	4,806.00	1,305.56	24,692.00	1,251.94	1,015.43	907.96	12,591.33
2005:01:26	1,187.70	4,208.82	13,565.31	11,453.39	2,079.80	4,783.60	1,344.11	24,510.00	1,256.92	1,008.58	933.33	12,329.16
2005:02:02	1,184.63	4,245.55	13,678.63	11,405.34	2,097.39	4,818.30	1,336.96	24,271.00	1,218.11	1,027.81	935.53	13,035.81
2005:02:09	1,174.07	4,214.12	13,623.68	11,376.57	2,086.93	4,847.10	1,355.32	24,530.00	1,241.96	1,037.51	923.37	13,045.05
2005:02:16	1,193.19	4,296.31	13,555.80	11,407.14	2,108.69	4,916.20	1,371.02	24,605.00	1,252.50	1,052.82	918.51	13,339.41
2005:02:23	1,191.99	4,353.15	14,017.23	11,473.35	2,149.60	4,990.40	1,484.60	26,314.00	1,252.50	1,045.87	920.31	13,662.38
2005:03:02	1,210.34	4,368.77	14,015.49	11,601.68	2,155.10	5,053.20	1,508.84	26,384.00	1,278.88	1,073.44	919.43	13,640.76
2005:03:09	1,190.80	4,310.66	13,957.94	11,500.18	2,136.42	4,988.50	1,520.90	27,198.00	1,309.47	1,102.93	899.68	13,541.96
2005:03:16	1,210.08	4,393.43	13,850.78	11,813.71	2,144.36	4,992.80	1,582.39	28,200.00	1,287.45	1,082.75	891.90	13,770.26
2005:03:23	1,207.01	4,375.60	13,941.47	11,966.69	2,184.29	4,996.10	1,530.02	28,514.00	1,316.79	1,116.81	903.62	13,671.40
2005:03:30	1,188.07	4,309.11	13,832.52	11,873.18	2,169.64	4,937.60	1,388.09	27,827.00	1,255.59	1,138.23	897.51	13,096.55
2005:04:06	1,172.53	4,317.20	13,603.61	11,739.12	2,145.10	4,910.40	1,364.28	26,248.00	1,201.65	1,142.15	881.25	12,852.81
2005:04:13	1,181.41	4,347.52	13,425.75	11,565.88	2,123.16	4,900.70	1,401.12	26,470.00	1,172.57	1,065.13	877.75	12,653.42
2005:04:20	1,184.07	4,379.18	13,562.26	11,827.16	2,165.78	4,947.40	1,423.30	25,695.00	1,214.87	1,103.29	861.75	12,170.87
2005:04:27	1,173.79	4,405.69	13,799.62	11,637.52	2,174.09	4,960.80	1,344.56	26,066.00	1,248.20	1,116.67	874.23	12,424.37
2005:05:04	1,137.50	4,178.62	13,501.63	11,088.58	2,129.25	4,822.00	1,309.48	25,062.00	1,184.19	1,070.95	871.91	11,842.72
2005:05:11	1,156.38	4,189.02	13,839.64	11,005.42	2,145.34	4,789.40	1,356.30	25,242.00	1,148.76	1,032.22	872.45	12,454.69
2005:05:18	1,175.65	4,264.35	13,945.05	11,192.17	2,149.38	4,882.50	1,442.13	25,474.00	1,130.83	1,049.58	903.07	12,643.04
2005:05:25	1,171.11	4,244.16	13,939.80	11,120.70	2,173.14	4,875.40	1,400.46	24,699.00	1,124.27	1,057.08	898.70	12,464.84
2005:06:01	1,185.56	4,324.60	13,627.01	10,835.41	2,153.65	4,949.40	1,459.33	24,898.00	1,102.96	1,040.26	886.37	12,727.74
2005:06:08	1,190.01	4,389.54	13,562.06	11,014.43	2,160.47	4,971.50	1,447.06	24,478.00	1,072.14	1,049.06	870.10	13,057.84
2005:06:15	1,202.22	4,527.17	13,873.07	11,329.67	2,176.93	5,011.00	1,516.17	25,949.00	1,039.19	1,082.94	861.96	13,143.62
2005:06:22	1,194.67	4,557.29	13,898.55	11,281.03	2,198.29	5,003.70	1,489.29	24,702.00	1,115.58	1,095.51	879.44	13,102.66
2005:06:29	1,206.58	4,548.42	13,914.30	11,415.88	2,201.91	5,019.50	1,453.66	25,481.00	1,072.84	1,119.58	900.30	13,501.51
2005:07:06	1,213.88	4,619.60	14,161.02	11,547.28	2,206.34	5,099.30	1,464.80	25,678.00	1,102.03	1,134.69	903.33	13,441.65
2005:07:13	1,199.85	4,583.63	14,277.28	11,577.44	2,202.27	5,109.10	1,374.55	25,126.00	1,104.99	1,126.86	889.98	13,550.14
2005:07:20	1,194.94	4,615.49	14,149.93	11,603.53	2,234.13	5,229.60	1,356.22	24,517.00	1,033.55	1,117.81	902.69	13,790.15
2005:07:27	1,223.29	4,679.89	14,307.30	11,659.84	2,239.01	5,245.90	1,423.36	25,856.00	1,037.39	1,132.79	913.07	14,005.23
2005:08:03	1,235.20	4,784.50	14,602.70	11,789.35	2,309.26	5,215.20	1,487.81	25,705.00	1,021.05	1,140.66	924.01	14,306.06
2005:08:10	1,236.79	4,855.35	14,801.86	11,835.08	2,333.62	5,263.60	1,502.93	25,338.00	1,089.91	1,178.11	931.97	14,173.38
2005:08:17	1,245.04	4,923.12	15,118.50	11,981.80	2,365.19	5,332.30	1,508.23	26,714.00	1,107.70	1,192.20	952.59	14,615.96
2005:08:24	1,229.13	4,990.57	15,346.41	12,098.08	2,338.49	5,377.50	1,509.23	27,117.00	1,165.03	1,176.84	939.48	14,702.58
2005:08:31	1,220.24	4,871.46	15,449.58	12,273.12	2,280.23	5,292.70	1,490.84	27,416.00	1,192.83	1,100.30	926.38	14,560.33

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2005:09:07	1,209.59	4,915.95	14,873.85	12,502.26	2,278.35	5,275.20	1,535.99	26,712.00	1,167.14	1,035.44	926.08	14,603.00
2005:09:14	1,220.33	4,829.69	14,903.55	12,413.60	2,275.43	5,296.90	1,581.65	28,045.00	1,162.80	1,050.09	909.67	14,243.19
2005:09:21	1,236.36	4,988.14	15,224.57	12,607.59	2,296.90	5,365.90	1,608.03	28,828.00	1,194.31	1,059.38	919.07	15,246.23
2005:09:28	1,227.16	4,911.17	15,086.62	12,834.25	2,313.35	5,347.40	1,618.10	29,050.00	1,217.26	1,058.63	914.74	15,221.39
2005:10:05	1,210.20	4,875.22	15,223.62	13,196.57	2,298.65	5,369.70	1,658.95	30,837.00	1,187.99	1,044.06	922.57	15,734.41
2005:10:12	1,216.89	5,048.74	15,221.46	13,435.91	2,301.84	5,494.80	1,687.78	31,317.00	1,131.77	1,027.89	924.50	15,869.33
2005:10:19	1,196.39	5,069.42	15,161.03	13,689.89	2,325.89	5,427.80	1,647.37	30,164.00	1,138.95	1,104.06	927.51	15,720.35
2005:10:26	1,177.68	4,981.77	14,575.02	13,463.74	2,320.53	5,342.20	1,604.56	29,880.00	1,161.85	1,102.98	928.49	15,103.16
2005:11:02	1,195.76	4,845.98	14,372.76	13,129.49	2,218.13	5,167.80	1,601.59	29,297.00	1,134.61	1,075.91	914.17	15,111.95
2005:11:09	1,191.38	4,900.79	14,458.14	13,395.02	2,228.79	5,227.80	1,609.78	29,730.00	1,097.16	1,062.18	905.21	15,666.22
2005:11:16	1,214.76	4,954.83	14,597.48	13,894.78	2,255.54	5,358.60	1,638.95	31,100.00	1,104.79	1,062.18	913.92	15,896.48
2005:11:23	1,220.65	5,011.38	14,597.55	14,072.20	2,270.33	5,439.80	1,592.43	30,666.00	1,108.15	1,052.82	906.55	15,981.18
2005:11:30	1,231.21	5,081.46	14,650.54	14,170.87	2,254.46	5,430.00	1,584.58	30,482.00	1,095.89	1,025.83	896.80	16,310.68
2005:12:07	1,265.61	5,196.08	15,062.35	14,742.58	2,296.52	5,531.70	1,627.38	31,943.00	1,105.75	1,061.08	902.90	16,713.91
2005:12:14	1,249.48	5,193.40	14,937.14	14,872.15	2,300.25	5,423.20	1,554.67	31,917.00	1,099.26	1,096.64	896.13	16,830.96
2005:12:21	1,257.37	5,266.75	15,134.95	15,484.66	2,311.81	5,528.80	1,525.53	32,757.00	1,099.61	1,151.36	891.67	17,244.19
2005:12:28	1,272.74	5,286.76	14,976.26	15,464.58	2,324.38	5,521.10	1,525.57	33,629.00	1,125.39	1,173.72	898.80	18,054.03
2006:01:04	1,262.79	5,397.23	15,221.42	15,957.57	2,332.67	5,587.40	1,491.27	33,517.00	1,130.76	1,160.56	894.65	17,781.51
2006:01:11	1,258.17	5,447.15	15,101.54	16,194.61	2,337.89	5,622.80	1,537.59	33,138.00	1,157.03	1,164.14	895.55	17,690.70
2006:01:18	1,273.46	5,523.62	15,200.06	16,361.54	2,384.14	5,714.60	1,610.52	35,002.00	1,180.96	1,211.70	897.13	18,669.23
2006:01:25	1,294.18	5,532.89	15,650.88	16,363.59	2,418.65	5,731.50	1,649.67	35,952.00	1,211.05	1,261.28	909.59	19,160.44
2006:02:01	1,277.93	5,395.61	15,481.21	15,341.18	2,359.30	5,663.70	1,645.52	35,805.00	1,233.35	1,193.20	901.32	18,265.96
2006:02:08	1,264.68	5,427.09	15,520.39	15,651.00	2,378.64	5,704.40	1,708.41	38,014.00	1,258.05	1,230.12	909.77	18,866.37
2006:02:15	1,282.46	5,726.53	15,742.30	16,480.09	2,431.74	5,801.60	1,747.15	38,485.00	1,287.63	1,240.69	927.85	19,162.38
2006:02:22	1,265.65	5,666.41	15,373.44	16,272.68	2,428.25	5,725.10	1,717.53	36,499.00	1,290.06	1,238.17	918.92	18,410.24
2006:03:01	1,280.00	5,764.37	15,423.26	15,932.83	2,424.17	5,791.50	1,669.17	37,239.00	1,299.17	1,236.94	927.17	18,169.16
2006:03:08	1,292.67	5,862.06	15,635.72	15,781.78	2,427.89	5,872.40	1,728.20	38,246.00	1,284.23	1,231.25	924.40	18,780.46
2006:03:15	1,291.24	5,866.61	15,818.09	15,964.46	2,482.67	5,844.10	1,741.87	39,178.00	1,306.59	1,239.27	921.56	19,058.74
2006:03:22	1,278.47	5,673.36	15,493.09	15,627.49	2,502.60	5,812.90	1,776.06	37,289.00	1,250.38	1,233.60	913.53	18,398.82
2006:03:29	1,303.02	5,898.48	15,720.36	16,319.04	2,498.02	5,965.10	1,799.10	38,244.00	1,274.81	1,244.44	924.24	18,999.64
2006:04:05	1,305.04	5,932.31	15,642.81	16,495.48	2,489.27	6,007.50	1,793.09	37,851.00	1,296.71	1,302.33	921.94	19,598.11
2006:04:12	1,302.89	5,914.78	15,745.11	16,938.41	2,520.75	5,959.20	1,803.94	37,492.00	1,305.57	1,322.97	932.98	19,132.34
2006:04:19	1,311.56	6,029.20	16,100.09	17,243.98	2,544.89	6,044.10	1,849.06	39,053.00	1,340.16	1,344.60	941.67	19,930.63
2006:04:26	1,288.12	5,901.25	16,310.76	17,162.55	2,546.25	6,000.80	1,850.11	38,427.00	1,360.13	1,372.39	941.88	19,322.62
2006:05:03	1,309.93	5,993.76	16,830.44	17,350.12	2,585.84	6,089.80	1,912.90	39,938.00	1,396.70	1,453.23	945.97	19,933.09
2006:05:10	1,305.41	6,107.12	16,672.66	17,055.93	2,596.65	6,104.30	1,919.74	40,410.00	1,417.48	1,481.72	949.29	20,566.91
2006:05:17	1,308.12	5,968.96	17,026.98	17,291.67	2,659.65	6,010.00	1,855.59	40,920.00	1,497.10	1,499.07	950.23	21,159.16
2006:05:24	1,322.85	6,118.38	17,080.59	16,951.93	2,642.89	6,083.40	1,896.21	41,752.00	1,545.69	1,539.40	966.62	21,781.07
2006:05:31	1,270.32	5,652.72	16,615.55	16,307.67	2,548.69	5,675.50	1,683.80	38,291.00	1,625.15	1,462.16	958.40	20,261.86
2006:06:07	1,258.57	5,587.23	15,822.64	15,907.20	2,436.55	5,587.10	1,578.79	35,792.00	1,590.92	1,323.15	927.75	18,805.57
2006:06:14	1,270.09	5,692.86	15,645.27	15,467.33	2,383.87	5,723.80	1,653.72	36,530.00	1,641.30	1,330.00	927.78	18,677.92
2006:06:21	1,256.15	5,543.93	15,816.55	15,096.01	2,355.43	5,706.30	1,619.27	35,264.00	1,589.55	1,287.18	923.57	18,413.44
2006:06:28	1,230.04	5,305.99	15,247.92	14,309.56	2,280.67	5,506.80	1,509.57	32,941.00	1,531.33	1,234.20	893.23	16,802.10
2006:07:05	1,252.20	5,503.41	15,659.36	14,644.26	2,329.60	5,665.00	1,579.39	34,547.00	1,598.12	1,293.29	894.66	18,156.21
2006:07:12	1,246.00	5,456.87	15,742.66	14,886.11	2,350.80	5,678.60	1,632.26	34,835.00	1,639.29	1,272.05	906.90	18,101.83
2006:07:19	1,270.91	5,625.63	16,267.18	15,523.94	2,424.11	5,826.70	1,700.21	36,378.00	1,718.56	1,338.32	924.89	19,514.62
2006:07:26	1,258.60	5,637.82	16,522.21	15,249.32	2,422.76	5,860.60	1,701.44	36,230.00	1,740.00	1,345.87	928.23	19,419.44
2006:08:02	1,259.81	5,539.29	16,097.54	14,500.26	2,341.79	5,778.00	1,662.52	36,785.00	1,645.16	1,280.50	911.98	19,871.78
2006:08:09	1,268.40	5,583.10	16,617.24	14,884.07	2,406.31	5,877.10	1,686.37	36,594.00	1,686.65	1,312.83	934.34	19,913.19
2006:08:16	1,277.41	5,680.82	17,032.75	15,464.29	2,453.99	5,932.10	1,714.60	37,288.00	1,600.87	1,394.36	934.07	20,145.10
2006:08:23	1,265.95	5,702.81	17,346.58	15,656.59	2,444.63	5,860.50	1,633.26	37,255.00	1,578.57	1,413.10	941.26	20,062.37
2006:08:30	1,295.43	5,812.94	17,451.03	16,071.36	2,453.43	5,896.60	1,634.10	37,678.00	1,616.41	1,437.77	937.98	20,900.00
2006:09:06	1,292.99	5,775.54	17,088.39	16,163.03	2,472.26	5,860.00	1,648.80	35,512.00	1,612.40	1,438.63	948.26	20,742.44
2006:09:13	1,305.37	5,867.53	17,284.71	15,872.02	2,471.40	5,929.30	1,660.44	36,313.00	1,655.19	1,425.22	958.12	21,331.09
2006:09:20	1,300.26	5,813.06	17,258.51	16,284.09	2,526.53	5,929.30	1,654.76	36,710.00	1,672.12	1,472.56	956.39	20,965.24
2006:09:27	1,318.07	5,906.12	17,210.04	15,750.05	2,508.03	5,892.20	1,632.14	36,550.00	1,689.39	1,451.08	954.25	21,320.21
2006:10:04	1,325.18	5,954.38	17,512.96	15,718.67	2,531.42	5,866.20	1,660.94	35,197.00	1,732.45	1,479.31	959.62	21,841.45
2006:10:11	1,336.59	5,989.71	17,521.51	15,947.87	2,557.90	5,930.10	1,644.72	36,106.00	1,725.04	1,523.06	966.32	21,748.57
2006:10:18	1,350.20	6,046.37	17,629.21	16,082.55	2,602.92	5,966.50	1,641.40	37,749.00	1,785.39	1,537.08	964.06	22,105.97
2006:10:25	1,349.95	6,119.45	17,862.79	16,400.57	2,641.61	6,073.50	1,630.14	38,322.00	1,790.10	1,553.12	970.37	22,387.08
2006:11:01	1,365.80	6,182.78	18,048.09	16,653.00	2,642.42	6,150.40	1,692.02	38,686.00	1,787.19	1,564.55	975.89	23,012.87
2006:11:08	1,382.22	6,264.92	18,157.94	16,699.30	2,714.66	6,214.60	1,765.66	39,563.00	1,806.65	1,572.85	982.63	23,397.69
2006:11:15	1,367.81	6,291.90	18,453.65	16,375.26	2,737.78	6,149.60	1,794.44	39,930.00	1,855.71	1,589.87	989.34	23,042.28
2006:11:22	1,385.72	6,349.26	18,811.24	16,215.74	2,735.30	6,239.00	1,873.39	41,334.00	1,866.82	1,646.07	1,007.29	23,930.64
2006:11:29	1,396.57	6,430.89	19,093.00	16,243.47	2,777.62	6,229.80	1,918.07	41,162.00	1,922.94	1,670.11	1,028.38	24,315.60
2006:12:06	1,406.09	6,476.13	19,250.79	15,914.23	2,830.02	6,160.30	1,939.08	41,913.00	2,041.35	1,705.44	1,043.81	24,674.75
2006:12:13	1,399.48	6,363.80	18,780.93	16,076.20	2,826.36	6,084.40	1,961.18	41,970.00	2,054.09	1,713.40	1,064.60	24,776.09
2006:12:20	1,412.90	6,369.51	19,026.36	16,371.28	2,895.02	6,090.30	1,976.12	43,096.00	2,156.60	1,784.43	1,098.35	25,615.85
2006:12:27	1,413.21	6,520.77	18,718.19	16,692.93	2,884.15	6,192.50	2,032.74	43,285.00	2,223.46	1,753.80	1,079.60	25,690.39
2007:01:03	1,423.53	6,586.91	19,240.12	17,011.04	2,920.83	6,198.60	2,042.72	43,502.00	2,373.21	1,766.80	1,076.30	25,394.69
2007:01:10	1,426.84	6,608.86	19,725.73	17,248.63	2,961.25	6,245.20	2,089.32	44,526.00	2,536.39	1,803.26	1,083.22	26,196.66
2007:01:17	1,416.60	6,691.32	20,413.39	17,353.67	3,037.74	6,319.00	2,097.55	44,445.00	2,715.72	1,834.71	1,117.09	26,619.37
2007:01:24	1,414.85	6,566.56	19,568.34	16,942.40	2,961.15	6,160.70	2,044.08	42,336.00	2,825.58	1,710.37	1,113.19	25,885.80
2007:01:31	1,430.62	6,701.70	20,064.57	17,261.35	3,037.66	6,204.50	2,055.38	42,735.00	2,778.90	1,758.48	1,139.71	26,558.50
2007:02:07	1,440.13	6,748.37	20,821.05	17,507.40	3,150.24	6,314.80	2,070.62	44,687.00	2,975.13	1,805.69	1,183.04	27,338.30
2007:02:14	1,438.24	6,789.11	20,106.42	17,383.42	3,125.56	6,203.10	2,070.64	44,642.00	2,786.33	1,757.26	1,189.35	27,561.49
2007:02:21	1,450.02	6,915.56	20,679.69	17,292.32	3,236.60	6,369.50	2,100.08	44,588.00	2,716.18	1,764.91	1,243.57	28,123.76
2007:02:28	1,455.30	6,961.18	20,209.91	17,752.64	3,182.21	6,421.20	2,129.94	45,996.00	2,905.09	1,750.99	1,245.64	28,539.69
2007:03:07	1,457.63	6,941.66	20,651.42	17,913.21	3,293.61	6,357.10	2,203.24	46,090.00	3,040.60	1,816.57	1,278.22	28,715.96
2007:03:14	1,406.82	6,715.44	19,651.51	17,604.12	3,104.15	6,171.50	2,067.64	43,892.00	2,881.07	1,740.97	1,196.45	26,638.95
2007:03:21	1,391.97	6,617.75	18,918.64	16,764.62	3,059.15	6,156.50	1,995.07	42,667.00	2,896.59	1,743.19	1,156.58	26,184.39
2007:03:28	1,387.17	6,447.70	18,836.93	16,676.89	3,053.21	6,000.70	2,011.51	43,288.00	2,906.33	1,762.28	1,166.38	26,719.32
2007:04:04	1,435.04	6,712.06	19,516.41	17,419.20	3,155.69	6,256.80	2,083.63	45,631.00	3,057.38	1,779.24	1,209.34	28,219.55
2007:04:11	1,417.23	6,816.89	19,553.87	17,254.73	3,201.75	6,267.20	2,072.07	44,484.00	3,173.02	1,800.39	1,235.24	28,098.28
2007:04:18	1,439.37	7,073.91	20,209.71	17,544.09	3,332.92	6,364.70	2,127.48	46,554.00	3,291.54	1,922.05	1,271.31	29,370.94

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2007:04:25	1,438.87	7,152.83	20,449.43	17,670.07	3,420.62	6,413.30	2,154.50	46,939.00	3,495.22	1,931.04	1,306.22	29,278.75
2007:05:02	1,472.50	7,282.34	20,777.09	17,667.33	3,400.41	6,449.40	2,211.96	48,710.00	3,612.40	1,959.68	1,328.63	29,559.52
2007:05:09	1,495.42	7,343.08	20,536.78	17,236.16	3,362.68	6,461.90	2,185.46	49,676.00	3,743.96	1,986.67	1,315.97	29,444.15
2007:05:16	1,495.92	7,455.93	20,388.49	17,394.92	3,417.81	6,484.50	2,156.84	49,472.00	3,950.01	2,008.56	1,342.79	29,259.92
2007:05:23	1,512.58	7,475.99	20,844.78	17,748.12	3,452.72	6,549.60	2,155.26	51,300.00	4,013.08	2,037.98	1,350.84	29,992.83
2007:05:30	1,514.14	7,481.25	20,937.26	17,529.00	3,501.17	6,559.50	2,162.89	51,738.00	3,986.04	2,063.76	1,352.41	30,341.25
2007:06:06	1,522.28	7,735.88	20,798.97	17,705.12	3,559.01	6,616.40	2,196.10	51,813.00	4,173.71	2,104.25	1,354.98	30,869.84
2007:06:13	1,530.23	7,764.97	20,293.76	17,588.26	3,511.13	6,602.10	2,222.22	52,528.00	4,053.09	2,055.40	1,339.18	31,380.00
2007:06:20	1,517.38	7,730.05	20,818.61	18,040.93	3,563.75	6,522.70	2,206.16	52,049.00	3,776.32	2,102.44	1,372.38	31,681.76
2007:06:27	1,515.67	7,680.76	20,578.75	17,732.77	3,551.22	6,559.60	2,168.43	52,994.00	4,176.48	2,088.60	1,353.03	31,884.06
2007:07:04	1,512.84	8,090.49	21,684.67	18,211.68	3,628.67	6,649.30	2,226.01	54,029.00	4,181.32	2,161.07	1,386.27	31,550.76
2007:07:11	1,506.34	7,801.23	21,705.56	17,849.28	3,505.50	6,527.60	2,227.33	54,143.00	4,078.60	2,125.34	1,357.43	30,804.21
2007:07:18	1,525.40	8,075.26	22,218.55	18,168.72	3,554.85	6,673.10	2,252.40	55,696.00	3,816.17	2,196.10	1,377.14	32,201.63
2007:07:25	1,518.76	7,898.54	22,607.02	18,049.51	3,594.94	6,615.10	2,266.09	56,356.00	3,865.72	2,273.42	1,359.27	31,916.27
2007:08:01	1,546.17	7,893.61	22,841.92	18,015.58	3,583.97	6,567.10	2,247.83	57,556.00	3,930.06	2,294.59	1,369.23	31,886.74
2007:08:08	1,518.09	7,692.55	23,362.18	17,858.42	3,633.54	6,454.30	2,242.78	56,001.00	4,323.97	2,394.56	1,379.73	31,103.53
2007:08:15	1,465.81	7,473.93	22,455.36	16,870.98	3,431.71	6,250.60	2,177.19	54,234.00	4,300.56	2,256.31	1,339.49	30,048.37
2007:08:22	1,497.49	7,605.94	22,536.67	17,029.28	3,413.17	6,393.90	2,158.44	55,241.00	4,663.16	2,262.64	1,307.17	30,661.87
2007:08:29	1,406.70	7,445.90	21,375.72	16,475.61	3,273.25	6,109.30	1,924.73	49,285.00	4,869.88	2,029.08	1,251.82	28,140.73
2007:09:05	1,464.07	7,500.48	22,346.88	15,900.64	3,321.50	6,196.00	2,008.50	51,745.00	4,980.08	2,062.99	1,255.39	29,269.34
2007:09:12	1,463.76	7,439.18	23,020.60	16,012.83	3,334.66	6,132.20	2,045.67	52,735.00	5,109.43	2,134.88	1,263.70	29,710.78
2007:09:19	1,472.29	7,588.03	24,069.17	16,158.45	3,445.08	6,270.70	2,061.01	54,408.00	5,310.72	2,214.62	1,297.93	30,809.55
2007:09:26	1,471.56	7,472.99	24,310.14	15,797.60	3,506.09	6,306.20	2,008.74	53,883.00	5,172.63	2,209.93	1,285.94	30,076.33
2007:10:03	1,529.03	7,750.84	25,554.64	16,381.54	3,594.36	6,460.00	2,116.49	57,264.00	5,395.27	2,313.34	1,297.16	30,512.64
2007:10:10	1,525.42	7,804.15	26,430.29	16,435.74	3,650.09	6,433.00	2,177.24	59,715.00	5,338.52	2,361.01	1,320.89	30,303.18
2007:10:17	1,539.59	7,955.30	27,479.94	17,199.89	3,754.62	6,535.20	2,254.39	60,099.00	5,692.75	2,451.59	1,366.96	31,178.84
2007:10:24	1,562.47	7,986.57	28,569.33	17,177.89	3,814.45	6,633.00	2,277.40	63,197.00	5,771.46	2,591.48	1,376.93	32,129.40
2007:10:31	1,541.24	7,985.41	29,298.71	16,955.31	3,839.73	6,677.70	2,240.21	63,194.00	6,036.28	2,641.59	1,374.39	32,721.82
2007:11:07	1,515.88	7,828.96	29,333.53	16,358.39	3,649.12	6,482.00	2,256.61	62,625.00	5,843.11	2,524.98	1,359.83	32,048.18
2007:11:14	1,549.38	8,019.22	31,352.58	16,737.63	3,805.70	6,721.60	2,351.44	65,318.00	5,954.77	2,643.49	1,413.65	31,458.67
2007:11:21	1,475.62	7,799.62	29,708.93	16,096.68	3,673.01	6,385.10	2,298.82	63,501.00	5,601.78	2,713.98	1,413.85	29,582.21
2007:11:28	1,470.58	7,783.11	29,166.01	15,499.56	3,524.91	6,432.10	2,309.43	64,631.00	5,412.69	2,691.87	1,384.58	29,655.68
2007:12:05	1,416.77	7,518.42	26,618.19	14,837.66	3,347.20	6,070.90	2,216.15	60,582.00	5,214.23	2,563.62	1,359.85	28,446.45
2007:12:12	1,469.02	7,723.66	27,371.24	15,153.78	3,369.72	6,306.20	2,230.83	61,715.00	4,803.39	2,671.90	1,366.58	29,276.39
2007:12:19	1,485.01	7,944.77	29,345.45	15,608.88	3,560.05	6,493.80	2,211.85	64,928.00	5,042.65	2,768.06	1,427.77	30,761.64
2007:12:26	1,486.59	8,076.12	28,521.06	15,932.26	3,549.25	6,559.80	2,226.12	64,742.00	5,095.54	2,795.84	1,423.72	30,088.04
2008:01:02	1,453.00	7,837.32	27,029.26	15,030.51	3,357.34	6,284.50	2,130.12	61,722.00	4,941.78	2,657.98	1,387.21	29,074.12
2008:01:09	1,497.66	8,038.60	27,842.93	15,653.54	3,473.21	6,497.80	2,179.90	64,288.00	5,233.35	2,714.55	1,424.02	30,002.46
2008:01:16	1,447.16	7,949.11	27,560.52	14,691.41	3,461.22	6,416.70	2,151.74	62,815.00	5,272.81	2,731.51	1,435.68	28,699.12
2008:01:23	1,409.13	7,782.71	27,615.85	14,599.16	3,344.53	6,272.70	2,089.58	62,674.00	5,435.81	2,830.26	1,491.66	28,401.61
2008:01:30	1,373.20	7,471.57	24,450.85	13,504.51	3,344.53	5,942.90	2,065.77	58,777.00	5,290.61	2,592.31	1,453.66	27,343.57
2008:02:06	1,338.60	6,439.21	24,090.17	12,829.06	3,050.09	5,609.30	1,891.25	54,235.00	4,703.05	2,476.28	1,383.35	27,620.33
2008:02:13	1,355.81	6,875.35	23,653.69	13,345.03	3,000.03	5,837.30	2,036.18	60,289.00	4,417.85	2,610.36	1,384.08	28,296.80
2008:02:20	1,326.45	6,847.51	23,469.46	13,099.24	2,931.97	5,875.40	2,039.51	58,969.00	4,417.85	2,639.09	1,415.94	27,929.29
2008:02:27	1,367.21	6,973.67	23,169.55	13,068.30	2,949.54	5,880.10	2,043.43	62,591.00	4,490.72	2,610.78	1,423.15	29,306.76
2008:03:05	1,360.03	6,899.68	23,590.58	13,310.37	3,026.83	5,893.60	2,074.70	63,747.00	4,567.03	2,689.26	1,414.32	29,224.44
2008:03:12	1,380.02	6,997.85	24,483.84	14,031.30	3,094.45	6,076.50	2,166.21	65,495.00	4,334.05	2,740.14	1,376.62	30,424.76
2008:03:19	1,333.70	6,683.71	23,114.34	12,972.06	2,910.77	5,853.50	2,182.11	64,629.00	4,292.65	2,639.65	1,280.23	29,277.35
2008:03:26	1,308.77	6,599.37	23,422.76	12,861.13	2,917.94	5,776.40	2,134.14	62,177.00	4,070.12	2,556.24	1,232.59	29,283.40
2008:04:02	1,298.42	6,361.22	21,866.94	12,260.44	2,833.21	5,545.60	2,014.06	58,827.00	3,761.60	2,323.57	1,186.54	29,071.34
2008:04:09	1,341.13	6,489.26	22,617.01	12,706.63	2,995.22	5,660.40	2,079.79	61,415.00	3,606.86	2,440.64	1,245.42	30,057.26
2008:04:16	1,367.53	6,777.44	23,872.43	13,189.36	3,124.61	5,915.90	2,152.62	63,364.00	3,347.88	2,342.19	1,239.65	31,467.87
2008:04:23	1,354.49	6,721.36	23,984.57	13,111.89	3,089.72	5,983.90	2,149.90	63,477.00	3,413.91	2,180.09	1,227.74	31,417.83
2008:04:30	1,364.71	6,702.84	23,878.35	13,146.13	3,087.49	6,046.20	2,161.54	64,152.00	3,291.60	2,337.92	1,253.64	31,910.21
2008:05:07	1,379.93	6,795.03	25,289.24	13,579.16	3,193.84	6,083.60	2,140.42	64,948.00	3,278.33	2,314.30	1,288.16	31,847.98
2008:05:14	1,385.59	6,948.82	25,755.35	13,849.99	3,147.79	6,087.30	2,095.53	67,868.00	3,693.11	2,304.52	1,279.86	30,281.41
2008:05:21	1,392.57	7,076.25	25,610.21	14,102.48	3,228.95	6,261.00	2,093.99	69,018.00	3,579.15	2,382.70	1,287.15	30,762.16
2008:05:28	1,408.66	7,083.24	25,533.48	14,118.55	3,198.51	6,216.00	2,088.78	70,027.00	3,657.43	2,449.34	1,287.74	31,336.57
2008:06:04	1,390.71	7,040.83	25,460.29	13,926.30	3,196.90	6,198.10	2,221.13	72,295.00	3,544.19	2,494.71	1,281.20	31,126.07
2008:06:11	1,390.84	7,033.84	24,249.51	13,709.44	3,132.78	6,069.60	2,233.41	73,153.00	3,459.03	2,433.77	1,260.58	31,647.03
2008:06:18	1,377.20	6,965.43	24,123.25	14,435.57	3,134.80	5,970.10	2,141.25	68,673.00	3,369.91	2,362.59	1,253.12	31,448.11
2008:06:25	1,335.49	6,650.26	23,327.60	14,183.48	3,046.77	5,723.30	2,072.08	66,795.00	3,024.24	2,374.78	1,229.28	30,446.24
2008:07:02	1,337.81	6,728.91	23,325.80	14,452.82	3,040.09	5,756.90	2,048.11	67,090.00	2,941.11	2,364.58	1,212.59	29,618.11
2008:07:09	1,321.97	6,617.84	22,635.16	13,829.92	2,986.62	5,666.10	2,091.92	65,853.00	2,905.01	2,341.36	1,209.11	29,569.44
2008:07:16	1,261.52	6,305.42	21,704.45	13,286.37	2,906.23	5,426.30	2,033.03	61,106.00	2,651.73	2,378.47	1,153.70	28,680.83
2008:07:23	1,244.69	6,386.46	21,805.81	13,052.13	2,917.62	5,529.60	1,940.15	60,253.00	2,920.55	2,286.03	1,139.81	28,095.79
2008:07:30	1,245.36	6,155.37	21,223.50	12,760.80	2,835.32	5,150.60	1,877.43	62,056.00	2,705.87	2,218.12	1,119.42	27,968.82
2008:08:06	1,282.19	6,536.09	23,134.55	13,312.93	2,978.98	5,449.90	1,940.74	59,421.00	2,837.85	2,225.84	1,139.41	27,644.75
2008:08:13	1,284.26	6,460.12	22,690.60	13,367.79	2,925.50	5,420.70	1,949.84	59,998.00	2,836.67	2,278.68	1,159.94	27,474.04
2008:08:20	1,289.19	6,561.39	22,104.20	13,254.89	2,886.78	5,486.10	1,871.66	57,542.00	2,719.37	2,187.20	1,133.59	27,342.39
2008:08:27	1,285.83	6,422.19	21,293.32	13,023.05	2,811.79	5,448.60	1,742.93	54,573.00	2,446.30	2,063.52	1,112.53	26,877.07
2008:09:03	1,274.54	6,317.80	20,931.26	12,851.69	2,751.75	5,371.80	1,740.26	55,377.00	2,523.28	2,069.70	1,073.21	26,865.04
2008:09:10	1,281.66	6,321.03	21,464.72	12,752.96	2,705.09	5,528.10	1,779.74	55,519.00	2,342.15	2,131.06	1,067.65	26,131.35
2008:09:17	1,274.98	6,467.49	20,585.06	12,689.59	2,706.53	5,499.70	1,758.13	53,527.00	2,276.67	2,116.00	1,085.38	26,467.79
2008:09:24	1,232.04	6,210.32	19,999.78	12,346.63	2,622.41	5,366.20	1,604.84	49,633.00	2,150.76	1,885.04	1,062.70	25,622.91
2008:10:01	1,156.39	5,860.98	17,637.19	11,749.79	2,419.29	4,912.40	1,491.98	45,909.00	1,929.05	1,769.89	1,002.99	23,456.84
2008:10:08	1,185.87	6,052.87	18,961.99	12,115.03	2,477.60	5,095.60	1,655.81	49,843.00	2,216.81	1,883.55	1,028.40	24,944.25
2008:10:15	1,161.06	5,806.33	18,211.11	11,368.26	2,358.91	4,959.60	1,605.68	49,799.00	2,173.74	1,648.74	1,016.70	25,117.32
2008:10:22	984.94	5,013.62	15,431.73	9,203.32	2,033.61	4,366.70	1,359.27	38,594.00	2,092.22	1,451.67	970.19	20,678.97
2008:10:29	907.84	4,861.63	15,998.30	9,547.47	2,059.39	4,079.60	1,185.73	36,833.00	1,994.67	1,520.41	949.88	21,135.42
2008:11:05	896.78	4,571.07	14,266.60	8,674.69	1,821.13	4,040.90	940.82	35,070.00	1,895.82	1,379.74	904.28	18,787.34
2008:11:12	930.09	4,808.69	12,702.07	8,211.90	1,671.20	4,242.50	918.45	34,845.00	1,719.81	1,113.62	829.41	19,157.33
2008:11:19	952.77	5,166.87	14,840.16	9,521.24	1,868.82	4,530.70	1,135.79	37,786.00	1,760.61	1,366.28	915.24	20,446.77
2008:11:26	852.30	4,620.80	13,939.09	8,695.51	1,784.01	4,182.00	1,008.26	34,374.00	1,859.11	1,326.62	890.34	18,804.95
2008:12:03	806.58	4,354.09	12,815.80	8,273.22	1,665.59	4,005.70	925.35	33,405.00	2,017.47	1,180.36	877.65	18,578.38

APPENDIX - C6
DATA FOR CHAPTER 5

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2008:12:10	887.68	4,560.50	13,369.45	8,213.22	1,711.13	4,152.70	954.81	36,470.00	1,897.88	1,193.15	856.37	20,025.79
2008:12:17	870.74	4,567.24	13,588.66	8,004.10	1,640.57	4,170.00	970.19	35,297.00	1,965.41	1,192.53	847.53	20,147.01
2008:12:24	899.24	4,804.88	15,577.74	8,660.24	1,821.70	4,367.30	1,060.87	39,004.00	2,079.12	1,315.90	854.66	21,689.84
2008:12:31	904.42	4,708.38	15,460.52	8,612.52	1,779.29	4,324.20	1,147.97	39,947.00	1,976.82	1,363.98	862.50	22,572.50
2009:01:07	868.15	4,629.38	14,184.14	8,517.10	1,736.99	4,216.60	1,038.31	36,864.00	1,863.80	1,336.61	869.62	22,340.70
2009:01:14	903.25	4,973.07	14,387.48	9,043.12	1,761.56	4,434.20	1,079.66	40,244.00	1,820.81	1,437.34	876.75	22,380.32
2009:01:21	906.65	4,937.47	14,987.46	9,239.24	1,880.58	4,507.50	1,167.06	40,820.00	1,924.01	1,421.47	927.62	22,117.51
2009:01:28	842.62	4,422.35	13,704.61	8,438.45	1,764.72	4,180.60	1,087.61	37,982.00	1,928.87	1,386.91	913.46	20,369.23
2009:02:04	840.24	4,261.15	12,583.63	7,901.64	1,704.52	4,059.90	1,062.68	38,543.00	1,985.02	1,321.45	873.41	19,497.10
2009:02:11	874.09	4,518.72	13,154.43	8,106.29	1,766.08	4,295.20	1,105.45	40,227.00	2,011.68	1,321.45	879.63	20,145.22
2009:02:18	832.23	4,492.79	13,063.89	8,038.94	1,707.39	4,228.60	1,079.04	40,129.00	2,107.75	1,320.36	876.80	19,622.60
2009:02:25	833.74	4,530.09	13,539.21	7,705.36	1,721.97	4,234.30	1,107.98	40,846.00	2,260.82	1,324.82	897.07	19,446.65
2009:03:04	788.42	4,204.96	13,016.00	7,534.44	1,651.06	4,006.80	1,054.90	39,674.00	2,209.86	1,330.61	895.23	18,741.27
2009:03:11	764.90	3,846.21	13,005.08	7,461.22	1,616.79	3,849.00	1,019.11	38,232.00	2,206.57	1,300.11	896.51	18,200.70
2009:03:18	712.87	3,890.94	12,331.15	7,290.96	1,544.34	3,645.90	986.27	38,402.00	2,198.11	1,289.38	866.93	17,824.96
2009:03:25	721.36	3,914.10	11,930.66	7,376.12	1,505.51	3,693.80	1,004.33	38,805.00	2,139.02	1,314.52	850.37	17,790.69
2009:04:01	794.35	3,996.32	13,117.17	7,972.17	1,575.94	3,805.00	1,065.56	40,142.00	2,223.73	1,322.84	847.96	19,620.48
2009:04:08	813.88	4,223.29	13,622.11	8,479.99	1,691.68	3,900.30	1,132.32	41,799.00	2,291.55	1,419.97	878.81	20,272.77
2009:04:15	811.08	4,131.07	13,519.54	8,351.91	1,702.26	3,955.60	1,134.61	41,976.00	2,408.02	1,461.75	884.18	19,880.37
2009:04:22	825.16	4,357.92	14,474.86	8,595.01	1,783.96	3,925.50	1,163.10	44,182.00	2,347.39	1,465.75	907.87	20,530.63
2009:04:29	852.06	4,549.79	15,669.62	8,742.96	1,905.99	3,968.40	1,214.92	45,273.00	2,536.06	1,593.66	956.68	21,861.36
2009:05:06	843.55	4,594.42	14,878.45	8,727.30	1,843.41	4,030.70	1,226.97	44,888.00	2,461.35	1,615.23	968.58	21,480.01
2009:05:13	873.64	4,704.56	14,956.95	8,828.26	1,849.57	4,189.60	1,270.61	47,227.00	2,468.19	1,644.19	967.46	22,079.34
2009:05:20	919.53	4,880.71	16,834.57	9,385.70	2,179.03	4,396.50	1,409.91	51,499.00	2,592.52	1,798.34	1,023.96	23,906.13
2009:05:27	883.92	4,727.61	17,059.62	9,340.49	2,185.29	4,331.40	1,461.22	48,679.00	2,663.77	1,851.33	1,022.84	23,155.01
2009:06:03	903.47	5,038.94	17,475.84	9,344.64	2,269.24	4,468.40	1,550.15	51,245.00	2,651.41	1,885.72	1,042.63	24,399.60
2009:06:10	893.06	5,000.77	17,885.27	9,438.77	2,306.08	4,416.20	1,567.36	51,792.00	2,632.93	1,892.84	1,047.68	24,507.81
2009:06:17	931.76	5,054.53	18,576.47	9,741.67	2,383.82	4,383.40	1,600.93	52,087.00	2,778.59	2,010.91	1,055.40	24,651.32
2009:06:24	939.15	5,051.18	18,785.66	9,991.49	2,391.22	4,436.80	1,654.99	53,411.00	2,816.25	2,108.81	1,082.97	25,183.72
2009:07:01	910.71	4,799.98	18,084.60	9,840.85	2,271.45	4,278.50	1,534.64	51,046.00	2,810.12	2,024.96	1,070.90	24,150.94
2009:07:08	900.94	4,836.01	17,892.15	9,590.32	2,278.96	4,280.00	1,545.81	49,672.00	2,922.30	1,995.67	1,057.85	23,711.24
2009:07:15	923.33	4,905.44	18,178.05	9,939.93	2,352.55	4,340.70	1,610.11	51,544.00	3,008.15	2,059.88	1,079.40	24,524.01
2009:07:22	879.56	4,572.65	17,721.07	9,420.75	2,259.77	4,140.20	1,477.84	49,178.00	3,080.77	2,083.97	1,065.47	23,468.98
2009:07:29	932.68	4,928.44	18,258.66	9,269.25	2,389.42	4,346.50	1,603.81	51,297.00	3,188.55	2,123.28	1,097.24	25,336.33
2009:08:05	954.07	5,121.56	19,248.17	9,723.16	2,450.83	4,493.70	1,642.51	53,073.00	3,296.61	2,125.61	1,148.70	26,288.21
2009:08:12	975.15	5,270.32	20,135.50	10,113.24	2,604.06	4,547.50	1,655.68	53,735.00	3,266.43	2,225.81	1,164.48	26,516.50
2009:08:19	1,002.72	5,353.01	20,494.77	10,252.53	2,606.83	4,647.10	1,806.51	56,384.00	3,428.50	2,317.06	1,179.49	28,082.63
2009:08:26	1,005.81	5,350.09	20,435.24	10,435.00	2,571.31	4,716.80	1,773.29	56,588.00	3,112.72	2,347.36	1,180.54	28,096.02
2009:09:02	996.46	5,231.98	19,954.23	10,204.00	2,522.78	4,689.70	1,728.21	56,156.00	2,785.58	2,277.75	1,155.53	27,598.37
2009:09:09	1,028.12	5,521.97	20,456.32	10,639.71	2,628.43	4,890.60	1,778.26	57,766.00	2,967.59	2,380.09	1,172.56	28,212.85
2009:09:16	994.75	5,319.84	19,522.00	10,280.46	2,569.93	4,817.50	1,753.66	55,386.00	2,714.97	2,285.93	1,168.01	27,953.34
2009:09:23	1,033.37	5,574.26	20,851.04	10,312.14	2,650.48	5,004.30	1,874.33	57,910.00	2,946.26	2,383.34	1,196.46	29,100.05
2009:09:30	1,068.76	5,700.26	21,402.92	10,270.77	2,674.42	5,124.10	1,977.41	60,411.00	2,999.71	2,439.36	1,212.98	30,017.72
2009:10:07	1,060.87	5,702.05	21,595.52	10,544.22	2,685.94	5,139.40	2,023.36	60,496.00	2,842.72	2,468.90	1,219.07	28,959.67
2009:10:14	1,057.08	5,675.16	20,955.25	10,133.23	2,672.57	5,133.90	2,075.14	61,518.00	2,779.43	2,467.59	1,202.08	29,232.24
2009:10:21	1,057.58	5,640.75	21,241.59	9,799.60	2,634.63	5,108.90	2,097.65	62,638.00	2,911.72	2,513.41	1,218.61	29,763.37
2009:10:28	1,092.02	5,854.14	21,886.48	10,060.21	2,708.48	5,256.10	2,224.27	66,201.00	2,970.53	2,511.72	1,246.84	30,881.10
2009:11:04	1,081.40	5,833.49	22,318.11	10,333.39	2,692.55	5,257.90	2,257.28	65,486.00	3,070.59	2,476.80	1,260.06	30,889.05
2009:11:11	1,042.63	5,496.27	21,761.58	10,075.05	2,648.98	5,080.40	2,119.76	60,162.00	3,031.33	2,355.31	1,249.05	28,670.90
2009:11:18	1,046.50	5,444.23	21,614.77	9,844.31	2,648.64	5,107.90	2,242.54	63,913.00	3,128.54	2,371.86	1,253.84	29,430.51
2009:11:25	1,098.51	5,668.35	22,627.21	9,871.68	2,740.43	5,266.80	2,250.89	66,431.00	3,175.19	2,403.88	1,270.15	31,097.64
2009:12:02	1,109.80	5,787.61	22,840.33	9,676.80	2,745.04	5,342.10	2,265.56	66,516.00	3,303.23	2,484.23	1,275.10	31,056.62
2009:12:09	1,110.63	5,803.02	22,611.80	9,441.64	2,792.84	5,364.80	2,253.45	67,917.00	3,290.17	2,461.53	1,271.00	31,364.04
2009:12:16	1,109.24	5,781.68	22,289.57	9,608.94	2,796.34	5,327.40	2,220.61	68,615.00	3,269.75	2,471.56	1,271.15	32,111.79
2009:12:23	1,095.95	5,647.84	21,741.76	10,004.72	2,797.21	5,203.90	2,162.63	68,012.00	3,239.57	2,481.30	1,255.76	31,670.21
2009:12:30	1,109.18	5,903.43	21,611.74	10,177.41	2,813.93	5,320.30	2,229.65	68,622.00	3,255.21	2,522.54	1,269.03	31,956.25
2010:01:06	1,120.59	5,957.44	21,328.74	10,536.92	2,841.56	5,372.40	2,249.35	67,589.00	3,073.78	2,474.88	1,260.53	32,450.23
2010:01:13	1,126.42	5,957.43	21,496.62	10,546.44	2,879.76	5,397.90	2,320.73	68,588.00	3,262.60	2,534.36	1,271.12	32,448.74
2010:01:20	1,137.14	6,034.33	22,416.67	10,731.45	2,930.49	5,530.00	2,362.46	70,729.00	3,254.22	2,603.30	1,293.17	32,830.16
2010:01:27	1,145.68	5,963.14	21,748.60	10,735.03	2,888.38	5,473.50	2,338.07	70,385.00	3,172.66	2,632.87	1,289.51	32,836.08
2010:02:03	1,138.04	5,851.53	21,286.17	10,737.52	2,893.13	5,420.80	2,351.54	68,200.00	3,151.85	2,667.27	1,072.69	32,025.34
2010:02:10	1,097.50	5,643.20	20,033.07	10,252.08	2,706.26	5,217.50	2,306.21	65,070.00	2,986.61	2,564.55	1,265.77	30,610.83
2010:02:17	1,097.28	5,672.09	20,722.08	10,404.33	2,764.84	5,253.10	2,325.79	67,109.00	3,003.83	2,604.55	1,267.15	31,287.04
2010:02:24	1,068.13	5,536.37	19,922.22	9,963.99	2,734.39	5,132.00	2,239.37	65,051.00	2,982.50	2,483.44	1,246.17	30,746.05
2010:03:03	1,099.51	5,648.34	20,534.01	10,306.83	2,794.06	5,276.60	2,320.67	67,285.00	3,003.40	2,581.34	1,259.07	31,892.12
2010:03:10	1,105.24	5,615.51	20,467.74	10,198.83	2,762.14	5,342.90	2,292.22	65,795.00	3,022.18	2,579.42	1,270.78	31,788.54
2010:03:17	1,118.79	5,817.88	20,876.79	10,253.14	2,782.79	5,533.20	2,291.32	67,641.00	3,097.00	2,567.09	1,286.10	32,353.54
2010:03:24	1,145.61	5,936.72	21,208.29	10,563.92	2,862.29	5,640.60	2,332.22	69,979.00	3,048.93	2,670.22	1,328.22	32,505.76
2010:03:31	1,166.21	6,024.28	21,384.49	10,846.98	2,919.30	5,644.60	2,382.38	69,723.00	3,050.48	2,756.26	1,301.95	32,798.30
2010:04:07	1,167.72	6,039.00	21,008.62	10,815.03	2,886.36	5,677.90	2,409.94	68,913.00	3,056.81	2,774.85	1,309.45	33,160.97
2010:04:14	1,169.43	6,153.55	21,239.35	11,089.94	2,887.46	5,679.60	2,373.71	70,372.00	3,109.10	2,777.30	1,320.57	33,266.43
2010:04:21	1,182.45	6,222.41	21,928.77	11,292.83	2,988.10	5,762.10	2,453.74	70,793.00	3,148.22	2,898.58	1,345.09	33,632.35
2010:04:28	1,210.65	6,278.40	22,121.43	11,204.90	3,019.74	5,796.30	2,458.52	71,035.00	3,166.18	2,885.01	1,335.89	34,113.93
2010:05:05	1,205.94	6,230.38	21,510.93	11,090.05	2,967.65	5,723.40	2,423.31	69,386.00	3,033.28	2,912.83	1,333.64	33,517.18
2010:05:12	1,191.36	6,084.34	20,949.40	10,924.79	2,932.04	5,586.60	2,378.05	66,656.00	2,900.33	2,903.32	1,333.17	32,952.86
2010:05:19	1,165.87	5,958.45	20,327.54	10,695.69	2,860.31	5,341.90	2,285.49	64,914.00	2,857.15	2,846.24	1,335.65	31,995.28
2010:05:26	1,171.67	6,183.49	20,212.49	10,394.03	2,880.33	5,383.50	2,300.50	65,224.00	2,655.71	2,847.62	1,344.10	32,379.63
2010:06:02	1,115.05	5,988.67	19,578.98	10,186.84	2,774.54	5,158.10	2,178.40	59,689.00	2,587.81	2,729.48	1,308.23	30,992.76
2010:06:09	1,067.95	5,758.02	19,196.45	9,522.66	2,696.02	5,038.10	2,061.07	60,190.00	2,625.79	2,696.78	1,248.94	31,328.49
2010:06:16	1,098.38	5,981.20	19,471.80	9,603.24	2,727.57	5,151.30	2,212.39	62,943.00	2,571.42	2,733.68	1,276.02	31,411.91
2010:06:23	1,055.69	5,984.75	19,621.24	9,439.13	2,745.80	5,085.90	2,217.54	61,479.00	2,583.87	2,785.79	1,290.08	31,209.33
2010:06:30	1,114.61	6,190.91	20,138.40	10,067.15	2,846.94	5,237.90	2,323.12	64,751.00	2,560.25	2,858.66	1,304.47	32,805.63
2010:07:07	1,092.04	6,204.52	20,856.61	9,923.70	2,871.05	5,178.50	2,326.95	65,160.00	2,569.87	2,924.79	1,329.70	32,663.29
2010:07:14	1,030.71	5,965.52	20,128.99	9,382.64	2,835.51	4,916.90	2,185.01	60,936.00	2,398.37	2,913.68	1,314.02	31,156.97
2010:07:21	1,060.27	5,992.86	19,857.07	9,279.65	2,861.03	5,014.80	2,265.00	63,284.00	2,421.12	2,902.04	1,311.75	32,035.19

APPENDIX - C6
DATA FOR CHAPTER 5

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2010:07:28	1,095.17	6,209.76	20,560.81	9,795.24	2,952.81	5,253.50	2,309.87	63,479.00	2,470.44	2,981.06	1,341.08	32,305.71
2010:08:04	1,069.59	5,990.38	20,487.23	9,278.83	2,926.09	5,214.60	2,327.35	64,477.00	2,535.39	3,013.40	1,341.02	32,108.99
2010:08:11	1,106.13	6,178.94	21,091.18	9,753.27	2,985.38	5,319.70	2,374.22	66,808.00	2,633.66	3,057.48	1,355.19	32,665.56
2010:08:18	1,127.24	6,331.33	21,549.88	9,489.34	3,001.87	5,386.20	2,455.72	68,272.00	2,638.52	2,983.25	1,362.74	32,900.48
2010:08:25	1,089.47	6,154.07	21,294.54	9,292.85	2,949.26	5,245.20	2,349.33	65,790.00	2,607.50	3,035.32	1,352.91	32,058.57
2010:09:01	1,094.16	6,186.31	21,022.73	9,240.54	2,919.37	5,302.90	2,466.70	67,638.00	2,666.30	3,072.09	1,385.51	32,408.30
2010:09:08	1,055.33	5,899.50	20,634.98	8,845.39	2,926.55	5,109.40	2,331.13	64,803.00	2,596.58	3,138.91	1,396.97	31,453.72
2010:09:15	1,080.29	6,083.90	20,623.83	8,927.02	2,982.83	5,366.40	2,394.76	67,073.00	2,622.88	3,135.32	1,431.96	32,339.23
2010:09:22	1,098.87	6,164.44	21,088.86	9,024.60	3,011.42	5,429.70	2,419.92	66,407.00	2,695.29	3,135.32	1,434.14	32,409.60
2010:09:29	1,125.07	6,261.87	21,725.64	9,516.56	3,071.03	5,555.60	2,439.28	68,107.00	2,652.50	3,357.03	1,472.95	33,046.69
2010:10:06	1,134.28	6,208.33	22,047.71	9,566.32	3,096.10	5,551.90	2,531.64	68,325.00	2,627.97	3,343.34	1,474.75	33,207.21
2010:10:13	1,144.73	6,246.92	22,378.67	9,559.38	3,106.03	5,569.30	2,641.41	69,228.00	2,610.68	3,495.46	1,461.78	33,186.76
2010:10:20	1,159.97	6,270.73	22,880.41	9,691.43	3,190.07	5,681.40	2,661.82	70,541.00	2,738.74	3,603.40	1,479.61	34,370.64
2010:10:27	1,178.10	6,434.52	23,457.69	9,403.51	3,202.16	5,747.40	2,729.54	71,675.00	2,861.36	3,611.98	1,496.97	34,798.65
2010:11:03	1,178.17	6,524.55	23,556.50	9,381.60	3,179.15	5,728.90	2,809.40	70,405.00	3,003.95	3,578.95	1,486.78	34,880.47
2010:11:10	1,182.45	6,568.00	23,164.58	9,387.03	3,124.38	5,646.00	2,954.86	70,569.00	2,997.05	3,624.47	1,499.11	35,262.90
2010:11:17	1,197.96	6,617.80	24,144.67	9,358.78	3,224.97	5,749.00	3,205.79	71,905.00	3,030.99	3,605.67	1,507.60	35,843.81
2010:11:24	1,218.71	6,719.84	24,500.61	9,830.52	3,289.24	5,816.90	3,310.97	71,638.00	3,115.36	3,756.97	1,528.01	36,417.47
2010:12:01	1,178.59	6,700.07	23,214.46	9,811.66	3,212.10	5,692.60	3,164.40	69,709.00	2,838.86	3,677.90	1,496.65	35,842.48
2010:12:08	1,198.35	6,823.80	23,023.86	10,030.11	3,137.01	5,657.10	3,283.42	69,629.00	2,859.94	3,658.78	1,488.54	37,079.28
2010:12:15	1,206.07	6,866.63	23,249.80	9,988.05	3,181.94	5,642.50	3,367.15	69,346.00	2,823.45	3,619.09	1,485.42	37,277.56
2010:12:22	1,228.28	6,975.87	23,092.52	10,232.33	3,202.80	5,794.50	3,368.73	68,175.00	2,848.55	3,769.99	1,510.06	37,617.77
2010:12:29	1,235.23	7,016.37	22,975.35	10,309.78	3,147.20	5,882.20	3,289.50	67,870.00	2,911.41	3,658.31	1,509.10	37,676.55
2011:01:05	1,258.84	7,067.92	23,045.19	10,346.48	3,144.31	5,983.50	3,476.26	68,471.00	2,877.90	3,620.68	1,515.05	38,172.91
2011:01:12	1,259.78	6,995.47	22,969.30	10,344.54	3,207.91	5,996.40	3,522.60	68,952.00	2,751.53	3,699.22	1,524.34	38,230.20
2011:01:19	1,276.56	6,939.82	23,757.82	10,380.77	3,254.25	6,043.90	3,604.80	71,091.00	2,839.22	3,783.71	1,566.17	38,696.24
2011:01:26	1,285.96	7,068.78	24,125.61	10,512.80	3,244.94	6,050.70	3,601.45	71,633.00	2,821.30	3,554.77	1,566.49	37,963.31
2011:02:02	1,281.92	7,082.76	24,419.62	10,557.10	3,241.96	5,976.70	3,636.90	70,058.00	2,758.10	3,517.27	1,566.51	37,810.16
2011:02:09	1,296.63	7,127.35	23,843.24	10,401.90	3,220.78	5,969.20	3,642.20	68,709.00	2,708.81	3,501.72	1,520.00	37,585.40
2011:02:16	1,304.03	7,183.67	23,908.96	10,457.36	3,211.12	6,000.10	3,640.98	66,688.00	2,708.81	3,480.83	1,531.82	37,948.75
2011:02:23	1,320.88	7,320.90	23,164.03	10,617.83	3,150.56	6,052.30	3,505.68	64,218.00	2,774.06	3,417.47	1,536.07	36,986.94
2011:03:02	1,336.32	7,414.30	23,156.97	10,808.29	3,094.72	6,085.30	3,545.39	67,571.00	2,923.90	3,416.78	1,506.30	37,074.93
2011:03:09	1,307.40	7,194.60	22,906.90	10,579.10	3,001.85	5,923.50	3,429.08	66,910.00	2,862.64	3,474.12	1,511.11	36,464.07
2011:03:16	1,308.44	7,181.12	23,048.66	10,492.38	3,027.51	5,914.90	3,426.28	67,282.00	2,913.81	3,486.20	1,499.28	36,863.53
2011:03:23	1,320.02	7,131.80	23,810.11	10,589.50	3,092.90	5,937.30	3,457.52	67,264.00	3,002.15	3,598.68	1,523.69	36,450.19
2011:03:30	1,256.88	6,513.84	22,700.88	9,093.72	2,971.00	5,598.20	3,197.53	66,003.00	2,930.80	3,531.48	1,492.44	35,655.31
2011:04:06	1,297.54	6,804.45	22,825.40	9,449.47	3,022.19	5,795.90	3,348.83	67,796.00	2,948.48	3,556.23	1,511.97	36,546.62
2011:04:13	1,328.26	7,057.15	23,451.43	9,708.79	3,095.32	5,948.30	3,376.44	67,997.00	2,955.77	3,640.98	1,531.63	37,210.27
2011:04:20	1,335.54	7,215.11	24,285.05	9,584.37	3,170.33	6,041.10	3,503.99	69,037.00	3,001.36	3,727.80	1,552.89	37,861.81
2011:04:27	1,314.41	7,177.97	24,135.03	9,641.18	3,172.08	6,010.40	3,407.24	66,486.00	3,050.40	3,734.41	1,535.59	37,347.69
2011:05:04	1,330.36	7,249.19	23,896.10	9,606.82	3,165.80	6,022.30	3,413.94	67,058.00	3,007.04	3,794.76	1,531.02	36,816.31
2011:05:11	1,355.66	7,404.95	23,892.84	9,691.84	3,182.68	6,068.20	3,377.29	66,264.00	2,925.41	3,804.93	1,529.91	36,826.93
2011:05:18	1,347.32	7,373.93	23,315.24	9,859.20	3,110.62	5,984.10	3,352.22	63,616.00	2,866.02	3,814.93	1,528.43	35,531.22
2011:05:25	1,342.08	7,495.05	23,291.80	9,864.26	3,177.18	5,976.00	3,384.57	63,776.00	2,883.42	3,838.14	1,536.03	35,380.53
2011:06:01	1,340.68	7,303.53	23,011.14	9,662.08	3,141.21	5,923.50	3,388.75	62,841.00	2,872.77	3,840.21	1,541.27	35,364.33
2011:06:08	1,320.47	7,170.94	22,747.28	9,422.88	3,118.65	5,870.10	3,268.55	63,388.00	2,741.74	3,780.16	1,533.57	35,498.42
2011:06:15	1,314.55	7,217.43	23,626.43	9,719.61	3,172.87	5,928.60	3,176.36	63,411.00	2,743.57	3,837.76	1,556.42	35,410.51
2011:06:22	1,279.56	7,060.23	22,661.63	9,449.46	3,102.98	5,808.90	3,123.29	63,033.00	2,750.29	3,825.82	1,551.79	34,879.07
2011:06:29	1,265.42	7,115.08	22,343.77	9,574.32	3,054.82	5,742.50	3,244.09	61,604.00	2,705.43	3,794.25	1,556.19	35,318.39
2011:07:06	1,287.14	7,278.19	21,859.97	9,629.43	3,042.83	5,773.00	3,333.58	61,194.00	2,649.32	3,821.83	1,567.35	35,399.44
2011:07:13	1,307.41	7,294.14	22,061.18	9,797.26	3,079.74	5,856.00	3,353.82	62,334.00	2,728.48	3,888.57	1,575.01	36,579.59
2011:07:20	1,339.22	7,431.19	22,517.55	10,082.48	3,114.71	6,002.90	3,461.75	62,565.00	2,810.48	3,908.96	1,591.34	36,468.01
2011:07:27	1,317.72	7,267.87	21,926.88	9,963.14	3,088.42	5,906.40	3,356.44	60,670.00	2,795.48	3,980.84	1,580.67	36,254.70
2011:08:03	1,325.84	7,221.36	22,003.69	10,005.90	3,126.53	5,853.80	3,335.56	59,120.00	2,794.21	4,050.63	1,562.59	35,341.67
2011:08:10	1,304.89	7,252.68	22,541.69	10,047.19	3,193.54	5,856.60	3,270.62	58,288.00	2,723.49	4,174.11	1,558.17	35,597.63
2011:08:17	1,260.34	6,640.59	21,992.72	9,637.14	3,130.34	5,584.50	3,308.75	56,017.00	2,678.49	4,136.51	1,545.10	34,484.37
2011:08:24	1,120.76	5,613.42	19,783.67	9,038.74	2,821.09	5,007.20	2,809.75	51,395.00	2,549.18	3,863.58	1,480.52	32,219.33
2011:08:31	1,193.89	5,948.94	20,289.03	9,057.26	2,828.53	5,331.60	2,993.83	55,073.00	2,601.26	4,020.99	1,503.07	34,049.58
2011:09:07	1,177.60	5,681.08	19,466.79	8,639.61	2,721.81	5,205.90	2,908.48	53,796.00	2,541.09	3,847.02	1,469.15	34,644.92
2011:09:14	1,218.89	5,784.85	20,534.85	8,955.20	2,885.26	5,394.50	2,964.79	56,495.00	2,567.34	3,841.73	1,474.09	35,721.10
2011:09:21	1,198.62	5,405.53	20,048.00	8,763.41	2,832.13	5,318.60	2,876.69	57,624.00	2,516.09	4,001.43	1,464.61	35,179.59
2011:09:28	1,188.68	5,340.19	19,045.44	8,518.57	2,739.35	5,227.00	2,750.11	56,286.00	2,484.83	3,799.04	1,437.61	34,661.78
2011:10:05	1,166.76	5,433.80	18,824.17	8,741.16	2,791.79	5,288.40	2,630.91	55,982.00	2,512.96	3,697.49	1,419.04	34,019.22
2011:10:12	1,151.06	5,578.42	18,011.06	8,615.65	2,701.17	5,217.60	2,514.56	53,270.00	2,392.06	3,513.17	1,371.55	33,438.16
2011:10:19	1,144.03	5,473.03	17,172.28	8,382.98	2,528.71	5,102.20	2,309.43	51,014.00	2,344.79	3,293.24	1,375.67	33,000.29
2011:10:26	1,207.25	5,994.47	18,329.46	8,738.90	2,737.75	5,441.80	2,539.08	54,601.00	2,420.00	3,635.93	1,428.50	34,470.36
2011:11:02	1,209.88	5,913.53	18,309.22	8,772.54	2,720.21	5,450.50	2,735.15	54,966.00	2,377.51	3,685.31	1,450.25	34,523.27
2011:11:09	1,242.00	6,016.07	19,066.54	8,748.47	2,769.94	5,553.20	2,880.78	57,144.00	2,427.48	3,738.61	1,470.93	35,818.58
2011:11:16	1,237.90	5,965.63	19,733.71	8,640.42	2,834.75	5,484.10	2,689.31	58,196.00	2,504.11	3,763.03	1,470.95	36,579.07
2011:11:23	1,229.10	5,829.54	20,014.43	8,755.44	2,858.66	5,460.40	2,676.44	57,550.00	2,524.92	3,857.36	1,489.64	36,553.85
2011:11:30	1,236.91	5,913.36	18,960.90	8,463.16	2,807.44	5,509.00	2,625.93	58,560.00	2,466.96	3,814.09	1,476.84	36,708.41
2011:12:07	1,161.79	5,457.77	17,864.43	8,165.18	2,676.57	5,139.80	2,410.76	54,972.00	2,395.06	3,687.01	1,433.17	35,375.61
2011:12:14	1,246.96	6,088.84	17,989.35	8,434.61	2,702.46	5,505.40	2,562.85	56,875.00	2,333.41	3,715.08	1,472.10	36,829.15
2011:12:21	1,261.01	5,994.73	19,240.58	8,722.17	2,782.55	5,546.90	2,558.11	58,663.00	2,332.73	3,793.24	1,482.99	37,054.56
2011:12:28	1,211.82	5,675.14	18,354.43	8,519.13	2,672.39	5,366.80	2,408.43	56,647.00	2,228.52	3,751.60	1,463.12	36,012.67
2012:01:04	1,243.72	5,791.53	18,416.45	8,459.98	2,673.32	5,389.70	2,440.87	56,653.00	2,191.15	3,794.27	1,484.98	36,628.06
2012:01:11	1,249.64	5,771.27	18,518.67	8,423.62	2,666.25	5,507.40	2,425.98	56,534.00	2,170.01	3,769.21	1,504.11	36,644.86
2012:01:18	1,277.30	6,111.55	18,727.31	8,560.11	2,711.02	5,668.50	2,715.46	59,365.00	2,169.39	3,907.42	1,504.22	37,387.63
2012:01:25	1,292.48	6,152.34	19,151.94	8,447.88	2,747.13	5,670.80	2,825.73	59,962.00	2,276.05	3,909.64	1,522.29	37,307.64
2012:02:01	1,308.04	6,354.57	19,686.92	8,550.58	2,795.40	5,702.40	2,862.24	61,723.00	2,266.38	3,978.13	1,517.38	37,506.76
2012:02:08	1,326.06	6,421.85	20,439.14	8,883.69	2,891.64	5,723.00	2,914.93	62,953.00	2,285.04	3,963.60	1,519.76	37,212.86
2012:02:15	1,324.09	6,616.64	20,333.37	8,809.79	2,904.76	5,790.70	2,837.06	64,567.00	2,268.08	3,964.98	1,537.09	37,709.65
2012:02:22	1,349.96	6,748.76	21,018.46	9,015.59	2,982.20	5,875.90	2,720.15	65,831.00	2,347.53	3,988.70	1,553.18	38,140.55
2012:02:29	1,343.23	6,757.94	21,365.23	9,260.34	3,011.68	5,892.20	2,725.47	65,368.00	2,366.70	3,953.04	1,561.30	37,864.55
2012:03:07	1,357.66	6,843.87	21,549.28	9,554.00	2,995.59	5,916.50	2,838.62	66,093.00	2,403.59	3,995.02	1,560.52	37,912.55

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DATA FOR CHAPTER 5

Date	GSPC	GDAXI	HSI	N225	STI	FTSE	MERV	BVSP	SSEC	JKSE	KLSE	MXX
2012:03:14	1,365.68	6,856.08	21,680.08	9,723.24	2,994.06	5,871.50	2,648.22	65,812.00	2,428.49	3,985.21	1,569.65	37,816.69
2012:03:21	1,352.63	6,671.11	20,627.78	9,576.06	2,913.16	5,791.40	2,687.97	66,017.00	2,394.79	3,942.52	1,574.83	37,548.54
2012:03:28	1,394.28	7,079.42	21,307.89	10,050.52	3,026.40	5,945.40	2,709.60	68,257.00	2,391.23	4,054.33	1,575.71	37,971.44
2012:04:04	1,402.89	7,071.32	20,856.63	10,086.49	3,005.63	5,892.00	2,718.83	66,860.00	2,378.20	4,036.23	1,582.53	38,434.51
2012:04:11	1,405.54	6,998.80	20,885.42	10,182.57	3,010.49	5,809.00	2,684.18	65,079.00	2,284.88	4,090.57	1,583.75	38,910.68
2012:04:18	1,398.96	6,784.06	20,593.00	9,819.99	2,985.04	5,703.80	2,557.46	63,529.00	2,302.24	4,134.04	1,599.27	39,398.88
2012:04:25	1,368.71	6,674.73	20,140.67	9,458.74	2,949.25	5,634.70	2,503.90	61,293.00	2,308.93	4,130.01	1,601.27	39,167.14
2012:05:02	1,385.14	6,732.03	20,780.73	9,667.26	3,000.58	5,745.30	2,357.67	63,010.00	2,380.85	4,166.24	1,598.86	39,330.12
2012:05:09	1,390.69	6,704.50	20,646.29	9,561.01	2,979.78	5,718.90	2,277.08	61,750.00	2,406.81	4,163.64	1,579.35	39,066.01
2012:05:16	1,402.31	6,710.77	21,309.08	9,380.25	3,006.14	5,758.10	2,241.71	62,424.00	2,438.44	4,219.29	1,582.39	39,597.42
2012:05:23	1,354.58	6,475.31	20,330.64	9,045.06	2,900.91	5,530.00	2,335.01	59,786.00	2,408.59	4,129.06	1,584.90	39,122.82
2012:05:30	1,324.80	6,384.26	19,259.83	8,801.17	2,831.15	5,405.30	2,160.44	55,888.00	2,346.19	3,980.50	1,536.04	37,511.08
2012:06:06	1,318.86	6,285.75	18,786.19	8,556.60	2,780.42	5,266.40	2,288.60	54,619.00	2,363.44	3,981.58	1,539.71	37,422.38
2012:06:13	1,313.32	6,280.80	18,690.22	8,633.19	2,783.95	5,297.30	2,264.92	53,798.00	2,384.67	3,917.92	1,575.17	38,070.67
2012:06:20	1,315.13	6,093.99	18,520.53	8,533.53	2,760.83	5,384.10	2,221.52	54,156.00	2,309.55	3,841.33	1,569.43	37,274.79
2012:06:27	1,314.88	6,152.49	19,026.52	8,587.84	2,786.88	5,483.80	2,151.14	55,651.00	2,318.92	3,860.46	1,576.23	37,142.15
2012:07:04	1,355.69	6,392.13	19,518.85	8,752.31	2,855.68	5,622.30	2,311.43	57,167.00	2,292.88	3,943.90	1,604.39	38,973.64
2012:07:11	1,331.85	6,228.99	19,176.95	8,730.49	2,841.60	5,523.90	2,279.52	53,109.00	2,216.93	3,934.87	1,601.89	39,490.68
2012:07:18	1,367.58	6,564.80	19,709.75	9,104.17	2,971.47	5,684.50	2,426.56	56,077.00	2,227.31	4,075.92	1,613.75	40,353.43
2012:07:25	1,341.45	6,453.85	19,419.87	8,851.00	2,989.31	5,664.50	2,361.96	53,569.00	2,175.38	4,019.13	1,629.45	40,221.80
2012:07:18	1,372.78	6,684.42	19,239.88	8,726.74	3,017.21	5,685.80	2,496.67	54,583.00	2,169.10	4,081.64	1,645.00	40,747.47
2012:07:25	1,337.89	6,406.52	18,877.33	8,365.90	2,990.92	5,498.30	2,398.82	52,608.00	2,136.15	4,000.84	1,635.09	40,435.10

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DATA FOR CHAPTER 5

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
1997:07:16	0.10604	1.118294	0.129100	0.008742	0.699600	1.659200	1.000600	0.928500	0.120600	0.000411	0.396200	0.125800
1997:07:23	0.10354	1.110859	0.129200	0.008869	0.696300	1.686800	1.000600	0.926400	0.120600	0.000411	0.399600	0.126800
1997:07:30	0.10500	1.091686	0.129100	0.008643	0.692600	1.676400	1.000600	0.925500	0.120600	0.000407	0.389200	0.126400
1997:08:06	0.10521	1.070166	0.129100	0.008666	0.684200	1.681700	1.000600	0.924500	0.120600	0.000390	0.380100	0.127900
1997:08:13	0.10604	1.063709	0.129100	0.008440	0.683800	1.627000	1.000000	0.923400	0.120600	0.000388	0.381000	0.128700
1997:08:20	0.10708	1.039450	0.129200	0.008393	0.679600	1.600700	1.000000	0.922500	0.120600	0.000386	0.379100	0.128600
1997:08:27	0.10771	1.059405	0.129100	0.008602	0.661400	1.579900	1.000000	0.921000	0.120600	0.000376	0.360100	0.128600
1997:09:03	0.10604	1.056862	0.129200	0.008475	0.663300	1.596300	1.000000	0.918700	0.120600	0.000360	0.360500	0.129000
1997:09:10	0.10688	1.085034	0.129200	0.008414	0.667300	1.609100	1.000000	0.916100	0.120600	0.000352	0.356400	0.129000
1997:09:17	0.10438	1.074274	0.129100	0.008256	0.659000	1.591800	1.000000	0.915700	0.120600	0.000331	0.338000	0.128800
1997:09:24	0.10333	1.083665	0.129100	0.008389	0.663000	1.586500	1.000000	0.916300	0.120600	0.000342	0.342500	0.128700
1997:10:01	0.10354	1.104403	0.129100	0.008294	0.659200	1.598800	1.000000	0.914600	0.120700	0.000336	0.332100	0.129000
1997:10:08	0.10000	1.102055	0.129200	0.008337	0.661600	1.615300	1.000000	0.913200	0.120700	0.000334	0.328700	0.127900
1997:10:15	0.10333	1.108903	0.129300	0.008282	0.650800	1.615000	1.000000	0.912200	0.120700	0.000298	0.297600	0.129000
1997:10:22	0.10333	1.112620	0.129300	0.008245	0.642300	1.621800	1.000000	0.911300	0.120700	0.000275	0.314300	0.129000
1997:10:29	0.10250	1.116924	0.129200	0.008244	0.646700	1.619500	1.000000	0.909900	0.120700	0.000283	0.319200	0.129400
1997:11:05	0.10417	1.095795	0.129100	0.008286	0.631100	1.632400	1.000000	0.908800	0.120700	0.000274	0.295000	0.129600
1997:11:12	0.10521	1.124554	0.129400	0.008306	0.634100	1.667200	1.000000	0.907700	0.120700	0.000277	0.295100	0.122400
1997:11:19	0.10667	1.133163	0.129300	0.008160	0.637300	1.679100	1.000100	0.906100	0.120700	0.000303	0.303500	0.122400
1997:11:26	0.10729	1.142358	0.129400	0.007954	0.635300	1.709000	1.000100	0.904200	0.120800	0.000299	0.303200	0.119500
1997:12:03	0.10688	1.129837	0.129400	0.007866	0.627300	1.688900	0.999900	0.903000	0.120800	0.000286	0.289400	0.120800
1997:12:10	0.10604	1.113990	0.129400	0.007859	0.626900	1.673000	0.999900	0.901100	0.120800	0.000273	0.286000	0.121900
1997:12:17	0.10625	1.104403	0.129200	0.007775	0.620000	1.683000	0.999900	0.900900	0.120800	0.000255	0.274700	0.123100
1997:12:24	0.10542	1.095795	0.129200	0.007751	0.616300	1.649100	0.999900	0.898700	0.120800	0.000226	0.273400	0.122900
1997:12:31	0.10604	1.107338	0.129000	0.007874	0.592900	1.650600	1.000300	0.898100	0.120800	0.000183	0.260800	0.123900
1998:01:07	0.10875	1.102838	0.129000	0.007698	0.598300	1.669200	1.000200	0.897300	0.120800	0.000169	0.259400	0.122600
1998:01:14	0.10833	1.092273	0.129100	0.007683	0.596300	1.650500	1.000200	0.896100	0.120800	0.000184	0.258400	0.124100
1998:01:21	0.10604	1.071535	0.129200	0.007551	0.563700	1.623800	1.000300	0.895300	0.120800	0.000123	0.217900	0.124100
1998:01:28	0.10500	1.071731	0.129100	0.007638	0.574900	1.630200	1.000300	0.894100	0.120800	0.000134	0.232000	0.122400
1998:02:04	0.10396	1.068405	0.129300	0.007822	0.568500	1.627000	1.000200	0.892700	0.120800	0.000087	0.228100	0.121000
1998:02:11	0.10583	1.083861	0.129300	0.007967	0.582600	1.638100	1.000200	0.891100	0.120800	0.000074	0.230400	0.119500
1998:02:18	0.10354	1.078578	0.129300	0.008016	0.594900	1.649800	1.000200	0.889700	0.120800	0.000112	0.253200	0.118900
1998:02:25	0.10563	1.076035	0.129200	0.008072	0.614600	1.629400	1.000200	0.888100	0.120800	0.000135	0.286500	0.118600
1998:03:04	0.10521	1.072905	0.129200	0.007921	0.603900	1.638800	1.000200	0.886400	0.120800	0.000111	0.261800	0.117200
1998:03:11	0.10771	1.085230	0.129100	0.007825	0.612700	1.648200	1.000200	0.885500	0.120800	0.000108	0.268500	0.116600
1998:03:18	0.10479	1.077404	0.129200	0.007930	0.613300	1.648400	1.000600	0.884300	0.120800	0.000109	0.265300	0.116600
1998:03:25	0.10292	1.067231	0.129100	0.007762	0.614800	1.641400	1.000600	0.883400	0.120800	0.000099	0.258700	0.115600
1998:04:01	0.10458	1.073687	0.129100	0.007680	0.622700	1.672600	1.000600	0.881900	0.120800	0.000098	0.273200	0.116900
1998:04:08	0.10458	1.070166	0.129100	0.007715	0.623900	1.674100	1.000600	0.880900	0.120800	0.000121	0.277000	0.117400
1998:04:15	0.10354	1.057840	0.129100	0.007501	0.618600	1.673300	1.000600	0.879500	0.120800	0.000117	0.274000	0.117600
1998:04:22	0.10354	1.068600	0.129100	0.007529	0.623400	1.668500	1.000600	0.878000	0.120800	0.000118	0.268800	0.117600
1998:04:29	0.10313	1.086208	0.129000	0.007737	0.626400	1.684100	1.000600	0.877000	0.120800	0.000128	0.269900	0.118100
1998:05:06	0.10292	1.090904	0.129000	0.007654	0.630700	1.674200	1.000600	0.875600	0.120800	0.000128	0.267500	0.118200
1998:05:13	0.10271	1.088556	0.129100	0.007560	0.629700	1.668900	1.000600	0.873600	0.120800	0.000124	0.266800	0.117700
1998:05:20	0.10396	1.105186	0.129100	0.007545	0.627000	1.661500	1.000600	0.874500	0.120800	0.000125	0.265300	0.118100
1998:05:27	0.10375	1.099903	0.129100	0.007458	0.603900	1.635000	1.000100	0.871900	0.120800	0.000099	0.257400	0.117500
1998:06:03	0.10542	1.101273	0.129000	0.007353	0.608800	1.627400	1.000100	0.870700	0.120800	0.000091	0.262600	0.116100
1998:06:10	0.10313	1.107729	0.129100	0.007270	0.602800	1.638000	1.000100	0.869000	0.120800	0.000096	0.261000	0.112700
1998:06:17	0.10396	1.103229	0.129100	0.007246	0.597600	1.636300	1.000100	0.868600	0.120800	0.000087	0.255600	0.113800
1998:06:24	0.10417	1.095990	0.129100	0.007103	0.579400	1.634900	1.000100	0.866500	0.120800	0.000080	0.250300	0.112600
1998:07:01	0.10583	1.091099	0.129100	0.007030	0.581200	1.658000	1.000100	0.865900	0.120800	0.000063	0.247900	0.112700
1998:07:08	0.10229	1.086404	0.129100	0.007129	0.604200	1.667500	1.000100	0.865400	0.120800	0.000068	0.253300	0.112100
1998:07:15	0.10313	1.077796	0.129100	0.007231	0.593300	1.662100	1.000100	0.864500	0.120800	0.000069	0.242700	0.111900
1998:07:22	0.10313	1.077404	0.129100	0.007184	0.589300	1.638200	1.000100	0.862000	0.120800	0.000068	0.240400	0.112100
1998:07:29	0.10417	1.086600	0.129100	0.007110	0.590300	1.637500	1.000100	0.861300	0.120800	0.000070	0.240700	0.113000
1998:08:05	0.10271	1.094230	0.129100	0.007106	0.584800	1.642400	1.000100	0.860200	0.120800	0.000071	0.241200	0.112800
1998:08:12	0.10271	1.104403	0.129100	0.007065	0.583600	1.645500	1.000100	0.860100	0.120800	0.000076	0.243300	0.112200
1998:08:19	0.10292	1.105381	0.129000	0.006952	0.580600	1.638500	1.000200	0.856900	0.120900	0.000079	0.241900	0.111100
1998:08:26	0.10208	1.102251	0.129100	0.006854	0.572200	1.630500	1.000500	0.854400	0.120800	0.000078	0.238400	0.108900
1998:09:02	0.10271	1.086600	0.129100	0.006933	0.569200	1.619500	1.000500	0.851900	0.120800	0.000085	0.238000	0.108900
1998:09:09	0.10250	1.084056	0.129100	0.006918	0.563700	1.638000	1.000000	0.853200	0.120800	0.000090	0.237200	0.102000
1998:09:16	0.09937	1.116924	0.129100	0.007266	0.576900	1.668200	1.000000	0.849600	0.120800	0.000094	0.263200	0.100500
1998:09:23	0.09896	1.129250	0.129000	0.007490	0.579000	1.658000	1.000000	0.848300	0.120800	0.000085	0.263200	0.096730
1998:09:30	0.09646	1.153509	0.129100	0.007416	0.579900	1.674300	1.000000	0.847700	0.120800	0.000092	0.263200	0.099400
1998:10:07	0.09521	1.159770	0.129100	0.007329	0.578400	1.680900	1.000500	0.845000	0.120800	0.000091	0.263200	0.098960
1998:10:14	0.08854	1.169356	0.129100	0.007369	0.593300	1.699000	1.000500	0.843800	0.120800	0.000094	0.263200	0.098090
1998:10:21	0.08438	1.210441	0.129100	0.008024	0.600600	1.690600	1.000500	0.845500	0.120800	0.000104	0.263200	0.098260
1998:10:28	0.08167	1.193812	0.129100	0.008377	0.616800	1.702600	1.000500	0.841500	0.120800	0.000114	0.263200	0.098380
1998:11:04	0.08125	1.192247	0.129100	0.008604	0.617500	1.704200	1.000500	0.840800	0.120800	0.000141	0.263200	0.099800
1998:11:11	0.08708	1.184421	0.129100	0.008497	0.616100	1.675200	1.000500	0.839000	0.120800	0.000134	0.263200	0.098570
1998:11:18	0.09271	1.173856	0.129100	0.008570	0.616700	1.654000	1.000000	0.840100	0.120800	0.000114	0.263200	0.100700
1998:11:25	0.09146	1.163096	0.129200	0.008218	0.606600	1.660000	1.000000	0.840100	0.120800	0.000129	0.263200	0.099940
1998:12:02	0.09000	1.173269	0.129100	0.008245	0.611900	1.674200	1.000000	0.839800	0.120800	0.000137	0.263200	0.100800
1998:12:09	0.09271	1.149988	0.129100	0.008269	0.610700	1.662000	1.000000	0.834900	0.120800	0.000134	0.263200	0.100700
1998:12:16	0.09104	1.164661	0.129100	0.008222	0.606100	1.653400	1.000000	0.832700	0.120800	0.000135	0.263200	0.100300
1998:12:23	0.08979	1.173269	0.129100	0.008451	0.605400	1.658300	1.000000	0.831300	0.120800	0.000135	0.263200	0.100500
1998:12:30	0.09042	1.177769	0.129100	0.008630	0.605800	1.680200	1.000200	0.830000	0.120800	0.000129	0.263200	0.101300
1999:01:06	0.09292	1.170530	0.129200	0.008618	0.604900	1.678600	1.000200	0.828300	0.120800	0.000129	0.263200	0.101900
1999:01:13	0.09229	1.171313	0.129100	0.008685	0.603300	1.674100	1.001000	0.827900	0.120800	0.000125	0.263500	0.100800
1999:01:20	0.09104	1.174400	0.129100	0.008904	0.597000	1.656800	1.000100	0.827100	0.120800	0.000127	0.263200	0.102400
1999:01:27	0.09042	1.169400	0.129100	0.008902	0.593500	1.649200	1.000100	0.760500	0.120800	0.000120	0.263200	0.095150
1999:02:03	0.08938	1.157600	0.129100	0.008815	0.595300	1.651300	1.000100	0.636900	0.120800	0.000119	0.263900	0.098310
1999:02:10	0.09083	1.152100	0.129100	0.008740	0.593300	1.653800	1.000100	0.531900	0.120800	0.000109	0.263200	0.098430
1999:02:17	0.09083	1.134000	0.129100	0.008913	0.592900	1.637500	0.996900	0.565000	0.120800	0.000117	0.263200	0.098940
1999:02:24	0.09104	1.132500	0.129100	0.008687	0.590800	1.631800	1.000400	0.531900	0.120800	0.000117	0.263200	0.099700

APPENDIX - C6
DATA FOR CHAPTER 5

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
1999:03:03	0.09188	1.123800	0.129100	0.008432	0.589300	1.636300	1.000400	0.523600	0.120800	0.000115	0.263200	0.101100
1999:03:10	0.09458	1.099200	0.129100	0.008237	0.579900	1.604500	1.000400	0.500000	0.120800	0.000114	0.263200	0.100700
1999:03:17	0.09458	1.091500	0.129100	0.008249	0.576400	1.617100	1.000300	0.460800	0.120800	0.000113	0.263200	0.100400
1999:03:24	0.09312	1.095400	0.129100	0.008313	0.578000	1.623500	1.000300	0.537600	0.120800	0.000111	0.263200	0.102400
1999:03:31	0.09167	1.098500	0.129000	0.008435	0.579800	1.628000	1.000100	0.533300	0.120800	0.000112	0.263200	0.103300
1999:04:07	0.09125	1.092800	0.129100	0.008507	0.578500	1.638200	1.000100	0.543500	0.120800	0.000113	0.263200	0.103300
1999:04:14	0.09083	1.073900	0.129000	0.008396	0.578000	1.613000	1.000100	0.583100	0.120800	0.000116	0.263200	0.105200
1999:04:21	0.08917	1.079600	0.129000	0.008262	0.576700	1.595200	1.000100	0.579700	0.120800	0.000115	0.263200	0.105400
1999:04:28	0.08667	1.080600	0.129000	0.008397	0.588500	1.618600	1.000100	0.602400	0.120800	0.000116	0.263200	0.105200
1999:05:05	0.08833	1.061300	0.129100	0.008395	0.584400	1.607900	1.000100	0.581400	0.120800	0.000116	0.263200	0.106800
1999:05:12	0.09125	1.067300	0.129000	0.008398	0.589800	1.618700	1.000100	0.590000	0.120800	0.000118	0.263200	0.107700
1999:05:19	0.09333	1.066500	0.129000	0.008275	0.587900	1.629800	1.000100	0.594200	0.120800	0.000124	0.263200	0.107600
1999:05:26	0.09312	1.066600	0.129000	0.008275	0.588700	1.619500	1.000100	0.602400	0.120800	0.000128	0.263200	0.107400
1999:06:02	0.09375	1.064500	0.129000	0.008052	0.582900	1.618600	1.000200	0.601000	0.120800	0.000125	0.263200	0.107500
1999:06:09	0.09417	1.055900	0.129000	0.008200	0.578400	1.601800	1.000200	0.582400	0.120800	0.000124	0.263200	0.103700
1999:06:16	0.09583	1.036900	0.128900	0.008271	0.579800	1.611200	1.000200	0.579000	0.120800	0.000124	0.263200	0.103300
1999:06:23	0.09312	1.046400	0.128900	0.008386	0.584400	1.604000	1.000200	0.579000	0.120800	0.000124	0.263200	0.103300
1999:06:30	0.09479	1.035300	0.128900	0.008310	0.586300	1.590000	1.000200	0.566300	0.120800	0.000138	0.263200	0.105700
1999:07:07	0.09563	1.031600	0.128900	0.008196	0.587600	1.581200	1.000200	0.560500	0.120800	0.000150	0.263200	0.106400
1999:07:14	0.09729	1.033000	0.128900	0.008273	0.588100	1.575800	1.000200	0.557700	0.120800	0.000146	0.263200	0.105600
1999:07:21	0.09438	1.023500	0.128900	0.008191	0.589500	1.560700	1.000200	0.562400	0.120800	0.000149	0.263200	0.107500
1999:07:28	0.09542	1.017600	0.128900	0.008271	0.588900	1.558500	1.000200	0.551600	0.120800	0.000150	0.263200	0.107200
1999:08:04	0.09312	1.046600	0.128900	0.008413	0.588900	1.573500	1.000200	0.558000	0.120800	0.000149	0.263200	0.107100
1999:08:11	0.09521	1.062400	0.128800	0.008620	0.595300	1.591100	1.000200	0.559000	0.120800	0.000145	0.263200	0.106700
1999:08:18	0.09708	1.077200	0.128800	0.008724	0.594200	1.623200	1.000200	0.547900	0.120800	0.000145	0.263200	0.105900
1999:08:25	0.09937	1.068700	0.128800	0.008696	0.599300	1.612400	1.000200	0.547900	0.120800	0.000145	0.263200	0.105900
1999:09:01	0.09646	1.053600	0.128800	0.008846	0.596400	1.605100	1.000200	0.528300	0.120800	0.000133	0.263200	0.107300
1999:09:08	0.09979	1.045000	0.128800	0.009003	0.591500	1.589200	1.000200	0.517300	0.120800	0.000132	0.263200	0.107600
1999:09:15	0.10042	1.061300	0.128800	0.009145	0.594700	1.609400	1.000100	0.514100	0.120800	0.000132	0.263200	0.106400
1999:09:22	0.10042	1.060400	0.128800	0.009016	0.590600	1.614600	1.000700	0.527400	0.120800	0.000118	0.263200	0.107000
1999:09:29	0.09625	1.035800	0.128800	0.009584	0.592300	1.606500	1.000700	0.532500	0.120800	0.000124	0.263200	0.107500
1999:10:06	0.09750	1.050900	0.128800	0.009591	0.585900	1.634600	1.000700	0.529100	0.120800	0.000120	0.263200	0.107800
1999:10:13	0.09750	1.055500	0.128700	0.009363	0.584800	1.645800	1.000200	0.520000	0.120800	0.000120	0.263200	0.107000
1999:10:20	0.09729	1.073100	0.128700	0.009310	0.595900	1.655900	1.000200	0.511000	0.120800	0.000129	0.263200	0.105900
1999:10:27	0.10083	1.077400	0.128700	0.009363	0.594400	1.655400	1.000200	0.517300	0.120800	0.000130	0.263200	0.105700
1999:11:03	0.10083	1.078400	0.128700	0.009417	0.598100	1.668400	1.000200	0.499300	0.120800	0.000139	0.263200	0.104000
1999:11:10	0.10396	1.057700	0.128700	0.009602	0.600100	1.652500	1.000200	0.501300	0.120800	0.000148	0.263200	0.103700
1999:11:17	0.10354	1.050200	0.128700	0.009613	0.599100	1.648200	1.000200	0.515200	0.120800	0.000149	0.263200	0.105100
1999:11:24	0.10521	1.041100	0.128700	0.009544	0.597900	1.623400	1.000200	0.518100	0.120800	0.000144	0.263200	0.106400
1999:12:01	0.10604	1.041000	0.128700	0.009480	0.598600	1.625200	1.000200	0.517300	0.120800	0.000143	0.263200	0.107000
1999:12:08	0.10688	1.023500	0.128700	0.009570	0.599600	1.615800	1.000200	0.518700	0.120800	0.000141	0.263200	0.107600
1999:12:15	0.10625	1.009800	0.128700	0.009777	0.595200	1.600000	1.000200	0.520000	0.121400	0.000138	0.263200	0.107500
1999:12:22	0.10542	1.025200	0.128600	0.009732	0.595800	1.626800	1.000200	0.536500	0.121400	0.000139	0.263200	0.105800
1999:12:29	0.10792	1.004000	0.128600	0.009661	0.595400	1.607000	1.000500	0.540500	0.120800	0.000139	0.263200	0.106700
2000:01:05	0.11208	1.008500	0.128700	0.009837	0.600000	1.611000	1.000500	0.550100	0.120800	0.000141	0.263200	0.107400
2000:01:12	0.10604	1.007000	0.128600	0.009775	0.600800	1.615200	1.000200	0.547000	0.120800	0.000141	0.263200	0.105900
2000:01:19	0.10979	1.031100	0.128600	0.009684	0.604400	1.635900	1.000200	0.541100	0.120800	0.000140	0.263200	0.104600
2000:01:26	0.11000	1.033500	0.128600	0.009431	0.599400	1.648700	1.000200	0.549100	0.120800	0.000138	0.263200	0.105100
2000:02:02	0.11146	1.013500	0.128600	0.009464	0.597400	1.637800	1.000200	0.558000	0.120800	0.000138	0.263200	0.106400
2000:02:09	0.11271	1.001600	0.128500	0.009435	0.593000	1.645500	1.000200	0.563100	0.120800	0.000136	0.263200	0.105100
2000:02:16	0.11458	0.972300	0.128500	0.009281	0.588700	1.615900	1.000200	0.559300	0.120800	0.000134	0.263200	0.104400
2000:02:23	0.11438	0.986700	0.128500	0.009136	0.589600	1.612700	1.000200	0.566900	0.120800	0.000136	0.263200	0.106500
2000:03:01	0.11563	0.981800	0.128500	0.009170	0.590200	1.596700	1.000200	0.563100	0.120800	0.000139	0.263200	0.107000
2000:03:08	0.11750	1.003500	0.128500	0.009023	0.585100	1.613200	1.000200	0.560200	0.120800	0.000134	0.263200	0.106100
2000:03:15	0.11667	0.965100	0.128500	0.009077	0.580200	1.578900	1.000200	0.565900	0.120800	0.000135	0.263200	0.106800
2000:03:22	0.11813	0.959500	0.128500	0.009423	0.582400	1.580200	1.000200	0.573400	0.120800	0.000135	0.263200	0.107800
2000:03:29	0.11854	0.968000	0.128500	0.009510	0.584900	1.577400	1.000200	0.575400	0.120800	0.000135	0.263200	0.107200
2000:04:05	0.11958	0.964700	0.128500	0.009352	0.581900	1.573300	1.000200	0.576400	0.120800	0.000134	0.263200	0.107700
2000:04:12	0.11917	0.961700	0.128500	0.009449	0.583300	1.589300	1.000200	0.574400	0.120800	0.000132	0.263200	0.108600
2000:04:19	0.11875	0.962600	0.128400	0.009534	0.582900	1.598000	1.000200	0.573100	0.120800	0.000130	0.263200	0.107200
2000:04:26	0.11813	0.959400	0.128400	0.009350	0.581700	1.586200	1.000200	0.573800	0.120800	0.000131	0.263200	0.106600
2000:05:03	0.11750	0.947200	0.128400	0.009551	0.589000	1.579400	1.000200	0.567800	0.120800	0.000129	0.263200	0.106500
2000:05:10	0.11646	0.921200	0.128400	0.009445	0.586900	1.581600	1.000200	0.559300	0.120800	0.000126	0.263200	0.106400
2000:05:17	0.11958	0.909000	0.128400	0.009220	0.582400	1.560300	1.000200	0.554800	0.120800	0.000125	0.263200	0.107100
2000:05:24	0.12354	0.907700	0.128400	0.009159	0.578800	1.531700	1.000200	0.552500	0.120800	0.000124	0.263200	0.105100
2000:05:31	0.12313	0.902300	0.128400	0.009128	0.577200	1.494200	1.000200	0.550100	0.120800	0.000117	0.263200	0.105200
2000:06:07	0.11958	0.906900	0.128300	0.009391	0.576900	1.478000	1.000200	0.540500	0.120800	0.000119	0.263200	0.104900
2000:06:14	0.11438	0.930000	0.128300	0.009274	0.577600	1.496100	1.000200	0.546700	0.120800	0.000116	0.263200	0.105200
2000:06:21	0.11979	0.954400	0.128300	0.009274	0.581700	1.528900	1.000200	0.556500	0.120800	0.000117	0.263200	0.102500
2000:06:28	0.11792	0.960900	0.128300	0.009351	0.581300	1.509200	1.000200	0.552300	0.120800	0.000117	0.263200	0.102100
2000:07:05	0.11750	0.956800	0.128300	0.009482	0.577000	1.518900	1.000200	0.555600	0.120800	0.000116	0.263200	0.101400
2000:07:12	0.11813	0.946300	0.128300	0.009494	0.577200	1.505900	1.000200	0.548800	0.120800	0.000115	0.263200	0.099450
2000:07:19	0.12104	0.951900	0.128300	0.009429	0.577000	1.515800	1.000200	0.553100	0.120800	0.000112	0.263200	0.105200
2000:07:26	0.12479	0.953000	0.128300	0.009335	0.573800	1.517000	1.000200	0.554900	0.120800	0.000107	0.263200	0.105600
2000:08:02	0.12458	0.926400	0.128300	0.009235	0.572800	1.497600	1.000200	0.556800	0.120800	0.000108	0.263200	0.107100
2000:08:09	0.12479	0.938300	0.128300	0.009162	0.573200	1.516100	1.000200	0.557800	0.120800	0.000110	0.263200	0.106900
2000:08:16	0.12604	0.914300	0.128200	0.009154	0.578200	1.492500	1.000200	0.559500	0.120800	0.000112	0.263200	0.107100
2000:08:23	0.12604	0.902200	0.128200	0.009212	0.579600	1.504900	1.000200	0.558000	0.120800	0.000116	0.263200	0.107200
2000:08:30	0.12667	0.913400	0.128200	0.009170	0.581700	1.504900	1.000200	0.554900	0.120800	0.000121	0.263200	0.108500
2000:09:06	0.12688	0.897200	0.128200	0.009241	0.583100	1.483900	1.000200	0.551000	0.120800	0.000124	0.263200	0.108200
2000:09:13	0.12750	0.892800	0.128200	0.009425	0.581200	1.457000	1.000200	0.547600	0.120800	0.000119	0.263200	0.108400
2000:09:20	0.12521	0.890800	0.128200	0.009453	0.579200	1.455300	1.000200	0.549100	0.120800	0.000120	0.263200	0.107900
2000:09:27	0.12313	0.862600	0.128200	0.009354	0.574500	1.406600	1.000200	0.546800	0.120800	0.000116	0.263200	0.108200
2000:10:04	0.12438	0.851600	0.128200	0.009353	0.574100	1.410800	1.000200	0.540200	0.120800	0.000116	0.263200	0.106500
2000:10:11	0.12521	0.883000	0.128200	0.009296	0.574300	1.464200	1.000200	0.540800	0.120800	0.000114	0.263200	0.106200

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2000:10:18	0.12583	0.879300	0.128300	0.009205	0.574300	1.467500	1.000200	0.540200	0.120800	0.000114	0.263200	0.106300
2000:10:25	0.12583	0.871900	0.128200	0.009278	0.571800	1.456200	1.000200	0.538200	0.120800	0.000113	0.263200	0.105700
2000:11:01	0.12750	0.855100	0.128200	0.009262	0.569700	1.451400	1.000200	0.534700	0.120800	0.000113	0.263200	0.104700
2000:11:08	0.12875	0.837400	0.128200	0.009271	0.571300	1.450700	1.000200	0.524100	0.120800	0.000112	0.263200	0.104300
2000:11:15	0.12854	0.849000	0.128200	0.009170	0.570100	1.448900	1.000200	0.526600	0.120800	0.000107	0.263200	0.104600
2000:11:22	0.12938	0.860700	0.128200	0.009349	0.576100	1.434800	1.000300	0.512100	0.120800	0.000108	0.263200	0.104100
2000:11:29	0.12854	0.858200	0.128200	0.009251	0.573700	1.431400	1.000200	0.512600	0.120800	0.000107	0.263200	0.105300
2000:12:06	0.12854	0.843700	0.128200	0.009078	0.569500	1.418000	1.000200	0.521400	0.120800	0.000106	0.263200	0.106700
2000:12:13	0.12604	0.856600	0.128200	0.009082	0.569700	1.416700	1.000200	0.508600	0.120800	0.000106	0.263200	0.106100
2000:12:20	0.12292	0.880500	0.128200	0.009000	0.574200	1.434500	1.000200	0.511100	0.120800	0.000105	0.263200	0.106400
2000:12:27	0.11313	0.879300	0.128300	0.008977	0.576300	1.449000	1.000400	0.508600	0.120800	0.000105	0.263200	0.105600
2001:01:03	0.11813	0.895400	0.128200	0.008896	0.576000	1.469100	1.000400	0.511800	0.120800	0.000108	0.263200	0.106200
2001:01:10	0.11667	0.932500	0.128200	0.008807	0.579400	1.484600	1.000300	0.510500	0.120800	0.000106	0.263200	0.104500
2001:01:17	0.11521	0.950700	0.128200	0.008744	0.577000	1.500500	1.000300	0.514900	0.120800	0.000106	0.263200	0.102000
2001:01:24	0.10708	0.945300	0.128200	0.008566	0.577000	1.490500	1.000200	0.514700	0.120800	0.000106	0.263200	0.102500
2001:01:31	0.10875	0.941500	0.128200	0.008504	0.577100	1.471800	1.000200	0.512600	0.120800	0.000106	0.263200	0.100500
2001:02:07	0.10688	0.937700	0.128200	0.008546	0.574500	1.470000	1.000200	0.510200	0.120800	0.000107	0.263200	0.102500
2001:02:14	0.10083	0.926900	0.128200	0.008634	0.573400	1.463100	1.000200	0.509200	0.120800	0.000107	0.263200	0.103400
2001:02:21	0.10271	0.929700	0.128200	0.008716	0.573800	1.459200	1.000200	0.499500	0.120800	0.000105	0.263200	0.103200
2001:02:28	0.10271	0.921400	0.128200	0.008577	0.573400	1.453700	1.000200	0.503800	0.120800	0.000105	0.263200	0.103000
2001:03:07	0.10167	0.912200	0.128200	0.008642	0.574500	1.447600	1.000200	0.498200	0.120800	0.000104	0.263200	0.103200
2001:03:14	0.09833	0.918000	0.128200	0.008615	0.574500	1.443600	1.000100	0.491500	0.120800	0.000102	0.263200	0.103300
2001:03:21	0.09500	0.934800	0.128200	0.008413	0.569500	1.468100	1.000200	0.491600	0.120800	0.000101	0.263200	0.103500
2001:03:28	0.09208	0.915000	0.128200	0.008354	0.568500	1.449900	1.000200	0.485200	0.120800	0.000098	0.263200	0.104400
2001:04:04	0.08729	0.908800	0.128200	0.008182	0.563800	1.436100	1.000300	0.479300	0.120800	0.000096	0.263200	0.105000
2001:04:11	0.08813	0.893700	0.128200	0.008188	0.558700	1.432400	1.000300	0.471300	0.120800	0.000096	0.263200	0.104900
2001:04:18	0.08333	0.896700	0.128200	0.007968	0.551700	1.433800	1.000400	0.459800	0.120800	0.000096	0.263200	0.106200
2001:04:25	0.08292	0.888100	0.128200	0.008047	0.552200	1.432400	1.000200	0.468100	0.120800	0.000094	0.263200	0.107800
2001:05:02	0.07917	0.882400	0.128200	0.008109	0.552900	1.430800	1.000300	0.455400	0.120800	0.000092	0.263200	0.108300
2001:05:09	0.07792	0.894300	0.128200	0.008192	0.551700	1.436000	1.000300	0.441700	0.120800	0.000085	0.263200	0.107900
2001:05:16	0.07896	0.892700	0.128200	0.008198	0.551900	1.435000	1.000400	0.454500	0.120800	0.000090	0.263200	0.108100
2001:05:23	0.07563	0.884100	0.128200	0.008248	0.549200	1.425600	1.000300	0.445700	0.120800	0.000091	0.263200	0.108700
2001:05:30	0.07250	0.878600	0.128200	0.008103	0.549900	1.424200	1.000300	0.427700	0.120800	0.000088	0.263200	0.108800
2001:06:06	0.07250	0.865500	0.128200	0.008152	0.552600	1.428100	1.000100	0.430700	0.120800	0.000088	0.263200	0.111300
2001:06:13	0.07479	0.854300	0.128200	0.008329	0.552900	1.422400	1.000100	0.426100	0.120800	0.000090	0.263200	0.109900
2001:06:20	0.07354	0.854400	0.128200	0.008314	0.552000	1.413000	1.000200	0.419200	0.120800	0.000089	0.263200	0.109500
2001:06:27	0.07208	0.852500	0.128200	0.008219	0.550700	1.371800	1.000100	0.416100	0.120800	0.000089	0.263200	0.109700
2001:07:04	0.07104	0.854400	0.128200	0.008134	0.550400	1.401000	1.000200	0.404100	0.120800	0.000088	0.263200	0.110300
2001:07:11	0.07104	0.863700	0.128200	0.008075	0.549800	1.415100	1.000200	0.429600	0.120800	0.000088	0.263200	0.110700
2001:07:18	0.07417	0.850300	0.128200	0.008040	0.548700	1.406600	1.000400	0.425600	0.120800	0.000088	0.263200	0.110600
2001:07:25	0.07271	0.856000	0.128200	0.007978	0.545000	1.412000	1.000300	0.400300	0.120800	0.000088	0.263200	0.109100
2001:08:01	0.07167	0.859500	0.128200	0.008001	0.545600	1.401400	1.000300	0.400800	0.120800	0.000088	0.263200	0.109400
2001:08:08	0.07208	0.876900	0.128200	0.008072	0.550200	1.424500	1.000500	0.405200	0.120800	0.000100	0.263200	0.109600
2001:08:15	0.07146	0.875800	0.128200	0.007998	0.554800	1.426300	1.000400	0.404500	0.120800	0.000106	0.263200	0.109100
2001:08:22	0.07083	0.877800	0.128200	0.008097	0.562400	1.417000	1.000600	0.402500	0.120800	0.000107	0.263200	0.109700
2001:08:29	0.06958	0.903400	0.128200	0.008214	0.569300	1.429900	1.000500	0.397300	0.120800	0.000118	0.263200	0.109600
2001:09:05	0.06875	0.917100	0.128200	0.008367	0.570900	1.452400	1.001000	0.391800	0.120800	0.000117	0.263200	0.109400
2001:09:12	0.06938	0.911600	0.128200	0.008325	0.570900	1.451500	1.000300	0.391200	0.120800	0.000111	0.263200	0.109400
2001:09:19	0.06917	0.888800	0.128200	0.008395	0.572700	1.444000	1.000400	0.390300	0.120800	0.000112	0.263200	0.108600
2001:09:26	0.05437	0.915000	0.128200	0.008398	0.571500	1.477600	1.000400	0.375900	0.120800	0.000110	0.263200	0.104800
2001:10:03	0.05021	0.928200	0.128200	0.008525	0.577000	1.468300	1.000400	0.375100	0.120800	0.000105	0.263200	0.104800
2001:10:10	0.04875	0.922900	0.128200	0.008501	0.564000	1.471300	1.000400	0.385000	0.121000	0.000106	0.263500	0.106500
2001:10:17	0.04542	0.919400	0.128200	0.008280	0.562300	1.469600	1.000400	0.386500	0.121000	0.000101	0.263500	0.105300
2001:10:24	0.04542	0.914100	0.128200	0.008317	0.554700	1.458000	1.000400	0.372300	0.121000	0.000101	0.263300	0.106100
2001:10:31	0.04521	0.908600	0.128200	0.008250	0.550400	1.448700	1.000400	0.373000	0.121000	0.000100	0.263300	0.109000
2001:11:07	0.04417	0.891100	0.128200	0.008155	0.547800	1.426100	1.000400	0.381000	0.121000	0.000098	0.263300	0.108700
2001:11:14	0.04187	0.904900	0.128200	0.008200	0.548400	1.452000	1.000400	0.377800	0.121000	0.000096	0.263300	0.108400
2001:11:21	0.03667	0.895900	0.128200	0.008253	0.550200	1.458300	1.000400	0.399200	0.121000	0.000092	0.263300	0.108900
2001:11:28	0.03833	0.881300	0.128200	0.008221	0.547500	1.441600	1.000400	0.409200	0.121000	0.000094	0.263300	0.108400
2001:12:05	0.03979	0.883100	0.128200	0.008163	0.544800	1.420100	1.000800	0.410700	0.121000	0.000095	0.263500	0.109400
2001:12:12	0.03813	0.883700	0.128200	0.008070	0.545500	1.415500	1.000800	0.422200	0.121000	0.000098	0.263400	0.108200
2001:12:19	0.03604	0.890300	0.128200	0.008053	0.544800	1.421600	1.000800	0.427300	0.121000	0.000096	0.263300	0.108600
2001:12:26	0.03417	0.892700	0.128200	0.007928	0.546000	1.439600	1.000800	0.447400	0.121000	0.000099	0.263300	0.109600
2002:01:02	0.03479	0.902900	0.128200	0.007824	0.544500	1.457200	1.000800	0.442600	0.121000	0.000099	0.263400	0.109900
2002:01:09	0.03563	0.879500	0.128300	0.007644	0.543900	1.444900	1.000800	0.447900	0.121000	0.000098	0.263500	0.110100
2002:01:16	0.03542	0.889900	0.128200	0.007602	0.541700	1.454600	1.008100	0.453100	0.121000	0.000097	0.263500	0.109900
2002:01:23	0.03438	0.893200	0.128200	0.007536	0.541100	1.439000	0.714300	0.445300	0.121000	0.000096	0.263300	0.109100
2002:01:30	0.03271	0.883200	0.128200	0.007613	0.547500	1.440300	0.714300	0.436600	0.121000	0.000096	0.263400	0.109200
2002:02:06	0.03479	0.886500	0.128200	0.007468	0.543400	1.429800	0.563400	0.439900	0.121000	0.000096	0.263300	0.109600
2002:02:13	0.03521	0.865300	0.128200	0.007501	0.545300	1.413700	0.552500	0.428500	0.121000	0.000097	0.263300	0.109100
2002:02:20	0.03542	0.867900	0.128200	0.007472	0.545100	1.415800	0.494100	0.429200	0.121000	0.000097	0.263300	0.109600
2002:02:27	0.03563	0.876500	0.128200	0.007539	0.547000	1.434500	0.495000	0.422700	0.121000	0.000098	0.263300	0.110600
2002:03:06	0.03583	0.876500	0.128200	0.007483	0.546700	1.431600	0.495000	0.428400	0.121000	0.000099	0.263300	0.110300
2002:03:13	0.03604	0.864100	0.128200	0.007429	0.545200	1.416900	0.466200	0.436600	0.121000	0.000099	0.263300	0.110300
2002:03:20	0.03625	0.872200	0.128200	0.007568	0.547900	1.424200	0.466200	0.448200	0.121000	0.000100	0.263300	0.110500
2002:03:27	0.03729	0.875600	0.128200	0.007758	0.549300	1.416000	0.432900	0.443400	0.121000	0.000100	0.263300	0.110200
2002:04:03	0.03771	0.882100	0.128200	0.007575	0.547100	1.424500	0.416700	0.444000	0.121000	0.000100	0.263300	0.110500
2002:04:10	0.03708	0.877300	0.128200	0.007525	0.540800	1.427400	0.349700	0.426100	0.121000	0.000105	0.263300	0.111000
2002:04:17	0.03646	0.879700	0.128200	0.007498	0.541600	1.437000	0.344800	0.435200	0.121000	0.000103	0.263300	0.111100
2002:04:24	0.03479	0.880900	0.128200	0.007634	0.544700	1.436900	0.362300	0.439000	0.121000	0.000104	0.263300	0.111000
2002:05:01	0.03521	0.883100	0.128200	0.007623	0.545500	1.440900	0.348400	0.431200	0.121000	0.000106	0.263300	0.109400
2002:05:08	0.03500	0.889000	0.128200	0.007680	0.546800	1.447600	0.322600	0.423700	0.121000	0.000106	0.263300	0.108300
2002:05:15	0.03583	0.900400	0.128200	0.007780	0.550600	1.458300	0.339000	0.423700	0.121000	0.000108	0.263300	0.106600
2002:05:22	0.03604	0.915500	0.128200	0.007817	0.553400	1.468100	0.315500	0.411000	0.121000	0.000109	0.263400	0.105700
2002:05:29	0.03604	0.902900	0.128200	0.007781	0.553100	1.450600	0.313500	0.399000	0.121000	0.000108	0.263300	0.105700

APPENDIX - C6
DATA FOR CHAPTER 5

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2002:06:05	0.03542	0.920300	0.128200	0.008054	0.558900	1.460000	0.311500	0.417900	0.121000	0.000111	0.263300	0.105600
2002:06:12	0.03542	0.928900	0.128200	0.008028	0.557700	1.459700	0.288200	0.395700	0.121000	0.000113	0.263300	0.104700
2002:06:19	0.03583	0.939600	0.128200	0.008057	0.559800	1.459300	0.277000	0.384000	0.121000	0.000116	0.263300	0.102900
2002:06:26	0.03542	0.948500	0.128200	0.007981	0.558400	1.472200	0.289000	0.367500	0.121000	0.000116	0.263500	0.103400
2002:07:03	0.03479	0.952000	0.128200	0.008042	0.557900	1.491600	0.284900	0.368600	0.121000	0.000116	0.263300	0.103600
2002:07:10	0.03458	0.979600	0.128300	0.008242	0.565600	1.509100	0.259700	0.354600	0.121000	0.000117	0.263500	0.101200
2002:07:17	0.03500	0.986500	0.128200	0.008340	0.565400	1.536300	0.277000	0.345700	0.121000	0.000114	0.263400	0.100500
2002:07:24	0.03521	0.993700	0.129900	0.008475	0.570000	1.549200	0.284100	0.350900	0.121000	0.000112	0.263300	0.101800
2002:07:31	0.03521	1.011900	0.128200	0.008626	0.575400	1.576000	0.283300	0.348100	0.121000	0.000112	0.263500	0.103700
2002:08:07	0.03417	0.988900	0.128200	0.008507	0.572900	1.563600	0.274000	0.342800	0.121000	0.000113	0.263300	0.103700
2002:08:14	0.03458	0.983500	0.128200	0.008322	0.567200	1.574400	0.271000	0.298300	0.121000	0.000111	0.263200	0.102900
2002:08:21	0.03250	0.966700	0.128300	0.008284	0.565100	1.538300	0.275500	0.322100	0.121000	0.000111	0.263300	0.103000
2002:08:28	0.03333	0.983900	0.128300	0.008444	0.569200	1.537600	0.276200	0.317000	0.121000	0.000113	0.263300	0.101000
2002:09:04	0.03333	0.979200	0.128200	0.008413	0.571600	1.529000	0.277000	0.323600	0.121000	0.000113	0.263300	0.102300
2002:09:11	0.03417	0.983400	0.128200	0.008463	0.572400	1.534700	0.277000	0.319600	0.121000	0.000113	0.263300	0.101000
2002:09:18	0.03313	0.997300	0.128300	0.008540	0.573000	1.565000	0.275500	0.322100	0.121000	0.000113	0.263500	0.099900
2002:09:25	0.03438	0.975600	0.128300	0.008340	0.569000	1.555700	0.275500	0.318900	0.121000	0.000113	0.263300	0.100200
2002:10:02	0.03417	0.974800	0.128200	0.008199	0.563900	1.542400	0.276200	0.308200	0.121000	0.000111	0.263300	0.100400
2002:10:09	0.03375	0.981600	0.128200	0.008108	0.561500	1.559200	0.274700	0.265300	0.121000	0.000111	0.263300	0.097480
2002:10:16	0.03208	0.983200	0.128300	0.008162	0.559600	1.565900	0.267400	0.277800	0.121000	0.000111	0.263300	0.098930
2002:10:23	0.03188	0.979000	0.128200	0.008044	0.559600	1.554100	0.268800	0.268600	0.121000	0.000111	0.263300	0.098760
2002:10:30	0.03375	0.981800	0.128200	0.008023	0.554600	1.552400	0.274700	0.261400	0.121000	0.000108	0.263300	0.099070
2002:11:06	0.03417	0.977800	0.128300	0.007992	0.560900	1.546600	0.277800	0.256300	0.121000	0.000110	0.263300	0.100200
2002:11:13	0.03063	0.983800	0.128100	0.008132	0.565600	1.557400	0.280900	0.261800	0.121000	0.000110	0.263300	0.098380
2002:11:20	0.02521	1.000400	0.128400	0.008212	0.568900	1.563500	0.283300	0.281700	0.121000	0.000109	0.263300	0.098140
2002:11:27	0.02479	1.012600	0.128200	0.008361	0.567100	1.589700	0.284100	0.276400	0.121000	0.000110	0.263300	0.097150
2002:12:04	0.02500	1.003500	0.128300	0.008190	0.565800	1.581100	0.284900	0.283900	0.121000	0.000112	0.263300	0.098490
2002:12:11	0.02521	0.993600	0.128300	0.008223	0.567200	1.552000	0.289000	0.277800	0.121000	0.000111	0.263400	0.098510
2002:12:18	0.02500	0.996700	0.128300	0.008030	0.564800	1.570600	0.283300	0.272500	0.121000	0.000111	0.263400	0.098470
2002:12:25	0.02458	1.008500	0.128200	0.008079	0.566300	1.571000	0.286400	0.264200	0.121000	0.000112	0.263300	0.098580
2003:01:01	0.02458	1.028800	0.128300	0.008246	0.572400	1.598000	0.283300	0.279200	0.121000	0.000113	0.263300	0.097680
2003:01:08	0.02396	1.030100	0.128200	0.008311	0.574700	1.595500	0.292400	0.285700	0.121000	0.000113	0.263300	0.097880
2003:01:15	0.02479	1.050100	0.128300	0.008422	0.576700	1.611400	0.298500	0.282900	0.121000	0.000112	0.263300	0.096640
2003:01:22	0.02438	1.042100	0.128200	0.008305	0.573100	1.605000	0.301200	0.306400	0.121000	0.000112	0.263300	0.096860
2003:01:29	0.02438	1.055600	0.128300	0.008469	0.577700	1.605300	0.308600	0.307200	0.120900	0.000113	0.263300	0.095840
2003:02:05	0.02375	1.072400	0.128200	0.008467	0.576700	1.617600	0.322600	0.286800	0.121000	0.000113	0.263200	0.092350
2003:02:12	0.02396	1.082300	0.128200	0.008427	0.576900	1.639900	0.301200	0.275100	0.121000	0.000113	0.263300	0.091600
2003:02:19	0.02396	1.088400	0.128200	0.008354	0.575600	1.649400	0.316500	0.280500	0.120900	0.000113	0.263500	0.091500
2003:02:26	0.02396	1.073500	0.128200	0.008266	0.570200	1.618500	0.320500	0.279100	0.121000	0.000112	0.263200	0.091300
2003:03:05	0.02417	1.069400	0.128000	0.008405	0.571500	1.590900	0.316500	0.278600	0.121000	0.000113	0.263300	0.092720
2003:03:12	0.02458	1.076500	0.128300	0.008528	0.577000	1.574800	0.316500	0.285000	0.121000	0.000113	0.263300	0.090470
2003:03:19	0.02396	1.088700	0.128200	0.008485	0.576100	1.581800	0.314500	0.280900	0.121000	0.000113	0.263300	0.089920
2003:03:26	0.02229	1.103800	0.128200	0.008540	0.575500	1.607100	0.320500	0.286500	0.121000	0.000113	0.263300	0.091750
2003:04:02	0.02354	1.063700	0.128300	0.008416	0.566400	1.566700	0.327900	0.289900	0.121000	0.000111	0.263300	0.091860
2003:04:09	0.02396	1.065600	0.128200	0.008324	0.566200	1.572900	0.341300	0.296600	0.121000	0.000112	0.263300	0.093590
2003:04:16	0.02292	1.091100	0.128300	0.008472	0.564800	1.577900	0.336700	0.304900	0.121000	0.000113	0.263300	0.093460
2003:04:23	0.02313	1.071000	0.128200	0.008342	0.561000	1.554300	0.343900	0.315000	0.121000	0.000113	0.263900	0.092890
2003:04:30	0.02396	1.080000	0.128200	0.008317	0.561400	1.570700	0.341300	0.326200	0.121000	0.000115	0.263200	0.094500
2003:05:07	0.02396	1.097100	0.128200	0.008335	0.562900	1.577800	0.342200	0.337500	0.121000	0.000115	0.263300	0.094880
2003:05:14	0.02292	1.108600	0.128300	0.008353	0.563200	1.594900	0.350900	0.345300	0.121000	0.000117	0.265000	0.097320
2003:05:21	0.02271	1.143000	0.128200	0.008511	0.574800	1.615200	0.357500	0.337400	0.121000	0.000117	0.264900	0.097420
2003:05:28	0.02167	1.153100	0.128300	0.008564	0.576900	1.609500	0.364000	0.358000	0.121000	0.000119	0.263900	0.098920
2003:06:04	0.02188	1.171100	0.128300	0.008570	0.580600	1.642000	0.347000	0.341900	0.121000	0.000119	0.263700	0.097770
2003:06:11	0.02271	1.181500	0.128200	0.008528	0.580700	1.638500	0.351400	0.340100	0.121000	0.000122	0.263500	0.096280
2003:06:18	0.02125	1.173600	0.128300	0.008394	0.579000	1.628900	0.353100	0.344800	0.121000	0.000123	0.264000	0.097420
2003:06:25	0.01896	1.167500	0.128300	0.008492	0.578100	1.652000	0.356300	0.357800	0.121000	0.000122	0.263000	0.093890
2003:07:02	0.01792	1.178500	0.128300	0.008467	0.579200	1.685400	0.356300	0.356700	0.121000	0.000124	0.262600	0.095320
2003:07:09	0.01875	1.151300	0.128300	0.008482	0.574500	1.664200	0.360600	0.358100	0.121000	0.000122	0.263600	0.095470
2003:07:16	0.01771	1.156500	0.128300	0.008376	0.569200	1.663200	0.359600	0.361500	0.121000	0.000123	0.262900	0.095900
2003:07:23	0.01813	1.132100	0.128300	0.008462	0.569300	1.636100	0.360600	0.355500	0.121000	0.000124	0.264700	0.095400
2003:07:30	0.01833	1.118000	0.128200	0.008475	0.568900	1.592200	0.358000	0.357600	0.121000	0.000121	0.261900	0.095900
2003:08:06	0.01854	1.133100	0.128200	0.008395	0.569500	1.596700	0.359700	0.355700	0.121000	0.000119	0.263300	0.096020
2003:08:13	0.01979	1.144400	0.128200	0.008340	0.570000	1.624300	0.352100	0.353700	0.121000	0.000118	0.262700	0.095180
2003:08:20	0.01917	1.139000	0.128200	0.008346	0.567200	1.616100	0.342500	0.333900	0.121000	0.000117	0.264200	0.093050
2003:08:27	0.01938	1.128700	0.128200	0.008425	0.569900	1.602600	0.346600	0.340300	0.121000	0.000117	0.262800	0.093270
2003:09:03	0.01958	1.114200	0.128400	0.008450	0.572300	1.588100	0.336100	0.341300	0.121000	0.000118	0.263700	0.092460
2003:09:10	0.02042	1.087400	0.128200	0.008528	0.570100	1.570000	0.342500	0.342400	0.121000	0.000118	0.262800	0.091540
2003:09:17	0.02042	1.081900	0.128200	0.008615	0.569500	1.568400	0.341300	0.343100	0.121000	0.000119	0.261900	0.090830
2003:09:24	0.01938	1.123400	0.128200	0.008565	0.569800	1.590800	0.342500	0.342100	0.121000	0.000119	0.264300	0.091220
2003:10:01	0.01938	1.118100	0.128300	0.008613	0.571600	1.588200	0.345800	0.343600	0.121000	0.000118	0.263600	0.092100
2003:10:08	0.01917	1.144800	0.129200	0.008911	0.576000	1.652300	0.345400	0.342500	0.121000	0.000119	0.262300	0.092250
2003:10:15	0.01896	1.166700	0.129100	0.008973	0.578200	1.664400	0.344800	0.346000	0.121000	0.000119	0.263600	0.091050
2003:10:22	0.01833	1.177700	0.129800	0.009108	0.581200	1.663100	0.350100	0.350000	0.121000	0.000119	0.262900	0.089170
2003:10:29	0.01875	1.172700	0.129200	0.009187	0.576300	1.671700	0.352400	0.353600	0.121000	0.000119	0.263400	0.089240
2003:11:05	0.01938	1.165600	0.129000	0.009132	0.574800	1.673100	0.350900	0.350300	0.121000	0.000118	0.262700	0.090010
2003:11:12	0.01938	1.166900	0.128900	0.009233	0.572900	1.698900	0.351500	0.349900	0.121000	0.000116	0.262800	0.090550
2003:11:19	0.01938	1.149300	0.128800	0.009127	0.574000	1.680300	0.350900	0.349700	0.121000	0.000118	0.263200	0.090940
2003:11:26	0.01938	1.150900	0.128900	0.009195	0.576300	1.665100	0.351100	0.344200	0.121000	0.000118	0.262900	0.091290
2003:12:03	0.01938	1.195100	0.129000	0.009254	0.582600	1.702600	0.353300	0.340000	0.121000	0.000119	0.264400	0.089200
2003:12:10	0.01896	1.178800	0.128800	0.009141	0.581100	1.698300	0.342700	0.340700	0.121000	0.000118	0.263200	0.088440
2003:12:17	0.01896	1.207900	0.128800	0.009207	0.581400	1.729600	0.336100	0.341200	0.121000	0.000118	0.263100	0.088500
2003:12:24	0.01854	1.225600	0.128800	0.009345	0.584300	1.746900	0.338200	0.340900	0.121000	0.000118	0.263800	0.089550
2003:12:31	0.01813	1.232600	0.128800	0.009305	0.586100	1.754400	0.337300	0.340600	0.121000	0.000118	0.263100	0.088910
2004:01:07	0.01813	1.239400	0.128800	0.009318	0.585600	1.763600	0.338200	0.344000	0.121000	0.000118	0.262900	0.088770
2004:01:14	0.01896	1.255700	0.128800	0.009341	0.587100	1.778500	0.341100	0.344700	0.121000	0.000118	0.263800	0.089110

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2004:01:21	0.01854	1.274100	0.128800	0.009418	0.589300	1.822000	0.349900	0.348900	0.121000	0.000120	0.262600	0.091800
2004:01:28	0.01792	1.276800	0.128800	0.009415	0.590100	1.846300	0.355700	0.356500	0.121000	0.000120	0.264000	0.092290
2004:02:04	0.01813	1.258000	0.128700	0.009341	0.586000	1.820200	0.346000	0.352400	0.121000	0.000119	0.263200	0.092120
2004:02:11	0.01917	1.264100	0.128800	0.009466	0.590000	1.828200	0.348300	0.348700	0.121000	0.000119	0.263200	0.091580
2004:02:18	0.01896	1.253500	0.128600	0.009480	0.590800	1.837700	0.341300	0.342900	0.121000	0.000118	0.262700	0.090340
2004:02:25	0.01896	1.270000	0.128700	0.009478	0.596900	1.871200	0.342000	0.342700	0.121000	0.000119	0.262600	0.090100
2004:03:03	0.01896	1.283800	0.128700	0.009465	0.597400	1.904000	0.341900	0.342900	0.121000	0.000119	0.263000	0.091910
2004:03:10	0.01958	1.268800	0.128600	0.009247	0.592100	1.891400	0.342500	0.338200	0.121000	0.000118	0.263000	0.090330
2004:03:17	0.01958	1.222000	0.128400	0.009084	0.585200	1.839700	0.342600	0.346000	0.121000	0.000118	0.263300	0.091340
2004:03:24	0.01958	1.231600	0.128400	0.008928	0.585700	1.825300	0.344200	0.348900	0.121000	0.000116	0.263600	0.091560
2004:03:31	0.01917	1.226600	0.128300	0.009189	0.587500	1.811700	0.344800	0.345200	0.121000	0.000116	0.263200	0.090800
2004:04:07	0.01917	1.233100	0.128300	0.009368	0.592800	1.849800	0.349200	0.343300	0.121000	0.000117	0.263400	0.091250
2004:04:14	0.01917	1.217800	0.128300	0.009469	0.594100	1.826200	0.350300	0.344000	0.121000	0.000116	0.262900	0.089480
2004:04:21	0.01917	1.209300	0.128300	0.009463	0.594200	1.839100	0.351400	0.347900	0.121000	0.000117	0.263100	0.089730
2004:04:28	0.01938	1.194700	0.128300	0.009378	0.598700	1.819400	0.355100	0.345900	0.121000	0.000117	0.263300	0.089060
2004:05:05	0.02021	1.186400	0.128200	0.009204	0.594900	1.787500	0.353400	0.341500	0.121100	0.000116	0.262200	0.088360
2004:05:12	0.01979	1.194200	0.128200	0.009141	0.589800	1.792900	0.357400	0.342900	0.121000	0.000116	0.263300	0.088870
2004:05:19	0.02021	1.209300	0.128200	0.009130	0.590300	1.794300	0.350000	0.337200	0.121000	0.000115	0.263200	0.087730
2004:05:26	0.02104	1.186700	0.128200	0.008835	0.581600	1.755200	0.347300	0.325300	0.121000	0.000111	0.263300	0.086480
2004:06:02	0.02125	1.194900	0.128200	0.008764	0.579400	1.767100	0.348400	0.319500	0.121000	0.000111	0.263400	0.086730
2004:06:09	0.02188	1.209800	0.128300	0.008950	0.584500	1.811500	0.354900	0.318800	0.121000	0.000108	0.263000	0.087340
2004:06:16	0.02375	1.224400	0.128300	0.009040	0.586200	1.840100	0.341900	0.317900	0.121000	0.000107	0.263600	0.087340
2004:06:23	0.02583	1.226800	0.128300	0.009121	0.585900	1.835100	0.336800	0.321800	0.121000	0.000108	0.263300	0.088390
2004:06:30	0.02667	1.216500	0.128200	0.009135	0.583800	1.831700	0.339600	0.320200	0.121000	0.000107	0.263200	0.087990
2004:07:07	0.02625	1.210300	0.128200	0.009150	0.580600	1.819400	0.341400	0.319300	0.121000	0.000106	0.263400	0.088320
2004:07:14	0.02708	1.208500	0.128200	0.009231	0.582800	1.807400	0.337800	0.321900	0.121000	0.000106	0.263400	0.087090
2004:07:21	0.02646	1.229400	0.128200	0.009136	0.582900	1.842800	0.341100	0.328400	0.121000	0.000111	0.262900	0.087170
2004:07:28	0.02750	1.232700	0.128200	0.009200	0.588100	1.855900	0.339000	0.329200	0.121000	0.000112	0.263200	0.087370
2004:08:04	0.02750	1.232900	0.128200	0.009201	0.586200	1.851800	0.339700	0.333100	0.121000	0.000111	0.263100	0.087590
2004:08:11	0.02958	1.205000	0.128200	0.009014	0.579800	1.822000	0.336800	0.327500	0.121000	0.000110	0.263100	0.087270
2004:08:18	0.03021	1.205500	0.128200	0.009045	0.581700	1.825400	0.333800	0.327800	0.121000	0.000109	0.263200	0.087720
2004:08:25	0.02938	1.224000	0.128200	0.008983	0.583400	1.826700	0.332200	0.330400	0.121000	0.000109	0.263400	0.087700
2004:09:01	0.03021	1.235200	0.128200	0.009088	0.583900	1.827800	0.335700	0.334000	0.121000	0.000108	0.263400	0.088400
2004:09:08	0.03146	1.208600	0.128200	0.009123	0.584100	1.791900	0.334300	0.338400	0.121000	0.000108	0.263400	0.088110
2004:09:15	0.03229	1.217900	0.128200	0.009157	0.584800	1.802400	0.337000	0.341800	0.121000	0.000107	0.263300	0.088020
2004:09:22	0.03354	1.210600	0.128200	0.009152	0.588700	1.773600	0.334200	0.343900	0.121000	0.000108	0.263600	0.086450
2004:09:29	0.03396	1.226000	0.128300	0.009126	0.592000	1.797200	0.334800	0.343900	0.121000	0.000110	0.263200	0.086700
2004:10:06	0.03479	1.234000	0.128200	0.009121	0.592400	1.797900	0.332800	0.348800	0.121000	0.000111	0.263700	0.087820
2004:10:13	0.03500	1.231900	0.128200	0.008981	0.589400	1.812700	0.338100	0.349000	0.121000	0.000108	0.263100	0.087690
2004:10:20	0.03479	1.232200	0.128300	0.009002	0.593300	1.783100	0.336700	0.353700	0.121000	0.000110	0.263100	0.088770
2004:10:27	0.03521	1.232900	0.128400	0.009115	0.593400	1.791400	0.337300	0.354900	0.121000	0.000110	0.263700	0.089020
2004:11:03	0.03729	1.252400	0.128400	0.009223	0.597200	1.804400	0.337800	0.347600	0.121000	0.000110	0.263300	0.087590
2004:11:10	0.03917	1.276700	0.128500	0.009376	0.601500	1.835500	0.336700	0.349300	0.121000	0.000110	0.263400	0.086960
2004:11:17	0.04000	1.273100	0.128500	0.009422	0.600100	1.840100	0.338400	0.350600	0.121000	0.000110	0.264200	0.087530
2004:11:24	0.04229	1.289900	0.128600	0.009463	0.604700	1.857500	0.336700	0.354000	0.121000	0.000112	0.263200	0.087530
2004:12:01	0.04333	1.295900	0.128600	0.009491	0.606400	1.853000	0.338000	0.359200	0.121000	0.000111	0.263100	0.088180
2004:12:08	0.04438	1.308100	0.128600	0.009674	0.608500	1.867300	0.340800	0.364700	0.121000	0.000111	0.263200	0.088390
2004:12:15	0.04521	1.329600	0.128600	0.009721	0.610800	1.911400	0.340000	0.367900	0.121000	0.000111	0.263300	0.089310
2004:12:22	0.04583	1.343100	0.128700	0.009724	0.611500	1.946000	0.336100	0.364200	0.121000	0.000110	0.263200	0.089450
2004:12:29	0.04521	1.330500	0.128600	0.009478	0.605800	1.928900	0.335900	0.361700	0.121000	0.000108	0.263200	0.089020
2005:01:05	0.04479	1.337500	0.128500	0.009585	0.609800	1.928200	0.337600	0.370600	0.121000	0.000107	0.263300	0.089650
2005:01:12	0.04542	1.361000	0.128700	0.009707	0.611500	1.927800	0.337400	0.371300	0.121000	0.000107	0.263100	0.089180
2005:01:19	0.04750	1.327000	0.128500	0.009557	0.606000	1.881600	0.338000	0.367900	0.121000	0.000108	0.262600	0.087830
2005:01:26	0.04771	1.311600	0.128300	0.009677	0.610400	1.877900	0.337800	0.367500	0.121000	0.000108	0.262400	0.089330
2005:02:02	0.04854	1.302400	0.128200	0.009777	0.611800	1.867100	0.340700	0.368100	0.121000	0.000109	0.263200	0.088940
2005:02:09	0.04938	1.297300	0.128200	0.009607	0.609500	1.863900	0.343100	0.373300	0.121000	0.000109	0.263300	0.088610
2005:02:16	0.05125	1.304600	0.128200	0.009647	0.610500	1.883800	0.342700	0.383700	0.121000	0.000108	0.263200	0.089720
2005:02:23	0.05146	1.276800	0.128200	0.009455	0.606800	1.854900	0.343100	0.380100	0.121000	0.000108	0.263200	0.089450
2005:03:02	0.05271	1.302200	0.128200	0.009578	0.610700	1.896800	0.344900	0.386500	0.121000	0.000108	0.263300	0.089700
2005:03:09	0.05458	1.325900	0.128200	0.009612	0.615200	1.911100	0.343500	0.384900	0.121000	0.000109	0.263300	0.090510
2005:03:16	0.05583	1.318600	0.128200	0.009580	0.616300	1.920400	0.339600	0.381000	0.121000	0.000108	0.263300	0.090180
2005:03:23	0.05604	1.334400	0.128200	0.009549	0.616800	1.928600	0.341600	0.377400	0.121000	0.000107	0.263300	0.091090
2005:03:30	0.05688	1.331400	0.128200	0.009571	0.615200	1.912300	0.343100	0.377400	0.121000	0.000107	0.263200	0.089090
2005:04:06	0.05750	1.308900	0.128200	0.009472	0.610100	1.885300	0.344000	0.364700	0.121000	0.000106	0.263200	0.089020
2005:04:13	0.05750	1.292100	0.128200	0.009299	0.605200	1.874100	0.342100	0.370800	0.121000	0.000105	0.263200	0.088840
2005:04:20	0.05625	1.287000	0.128200	0.009247	0.602300	1.881400	0.342700	0.380800	0.121000	0.000106	0.263200	0.088980
2005:04:27	0.05667	1.292100	0.128200	0.009286	0.607500	1.891800	0.346000	0.388700	0.121000	0.000105	0.263200	0.090390
2005:05:04	0.05854	1.307600	0.128200	0.009369	0.606800	1.919400	0.344800	0.388700	0.121000	0.000105	0.263200	0.090400
2005:05:11	0.05875	1.298100	0.128200	0.009438	0.607300	1.905900	0.345400	0.394600	0.121000	0.000103	0.263200	0.090230
2005:05:18	0.05833	1.289200	0.128400	0.009533	0.610200	1.893600	0.345400	0.401400	0.121000	0.000105	0.263200	0.090970
2005:05:25	0.05833	1.287400	0.128200	0.009471	0.608100	1.882400	0.346000	0.405000	0.121000	0.000106	0.263300	0.090760
2005:06:01	0.05813	1.260000	0.128200	0.009301	0.603900	1.833200	0.347300	0.403300	0.121000	0.000106	0.263200	0.090980
2005:06:08	0.05979	1.258900	0.128500	0.009300	0.604500	1.828100	0.346600	0.412000	0.121000	0.000106	0.263200	0.091210
2005:06:15	0.06063	1.230800	0.128500	0.009214	0.600000	1.817300	0.347200	0.415200	0.121000	0.000105	0.263200	0.091900
2005:06:22	0.06146	1.228700	0.128500	0.009383	0.602500	1.835000	0.345700	0.405800	0.121000	0.000105	0.263200	0.092020
2005:06:29	0.06146	1.203400	0.128700	0.009136	0.595800	1.806200	0.347600	0.411400	0.121000	0.000104	0.263200	0.092350
2005:07:06	0.06167	1.217900	0.128700	0.009238	0.599000	1.829200	0.348700	0.421500	0.121000	0.000104	0.263200	0.092920
2005:07:13	0.06375	1.206000	0.128700	0.009096	0.594700	1.815500	0.345700	0.423400	0.121000	0.000103	0.263200	0.092590
2005:07:20	0.06500	1.191800	0.128700	0.008963	0.589700	1.757500	0.346600	0.421100	0.121000	0.000101	0.263200	0.092900
2005:07:27	0.06542	1.224400	0.128600	0.009023	0.593200	1.778400	0.348400	0.427400	0.121000	0.000103	0.263200	0.093370
2005:08:03	0.06729	1.204300	0.128600	0.008869	0.592300	1.740300	0.349700	0.426700	0.121000	0.000102	0.263200	0.094280
2005:08:10	0.06938	1.201800	0.128600	0.008890	0.599500	1.738800	0.349700	0.409500	0.123500	0.000102	0.266800	0.093610
2005:08:17	0.07042	1.219700	0.128700	0.008977	0.604700	1.770500	0.350000	0.424500	0.123600	0.000103	0.266700	0.094320
2005:08:24	0.07146	1.237100	0.128700	0.008929	0.604800	1.787100	0.348600	0.436200	0.123500	0.000102	0.266900	0.094190
2005:08:31	0.07146	1.236100	0.128700	0.009132	0.603500	1.810300	0.347500	0.424600	0.123600	0.000101	0.265800	0.094320

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2005:09:07	0.07146	1.223600	0.128600	0.009105	0.599700	1.801800	0.343900	0.415400	0.123600	0.000099	0.265400	0.092490
2005:09:14	0.07146	1.222500	0.128700	0.008988	0.593900	1.786600	0.343600	0.419600	0.123700	0.000097	0.265700	0.092410
2005:09:21	0.07083	1.247500	0.128700	0.009122	0.596700	1.843000	0.344200	0.430500	0.123800	0.000095	0.265400	0.093720
2005:09:28	0.06979	1.227200	0.128900	0.009040	0.594800	1.823000	0.342500	0.430000	0.123800	0.000099	0.265400	0.092720
2005:10:05	0.06958	1.212900	0.128800	0.008937	0.594200	1.799800	0.343300	0.435100	0.123800	0.000098	0.264300	0.092400
2005:10:12	0.07063	1.201600	0.128900	0.008829	0.590700	1.767100	0.343900	0.443900	0.123800	0.000097	0.265500	0.091870
2005:10:19	0.07271	1.192500	0.128900	0.008757	0.590400	1.760500	0.343300	0.443200	0.123700	0.000098	0.265200	0.093340
2005:10:26	0.07542	1.199500	0.128900	0.008731	0.591300	1.746400	0.339100	0.448200	0.123900	0.000100	0.265000	0.092490
2005:11:02	0.07833	1.196300	0.128900	0.008649	0.590100	1.750700	0.337000	0.445500	0.123900	0.000099	0.265300	0.092120
2005:11:09	0.07938	1.209800	0.129000	0.008691	0.592200	1.783700	0.335800	0.441400	0.123800	0.000100	0.264900	0.092010
2005:11:16	0.08000	1.201500	0.129000	0.008576	0.590100	1.765800	0.333300	0.443100	0.123800	0.000100	0.265300	0.092950
2005:11:23	0.08083	1.178100	0.129000	0.008533	0.587700	1.743300	0.336900	0.458600	0.123700	0.000099	0.264900	0.093440
2005:11:30	0.08146	1.172700	0.128900	0.008417	0.587700	1.736200	0.339000	0.453700	0.123800	0.000100	0.265400	0.094070
2005:12:07	0.08021	1.181300	0.129000	0.008418	0.589100	1.722100	0.339800	0.445100	0.123900	0.000100	0.266400	0.094220
2005:12:14	0.08042	1.172200	0.129000	0.008356	0.590000	1.713000	0.334900	0.455800	0.123900	0.000100	0.264700	0.094480
2005:12:21	0.08188	1.172600	0.129000	0.008260	0.592400	1.734000	0.333400	0.457900	0.123800	0.000101	0.264700	0.095660
2005:12:28	0.07917	1.186500	0.129000	0.008298	0.594500	1.761600	0.332400	0.443300	0.123900	0.000102	0.265100	0.094190
2006:01:04	0.08104	1.201400	0.129000	0.008619	0.600800	1.768200	0.330400	0.423900	0.123900	0.000101	0.264700	0.093140
2006:01:11	0.08042	1.185900	0.129000	0.008599	0.600500	1.733800	0.329500	0.427500	0.123900	0.000102	0.264200	0.093780
2006:01:18	0.08500	1.184000	0.129000	0.008492	0.601900	1.722800	0.329700	0.428000	0.124000	0.000103	0.265000	0.094290
2006:01:25	0.08729	1.207500	0.129000	0.008737	0.611700	1.766300	0.326700	0.443400	0.124100	0.000106	0.266900	0.094620
2006:02:01	0.08854	1.210100	0.129000	0.008682	0.612200	1.765000	0.329100	0.437400	0.124000	0.000106	0.266900	0.094880
2006:02:08	0.08979	1.228800	0.128900	0.008728	0.616800	1.785800	0.329500	0.445200	0.124100	0.000106	0.267000	0.095110
2006:02:15	0.09083	1.211200	0.128900	0.008522	0.615400	1.772000	0.326600	0.452000	0.124000	0.000107	0.266800	0.095780
2006:02:22	0.09146	1.197500	0.128900	0.008439	0.613800	1.747400	0.325800	0.458300	0.124100	0.000108	0.267900	0.095610
2006:03:01	0.09229	1.190300	0.128900	0.008515	0.614100	1.738700	0.325900	0.466300	0.124300	0.000109	0.268900	0.094940
2006:03:08	0.09271	1.192100	0.128800	0.008431	0.613500	1.744100	0.326100	0.470500	0.124300	0.000108	0.269000	0.095820
2006:03:15	0.09354	1.187400	0.128900	0.008608	0.616200	1.744300	0.325600	0.468900	0.124400	0.000108	0.269300	0.095600
2006:03:22	0.09354	1.195100	0.128900	0.008497	0.613600	1.742600	0.325000	0.464700	0.124400	0.000108	0.269600	0.093480
2006:03:29	0.09375	1.197600	0.128900	0.008454	0.615600	1.737600	0.325100	0.469700	0.124300	0.000109	0.269300	0.093340
2006:04:05	0.09521	1.213400	0.128900	0.008574	0.618600	1.751300	0.325400	0.464600	0.124600	0.000109	0.270700	0.092710
2006:04:12	0.09375	1.204000	0.128900	0.008557	0.617800	1.748000	0.338200	0.454600	0.124800	0.000111	0.270500	0.091210
2006:04:19	0.09479	1.218300	0.128900	0.008502	0.620000	1.745600	0.331900	0.469400	0.124900	0.000112	0.272000	0.092130
2006:04:26	0.09542	1.212000	0.128900	0.008439	0.620300	1.744300	0.329100	0.466300	0.125000	0.000112	0.272900	0.090220
2006:05:03	0.09583	1.226800	0.128900	0.008491	0.624400	1.773200	0.332000	0.469700	0.124800	0.000112	0.272900	0.090740
2006:05:10	0.09708	1.239500	0.129000	0.008723	0.629900	1.787000	0.338400	0.472900	0.125000	0.000114	0.274700	0.090270
2006:05:17	0.09792	1.260600	0.129000	0.008808	0.633400	1.830800	0.328700	0.481600	0.124900	0.000114	0.276500	0.090470
2006:05:24	0.09896	1.271200	0.129000	0.008968	0.637500	1.859200	0.329500	0.484500	0.125100	0.000114	0.278700	0.091530
2006:05:31	0.09813	1.281900	0.129000	0.009073	0.632700	1.882200	0.329200	0.463900	0.125100	0.000110	0.277600	0.090080
2006:06:07	0.09792	1.285300	0.129000	0.008977	0.632700	1.884000	0.326100	0.440900	0.124800	0.000108	0.276700	0.089060
2006:06:14	0.09833	1.282600	0.128900	0.008917	0.634000	1.872100	0.324700	0.436300	0.124700	0.000109	0.276500	0.089230
2006:06:21	0.09854	1.287800	0.128900	0.008883	0.633300	1.868900	0.325000	0.441900	0.124900	0.000107	0.275900	0.088250
2006:06:28	0.09917	1.257700	0.128800	0.008721	0.626200	1.840400	0.324900	0.436500	0.124900	0.000106	0.271400	0.087420
2006:07:05	0.09958	1.257600	0.128800	0.008686	0.627300	1.841800	0.325100	0.445400	0.125100	0.000107	0.273100	0.087160
2006:07:12	0.10146	1.259300	0.128800	0.008606	0.626500	1.823600	0.324700	0.448200	0.125200	0.000107	0.271600	0.087360
2006:07:19	0.10146	1.280300	0.128700	0.008727	0.632700	1.845000	0.324700	0.461300	0.125200	0.000107	0.274600	0.090330
2006:07:26	0.10271	1.274300	0.128700	0.008755	0.633800	1.842300	0.324400	0.459100	0.125300	0.000112	0.274100	0.090980
2006:08:02	0.10354	1.252200	0.128600	0.008542	0.628000	1.823600	0.324900	0.455400	0.125200	0.000108	0.271600	0.091170
2006:08:09	0.10354	1.262400	0.128600	0.008559	0.630600	1.847600	0.325100	0.456000	0.125300	0.000109	0.272400	0.091820
2006:08:16	0.10354	1.276300	0.128700	0.008717	0.633100	1.868100	0.325900	0.458700	0.125600	0.000110	0.273600	0.091060
2006:08:23	0.10271	1.283400	0.128600	0.008690	0.635500	1.906100	0.326000	0.458400	0.125600	0.000110	0.273700	0.091890
2006:08:30	0.10271	1.274500	0.128500	0.008592	0.632900	1.891100	0.325600	0.464400	0.125200	0.000110	0.271800	0.092300
2006:09:06	0.10333	1.284700	0.128600	0.008603	0.635800	1.891000	0.324900	0.469900	0.125700	0.000110	0.272100	0.092670
2006:09:13	0.10250	1.280300	0.128600	0.008556	0.635000	1.897000	0.327300	0.470100	0.125800	0.000110	0.272300	0.091980
2006:09:20	0.10063	1.283400	0.128600	0.008628	0.638000	1.900300	0.323500	0.471100	0.126100	0.000110	0.274300	0.092150
2006:09:27	0.09958	1.270600	0.128500	0.008499	0.634200	1.870500	0.322600	0.460500	0.126000	0.000110	0.273500	0.090560
2006:10:04	0.10021	1.269400	0.128400	0.008495	0.630000	1.881900	0.323300	0.465800	0.126200	0.000110	0.271800	0.091700
2006:10:11	0.09896	1.272300	0.128400	0.008576	0.630400	1.898400	0.323000	0.453000	0.126500	0.000108	0.273200	0.090550
2006:10:18	0.10000	1.274000	0.128300	0.008496	0.631800	1.887600	0.322500	0.464300	0.126600	0.000109	0.278600	0.091080
2006:10:25	0.10188	1.257000	0.128300	0.008379	0.629300	1.861900	0.322300	0.465500	0.126700	0.000108	0.272000	0.090360
2006:11:01	0.10313	1.253900	0.128500	0.008411	0.632500	1.865700	0.322700	0.469500	0.126600	0.000109	0.273400	0.092240
2006:11:08	0.10396	1.254900	0.128500	0.008376	0.634800	1.872100	0.324200	0.468100	0.126700	0.000109	0.273500	0.092240
2006:11:15	0.10271	1.272200	0.128600	0.008513	0.640800	1.901700	0.323800	0.467700	0.127100	0.000110	0.275100	0.092830
2006:11:22	0.10333	1.276100	0.128500	0.008485	0.640200	1.903900	0.324700	0.469000	0.127100	0.000110	0.275600	0.092530
2006:11:29	0.10313	1.282100	0.128500	0.008494	0.642400	1.900700	0.325700	0.464100	0.127300	0.000110	0.276100	0.092070
2006:12:06	0.10250	1.282000	0.128400	0.008472	0.642000	1.898200	0.325400	0.463200	0.127200	0.000109	0.275300	0.091130
2006:12:13	0.10229	1.314600	0.128600	0.008612	0.645100	1.942500	0.325300	0.457200	0.127600	0.000110	0.275800	0.090260
2006:12:20	0.10125	1.332700	0.128700	0.008691	0.649400	1.976900	0.327500	0.463800	0.128000	0.000110	0.282000	0.091630
2006:12:27	0.10042	1.324800	0.128600	0.008554	0.649100	1.962200	0.327500	0.467300	0.127900	0.000110	0.282700	0.092220
2007:01:03	0.10083	1.313500	0.128600	0.008472	0.647400	1.956200	0.327500	0.465000	0.128000	0.000111	0.279800	0.092370
2007:01:10	0.10083	1.313400	0.128500	0.008411	0.649000	1.958700	0.327900	0.465700	0.128100	0.000110	0.282800	0.092020
2007:01:17	0.10229	1.325300	0.128500	0.008419	0.653100	1.968200	0.327300	0.469000	0.128100	0.000112	0.283400	0.092710
2007:01:24	0.10313	1.302600	0.128300	0.008401	0.651000	1.941400	0.324800	0.466200	0.128200	0.000111	0.285300	0.091310
2007:01:31	0.10375	1.294400	0.128200	0.008301	0.649500	1.964500	0.324900	0.467200	0.128500	0.000110	0.285700	0.091160
2007:02:07	0.10396	1.298100	0.128200	0.008227	0.650700	1.981700	0.323400	0.468900	0.128800	0.000111	0.285700	0.091350
2007:02:14	0.10354	1.296100	0.128000	0.008213	0.650100	1.963000	0.322300	0.469400	0.128800	0.000110	0.285700	0.090270
2007:02:21	0.10438	1.294000	0.128100	0.008315	0.652300	1.964300	0.322700	0.480600	0.129100	0.000111	0.286200	0.091630
2007:02:28	0.10438	1.299000	0.128000	0.008233	0.648800	1.946400	0.322700	0.474300	0.129000	0.000111	0.285900	0.090790
2007:03:07	0.10479	1.315500	0.128000	0.008341	0.652500	1.952600	0.322600	0.478700	0.129200	0.000111	0.286500	0.091130
2007:03:14	0.10396	1.320600	0.128000	0.008350	0.655000	1.964200	0.322700	0.477000	0.129300	0.000111	0.286300	0.090080
2007:03:21	0.10313	1.310500	0.128000	0.008602	0.654000	1.925600	0.322700	0.470000	0.129300	0.000108	0.284800	0.089610
2007:03:28	0.10229	1.318900	0.128000	0.008533	0.654500	1.931400	0.322800	0.478700	0.129300	0.000109	0.285300	0.089720
2007:04:04	0.10229	1.329800	0.128000	0.008505	0.655400	1.951200	0.322900	0.482500	0.129400	0.000109	0.286100	0.089890
2007:04:11	0.10229	1.333800	0.128000	0.008467	0.659500	1.967200	0.322500	0.485700	0.129500	0.000110	0.289900	0.090680
2007:04:18	0.10229	1.336300	0.128000	0.008452	0.658700	1.977500	0.323000	0.490200	0.129500	0.000110	0.289000	0.090920

APPENDIX - C6
DATA FOR CHAPTER 5

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2007:04:25	0.10188	1.340900	0.128000	0.008396	0.659900	1.969100	0.323500	0.494200	0.129500	0.000110	0.290100	0.091020
2007:05:02	0.10104	1.354900	0.128000	0.008377	0.660700	1.996800	0.324500	0.492400	0.129500	0.000110	0.291100	0.090960
2007:05:09	0.10042	1.358400	0.128000	0.008434	0.660600	1.999700	0.324800	0.491900	0.129600	0.000110	0.292300	0.091070
2007:05:16	0.09917	1.363900	0.127800	0.008365	0.657900	2.001100	0.323900	0.492600	0.129900	0.000110	0.291800	0.091280
2007:05:23	0.09854	1.357900	0.127900	0.008341	0.660100	1.992900	0.325000	0.495400	0.130100	0.000112	0.293500	0.092300
2007:05:30	0.09604	1.355600	0.128000	0.008309	0.659500	1.980400	0.325600	0.500600	0.130300	0.000114	0.294700	0.092590
2007:06:06	0.09917	1.345900	0.127800	0.008233	0.653100	1.972700	0.325900	0.516700	0.130800	0.000114	0.295300	0.092890
2007:06:13	0.09792	1.346200	0.127900	0.008228	0.654700	1.983900	0.324600	0.515800	0.130900	0.000114	0.295300	0.092690
2007:06:20	0.09708	1.350900	0.128100	0.008222	0.653700	1.992900	0.326000	0.515900	0.131000	0.000114	0.293900	0.092860
2007:06:27	0.09396	1.334600	0.128000	0.008216	0.649500	1.972900	0.325600	0.516100	0.131000	0.000110	0.290100	0.091560
2007:07:04	0.09583	1.341500	0.127900	0.008094	0.650400	1.985700	0.325700	0.526000	0.131400	0.000111	0.291400	0.092850
2007:07:11	0.09667	1.346100	0.128000	0.008108	0.650300	1.998800	0.324500	0.514200	0.131500	0.000111	0.288000	0.092210
2007:07:18	0.10021	1.361600	0.128000	0.008171	0.656700	2.017000	0.323800	0.523700	0.131800	0.000111	0.290500	0.092980
2007:07:25	0.10000	1.365400	0.127900	0.008133	0.659000	2.018100	0.322300	0.527900	0.132100	0.000111	0.290900	0.092830
2007:08:01	0.10042	1.378100	0.127900	0.008195	0.659200	2.041000	0.322700	0.536700	0.132400	0.000111	0.290500	0.092820
2007:08:08	0.10083	1.382300	0.127900	0.008283	0.664400	2.062400	0.319800	0.543400	0.132400	0.000110	0.294000	0.092880
2007:08:15	0.09875	1.370500	0.127800	0.008399	0.661200	2.031200	0.320600	0.535000	0.132300	0.000109	0.289600	0.091600
2007:08:22	0.10000	1.378800	0.127700	0.008427	0.660100	2.027700	0.318900	0.525200	0.132300	0.000108	0.289600	0.091270
2007:08:29	0.08604	1.359200	0.127800	0.008470	0.657100	2.006000	0.318300	0.512300	0.132200	0.000107	0.287600	0.090580
2007:09:05	0.07438	1.347900	0.128000	0.008724	0.654200	1.983900	0.317000	0.492500	0.131900	0.000106	0.286100	0.089920
2007:09:12	0.08021	1.364000	0.128200	0.008669	0.656700	2.008300	0.315700	0.508600	0.132500	0.000106	0.286400	0.090300
2007:09:19	0.08792	1.360400	0.128300	0.008631	0.655800	2.015500	0.316900	0.512400	0.132600	0.000106	0.285300	0.090700
2007:09:26	0.08125	1.381000	0.128500	0.008791	0.657000	2.028900	0.317900	0.517600	0.133100	0.000106	0.284600	0.090000
2007:10:03	0.07938	1.387300	0.128400	0.008676	0.659500	1.995300	0.319400	0.524400	0.133100	0.000107	0.287000	0.089950
2007:10:10	0.07542	1.409900	0.128700	0.008724	0.666500	2.015800	0.318200	0.536000	0.133300	0.000109	0.291200	0.091310
2007:10:17	0.08000	1.419300	0.128800	0.008646	0.675500	2.041400	0.317900	0.551000	0.133400	0.000110	0.293900	0.091790
2007:10:24	0.08188	1.405000	0.128900	0.008533	0.678700	2.033300	0.317400	0.552700	0.133200	0.000110	0.294400	0.092240
2007:10:31	0.08188	1.418400	0.129000	0.008546	0.681700	2.037500	0.316700	0.551000	0.133200	0.000110	0.295900	0.092390
2007:11:07	0.07729	1.421400	0.129000	0.008729	0.682800	2.040600	0.316200	0.556900	0.133400	0.000110	0.296700	0.092440
2007:11:14	0.07958	1.441100	0.129000	0.008722	0.689000	2.063600	0.317400	0.570700	0.134000	0.000110	0.299200	0.093330
2007:11:21	0.07000	1.451400	0.128800	0.008729	0.690300	2.084500	0.319600	0.576300	0.134300	0.000110	0.299600	0.093370
2007:11:28	0.06917	1.458100	0.128400	0.009087	0.689100	2.065300	0.319600	0.562700	0.134700	0.000109	0.298800	0.091530
2007:12:05	0.06917	1.472400	0.128500	0.009089	0.689900	2.056900	0.320000	0.568500	0.134900	0.000107	0.297400	0.091040
2007:12:12	0.06167	1.485800	0.128500	0.009257	0.693300	2.070300	0.318400	0.541900	0.135600	0.000107	0.296800	0.090930
2007:12:19	0.06208	1.469500	0.128400	0.009083	0.690600	2.062600	0.319000	0.552600	0.135400	0.000108	0.299200	0.091730
2007:12:26	0.05854	1.470800	0.128300	0.008947	0.693900	2.045900	0.318900	0.568700	0.135700	0.000108	0.301800	0.092550
2008:01:02	0.05917	1.440100	0.128200	0.008836	0.685100	2.018200	0.318900	0.552900	0.135600	0.000107	0.298700	0.092120
2008:01:09	0.06708	1.440200	0.128100	0.008762	0.688300	1.977300	0.325600	0.560300	0.136000	0.000106	0.304100	0.092680
2008:01:16	0.06604	1.459700	0.128200	0.008959	0.694900	1.985600	0.320500	0.572400	0.137100	0.000106	0.305000	0.091770
2008:01:23	0.06479	1.470600	0.128200	0.009145	0.698100	1.973400	0.319500	0.569000	0.137800	0.000106	0.305700	0.091850
2008:01:30	0.06333	1.486800	0.128200	0.009292	0.699900	1.961400	0.318900	0.575400	0.138300	0.000106	0.307200	0.091690
2008:02:06	0.04396	1.448700	0.128000	0.009412	0.691800	1.947800	0.317000	0.551200	0.138400	0.000106	0.303600	0.091150
2008:02:13	0.04458	1.477300	0.128100	0.009362	0.704100	1.986400	0.317700	0.563800	0.139200	0.000107	0.309000	0.092110
2008:02:20	0.04250	1.475000	0.128200	0.009351	0.706300	1.970100	0.316800	0.571200	0.139400	0.000109	0.309900	0.092590
2008:02:27	0.04604	1.453800	0.128200	0.009340	0.705600	1.953400	0.316200	0.571400	0.139300	0.000108	0.308800	0.092970
2008:03:05	0.04521	1.470200	0.128200	0.009272	0.708300	1.950600	0.317100	0.576900	0.140100	0.000109	0.310100	0.093160
2008:03:12	0.04021	1.485200	0.128300	0.009271	0.711700	1.970400	0.317100	0.590600	0.139900	0.000111	0.311600	0.092930
2008:03:19	0.03083	1.520300	0.128500	0.009690	0.719300	1.985600	0.317100	0.599100	0.140900	0.000110	0.313800	0.093480
2008:03:26	0.03000	1.536200	0.128400	0.009781	0.720300	2.008700	0.317300	0.588100	0.140900	0.000109	0.312600	0.092350
2008:04:02	0.01354	1.576400	0.128700	0.010239	0.725300	2.008400	0.317700	0.585400	0.141400	0.000109	0.315100	0.093040
2008:04:09	0.02646	1.553300	0.128500	0.009961	0.722400	1.992900	0.317800	0.575400	0.142000	0.000110	0.313500	0.093640
2008:04:16	0.02646	1.569600	0.128400	0.009955	0.725400	1.980600	0.315900	0.572100	0.142800	0.000108	0.313300	0.094110
2008:04:23	0.02646	1.573200	0.128400	0.009772	0.724600	1.979500	0.317000	0.587700	0.143000	0.000109	0.313900	0.094750
2008:04:30	0.02333	1.582100	0.128300	0.009880	0.737000	1.969800	0.317200	0.594000	0.143200	0.000109	0.315800	0.095590
2008:05:07	0.02500	1.593100	0.128300	0.009699	0.740000	1.985900	0.314600	0.602700	0.143300	0.000109	0.318600	0.095050
2008:05:14	0.02792	1.560900	0.128300	0.009612	0.735000	1.982000	0.315500	0.590800	0.143400	0.000108	0.317200	0.095330
2008:05:21	0.03396	1.552000	0.128300	0.009550	0.736300	1.972800	0.315200	0.604200	0.143300	0.000109	0.317500	0.095430
2008:05:28	0.03708	1.550700	0.128300	0.009613	0.731000	1.951000	0.315000	0.602700	0.143300	0.000109	0.311200	0.095440
2008:06:04	0.03771	1.559100	0.128200	0.009617	0.730800	1.958900	0.318000	0.606200	0.143600	0.000109	0.308400	0.096320
2008:06:11	0.03875	1.575800	0.128100	0.009641	0.734100	1.978700	0.318900	0.602200	0.144100	0.000107	0.308600	0.096210
2008:06:18	0.03750	1.552900	0.128100	0.009560	0.733900	1.965300	0.325300	0.616600	0.144600	0.000107	0.310800	0.096870
2008:06:25	0.03958	1.555300	0.128000	0.009364	0.730600	1.963500	0.326400	0.613600	0.144700	0.000107	0.306200	0.096480
2008:07:02	0.03917	1.550300	0.128100	0.009256	0.730700	1.959900	0.329500	0.618700	0.145300	0.000108	0.308300	0.096990
2008:07:09	0.03667	1.555000	0.128100	0.009267	0.731200	1.966900	0.331600	0.622200	0.145800	0.000108	0.307300	0.096920
2008:07:16	0.03729	1.576800	0.128200	0.009445	0.734900	1.994000	0.331200	0.623700	0.146100	0.000109	0.306500	0.096810
2008:07:23	0.03729	1.569700	0.128200	0.009340	0.733500	1.973700	0.332000	0.624200	0.146000	0.000109	0.307000	0.096790
2008:07:30	0.02813	1.593900	0.128200	0.009488	0.741600	2.001900	0.331000	0.627500	0.146800	0.000110	0.310700	0.097030
2008:08:06	0.03208	1.588900	0.128300	0.009379	0.739000	2.000400	0.330900	0.632800	0.146800	0.000109	0.309000	0.098780
2008:08:13	0.03208	1.569900	0.128200	0.009287	0.733000	1.989600	0.331500	0.636700	0.146700	0.000110	0.306700	0.099490
2008:08:20	0.03333	1.551500	0.128100	0.009251	0.726600	1.957700	0.329200	0.636400	0.146100	0.000110	0.305800	0.101100
2008:08:27	0.03792	1.489900	0.128100	0.009092	0.709000	1.904300	0.329800	0.617300	0.145900	0.000109	0.300800	0.098320
2008:09:03	0.03479	1.469700	0.128000	0.009100	0.706700	1.862600	0.330400	0.611200	0.145900	0.000108	0.300100	0.098250
2008:09:10	0.03417	1.467400	0.128100	0.009124	0.702900	1.842800	0.330500	0.612400	0.146200	0.000107	0.295000	0.098450
2008:09:17	0.03458	1.454300	0.128100	0.009219	0.699600	1.788100	0.330200	0.606000	0.146500	0.000108	0.292200	0.096540
2008:09:24	0.03375	1.413300	0.128200	0.009285	0.698100	1.760100	0.328000	0.574400	0.146400	0.000107	0.290400	0.095330
2008:10:01	0.00042	1.421600	0.128500	0.009577	0.698400	1.790400	0.323900	0.550200	0.146300	0.000108	0.289600	0.093090
2008:10:08	0.00917	1.475600	0.128800	0.009479	0.708300	1.855700	0.323500	0.555500	0.147100	0.000107	0.294200	0.093790
2008:10:15	0.01667	1.429500	0.128800	0.009537	0.698500	1.799000	0.320300	0.516400	0.146300	0.000105	0.290600	0.090890
2008:10:22	0.01333	1.357400	0.128700	0.009796	0.682900	1.748900	0.313900	0.453100	0.146800	0.000105	0.286600	0.083740
2008:10:29	0.00417	1.366500	0.128900	0.009773	0.684700	1.749200	0.311800	0.476700	0.146600	0.000103	0.286600	0.082070
2008:11:05	0.02104	1.324800	0.129000	0.009872	0.676300	1.706700	0.310900	0.462300	0.146600	0.000100	0.284000	0.077000
2008:11:12	0.01167	1.249100	0.129000	0.010569	0.663600	1.561200	0.303700	0.455500	0.146600	0.000093	0.281200	0.075300
2008:11:19	0.00792	1.272800	0.129000	0.010075	0.676200	1.583800	0.297500	0.469000	0.146700	0.000092	0.283600	0.078740
2008:11:26	0.00292	1.270000	0.129000	0.010222	0.667700	1.557700	0.303100	0.455500	0.146800	0.000090	0.279400	0.077870
2008:12:03	0.00125	1.263100	0.129000	0.010352	0.655300	1.499800	0.300900	0.436000	0.146700	0.000084	0.277200	0.075880

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2008:12:10	0.00063	1.291200	0.129000	0.010390	0.660900	1.518200	0.300900	0.432600	0.146700	0.000081	0.277100	0.074950
2008:12:17	0.00063	1.265200	0.129000	0.010715	0.653700	1.490500	0.295300	0.425100	0.145500	0.000082	0.275000	0.073550
2008:12:24	0.00000	1.289200	0.129000	0.010797	0.664000	1.482000	0.290100	0.401900	0.145700	0.000089	0.276300	0.074370
2008:12:31	0.00000	1.372200	0.129000	0.011080	0.678800	1.530300	0.294300	0.421300	0.146300	0.000091	0.282800	0.075240
2009:01:07	0.00000	1.397600	0.129000	0.011079	0.691100	1.480900	0.292000	0.420500	0.146200	0.000091	0.288300	0.076060
2009:01:14	0.00250	1.409700	0.129000	0.011067	0.693500	1.447900	0.290200	0.427000	0.146700	0.000091	0.287600	0.073300
2009:01:21	0.00208	1.349700	0.129000	0.010680	0.678200	1.469200	0.290300	0.453900	0.146500	0.000090	0.285500	0.074680
2009:01:28	0.00229	1.327700	0.128900	0.011197	0.671500	1.467200	0.290100	0.432600	0.146500	0.000090	0.279600	0.072570
2009:02:04	0.00229	1.298000	0.128900	0.011069	0.664500	1.412500	0.288900	0.426500	0.146400	0.000089	0.277100	0.071780
2009:02:11	0.00375	1.320300	0.128900	0.011209	0.666400	1.408600	0.288800	0.433800	0.146400	0.000091	0.277100	0.071160
2009:02:18	0.00604	1.288700	0.129000	0.011182	0.661500	1.427300	0.286400	0.431800	0.146400	0.000086	0.276600	0.069070
2009:02:25	0.00625	1.292700	0.129000	0.010972	0.666900	1.477300	0.286300	0.443300	0.146700	0.000085	0.278000	0.070130
2009:03:04	0.00625	1.265300	0.129000	0.010854	0.655800	1.423700	0.287000	0.437700	0.146500	0.000083	0.274900	0.068760
2009:03:11	0.00604	1.275100	0.129000	0.010467	0.654300	1.450200	0.282500	0.420000	0.146400	0.000084	0.273700	0.067080
2009:03:18	0.00521	1.260200	0.128900	0.010229	0.644800	1.406700	0.277700	0.410500	0.146400	0.000083	0.270000	0.065130
2009:03:25	0.00458	1.268700	0.128900	0.010139	0.649000	1.381700	0.274800	0.425400	0.146400	0.000084	0.270600	0.064730
2009:04:01	0.00417	1.298700	0.129000	0.010150	0.652300	1.405900	0.275000	0.440400	0.146500	0.000084	0.272500	0.070640
2009:04:08	0.00396	1.359600	0.129000	0.010219	0.663000	1.467400	0.271200	0.445300	0.146600	0.000085	0.275600	0.070170
2009:04:15	0.00438	1.327700	0.129000	0.010141	0.657700	1.431200	0.269400	0.432300	0.146500	0.000087	0.274600	0.070550
2009:04:22	0.00375	1.332400	0.129000	0.009949	0.662200	1.470500	0.272200	0.449900	0.146500	0.000087	0.278900	0.073470
2009:04:29	0.00292	1.330900	0.129000	0.010037	0.665500	1.487800	0.272400	0.460700	0.146600	0.000090	0.279300	0.076370
2009:05:06	0.00292	1.294000	0.129000	0.010182	0.663100	1.457800	0.271400	0.447600	0.146700	0.000093	0.274600	0.074980
2009:05:13	0.00188	1.304000	0.129000	0.010381	0.667000	1.460600	0.270100	0.455900	0.146700	0.000092	0.276300	0.071510
2009:05:20	0.00375	1.337900	0.129000	0.010115	0.679400	1.505600	0.270800	0.470400	0.146900	0.000096	0.284700	0.075580
2009:05:27	0.00354	1.362300	0.129000	0.010299	0.684600	1.520000	0.269000	0.485500	0.146800	0.000097	0.284700	0.075590
2009:06:03	0.00354	1.359300	0.129000	0.010387	0.683600	1.542100	0.269100	0.485600	0.146700	0.000098	0.283500	0.077120
2009:06:10	0.00333	1.396300	0.129000	0.010546	0.690000	1.589000	0.267700	0.493000	0.146600	0.000098	0.285100	0.076030
2009:06:17	0.00271	1.420700	0.129000	0.010408	0.694800	1.646600	0.267600	0.514500	0.146600	0.000099	0.287100	0.075520
2009:06:24	0.00354	1.395000	0.129000	0.010204	0.685900	1.615200	0.266500	0.513600	0.146500	0.000100	0.284100	0.074330
2009:07:01	0.00354	1.384200	0.129000	0.010329	0.685400	1.636400	0.265700	0.513400	0.146500	0.000099	0.284000	0.074800
2009:07:08	0.00375	1.394200	0.129000	0.010486	0.686000	1.633700	0.265000	0.498600	0.146500	0.000098	0.282500	0.075110
2009:07:15	0.00354	1.408600	0.129000	0.010414	0.690500	1.656800	0.264100	0.511900	0.146600	0.000098	0.284700	0.076030
2009:07:22	0.00354	1.396700	0.129000	0.010509	0.686400	1.621500	0.263000	0.511500	0.146600	0.000098	0.282000	0.075500
2009:07:29	0.00354	1.397500	0.129000	0.010740	0.685200	1.627800	0.262700	0.507500	0.146600	0.000099	0.278800	0.072960
2009:08:05	0.00375	1.421300	0.129000	0.010646	0.693600	1.647100	0.262900	0.525400	0.146600	0.000100	0.282500	0.075280
2009:08:12	0.00354	1.422700	0.129000	0.010548	0.694400	1.648100	0.262900	0.532300	0.146600	0.000100	0.285200	0.075520
2009:08:19	0.00354	1.440200	0.129000	0.010514	0.697900	1.694200	0.261600	0.547400	0.146600	0.000103	0.286300	0.076290
2009:08:26	0.00354	1.414900	0.129000	0.010360	0.691700	1.648400	0.261400	0.542100	0.146500	0.000101	0.285200	0.077260
2009:09:02	0.00354	1.411300	0.129000	0.010548	0.689900	1.643900	0.260700	0.537300	0.146500	0.000100	0.282900	0.077120
2009:09:09	0.00292	1.430500	0.129000	0.010615	0.693500	1.638700	0.259800	0.544900	0.146600	0.000100	0.284800	0.077470
2009:09:16	0.00271	1.430700	0.129000	0.010745	0.693600	1.624700	0.259900	0.533400	0.146600	0.000099	0.283700	0.074450
2009:09:23	0.00292	1.442100	0.129000	0.010812	0.699900	1.644900	0.260100	0.546200	0.146700	0.000100	0.285700	0.075110
2009:09:30	0.00188	1.462100	0.129000	0.010979	0.703100	1.654500	0.261000	0.553100	0.146600	0.000101	0.285900	0.074990
2009:10:07	0.00188	1.475500	0.129000	0.010931	0.707400	1.629800	0.261000	0.552800	0.146700	0.000104	0.288100	0.075000
2009:10:14	0.00250	1.459200	0.129000	0.011115	0.705200	1.592200	0.261100	0.559800	0.146700	0.000103	0.287200	0.073880
2009:10:21	0.00125	1.471000	0.129000	0.011228	0.712500	1.594400	0.260800	0.571400	0.146700	0.000105	0.291100	0.073830
2009:10:28	0.00125	1.480500	0.129000	0.011139	0.715700	1.581600	0.261400	0.576500	0.146700	0.000107	0.295000	0.075780
2009:11:04	0.00125	1.495800	0.129000	0.011050	0.718800	1.640200	0.262100	0.576400	0.146700	0.000107	0.297600	0.077320
2009:11:11	0.00125	1.485700	0.129000	0.010866	0.715400	1.635100	0.262000	0.577500	0.146600	0.000105	0.294400	0.075430
2009:11:18	0.00104	1.472900	0.129000	0.011081	0.714400	1.636600	0.262200	0.569800	0.146700	0.000104	0.292000	0.075480
2009:11:25	0.00125	1.498300	0.129000	0.011124	0.720500	1.671200	0.262300	0.587100	0.146700	0.000107	0.295700	0.075420
2009:12:02	0.00063	1.492000	0.129000	0.011219	0.721900	1.681300	0.262500	0.583500	0.146700	0.000107	0.297400	0.076880
2009:12:09	0.00083	1.495000	0.129000	0.011274	0.721500	1.657000	0.263600	0.579400	0.146700	0.000106	0.295600	0.077250
2009:12:16	0.00083	1.505100	0.129000	0.011524	0.723600	1.652100	0.263000	0.576400	0.146700	0.000107	0.296300	0.077610
2009:12:23	0.00063	1.479800	0.129000	0.011261	0.718900	1.636800	0.262900	0.574400	0.146700	0.000104	0.294700	0.078510
2009:12:30	0.00083	1.459000	0.129000	0.011213	0.718000	1.627200	0.262600	0.571900	0.146700	0.000105	0.293300	0.078530
2010:01:06	0.00104	1.428600	0.128900	0.010940	0.711200	1.602700	0.262900	0.562300	0.146600	0.000104	0.291500	0.077480
2010:01:13	0.00083	1.438900	0.128900	0.010898	0.711800	1.598900	0.263000	0.576300	0.146700	0.000106	0.291500	0.076900
2010:01:20	0.00104	1.441700	0.128900	0.010876	0.716500	1.605900	0.263900	0.580000	0.146700	0.000107	0.295800	0.077840
2010:01:27	0.00104	1.449700	0.129000	0.010906	0.719700	1.612600	0.263600	0.575400	0.146700	0.000109	0.299200	0.078450
2010:02:03	0.00104	1.434800	0.128800	0.011017	0.719800	1.638200	0.263700	0.565400	0.146700	0.000109	0.299900	0.079030
2010:02:10	0.00146	1.410600	0.128700	0.011125	0.713100	1.619000	0.263000	0.546600	0.146700	0.000108	0.292900	0.077670
2010:02:17	0.00188	1.393600	0.128700	0.011036	0.709300	1.595200	0.261300	0.543400	0.146700	0.000108	0.292900	0.077650
2010:02:24	0.00208	1.371800	0.128700	0.011175	0.704400	1.562200	0.260500	0.539200	0.146700	0.000108	0.291400	0.076040
2010:03:03	0.00188	1.369200	0.128700	0.011108	0.711100	1.572000	0.259600	0.542100	0.146600	0.000108	0.292400	0.077630
2010:03:10	0.00229	1.357900	0.128800	0.011037	0.709900	1.546000	0.259100	0.551100	0.146700	0.000108	0.294500	0.077920
2010:03:17	0.00292	1.355400	0.128800	0.011233	0.712200	1.494400	0.259700	0.562200	0.146700	0.000107	0.296700	0.078580
2010:03:24	0.00292	1.359000	0.128900	0.011127	0.714600	1.498600	0.259400	0.559900	0.146700	0.000109	0.299700	0.078980
2010:03:31	0.00313	1.372500	0.128900	0.011063	0.716600	1.514200	0.259300	0.567200	0.146700	0.000109	0.301800	0.079800
2010:04:07	0.00292	1.351700	0.128800	0.011071	0.713900	1.504100	0.258900	0.562700	0.146700	0.000109	0.301300	0.079850
2010:04:14	0.00313	1.345500	0.128800	0.010791	0.715000	1.507200	0.258600	0.558500	0.146700	0.000110	0.306300	0.080590
2010:04:21	0.00333	1.340000	0.128800	0.010652	0.716000	1.520900	0.258500	0.569200	0.146700	0.000110	0.310600	0.081700
2010:04:28	0.00333	1.358900	0.128900	0.010751	0.718100	1.538400	0.258200	0.569900	0.146700	0.000111	0.310600	0.082050
2010:05:05	0.00292	1.346900	0.128800	0.010759	0.727200	1.536400	0.258700	0.571100	0.146700	0.000111	0.312200	0.081800
2010:05:12	0.00333	1.330000	0.128800	0.010691	0.729900	1.534400	0.258500	0.570700	0.146700	0.000111	0.314100	0.081810
2010:05:19	0.00292	1.309300	0.128800	0.010573	0.726700	1.518200	0.257500	0.575400	0.146700	0.000111	0.311500	0.080830
2010:05:26	0.00313	1.271100	0.128500	0.010792	0.723600	1.486500	0.256700	0.564000	0.146700	0.000109	0.311600	0.079920
2010:06:02	0.00354	1.235400	0.128300	0.010802	0.719800	1.443300	0.256500	0.556600	0.146700	0.000110	0.311400	0.079290
2010:06:09	0.00333	1.226100	0.128200	0.011140	0.705500	1.433800	0.257100	0.533500	0.146600	0.000107	0.298500	0.075860
2010:06:16	0.00292	1.222800	0.128400	0.010983	0.709400	1.458300	0.255200	0.549000	0.146700	0.000108	0.303100	0.077280
2010:06:23	0.00188	1.194800	0.128100	0.010937	0.706500	1.443400	0.254900	0.535200	0.146600	0.000108	0.300600	0.077400
2010:06:30	0.00188	1.227000	0.128300	0.010950	0.716500	1.477100	0.254900	0.555400	0.146600	0.000109	0.306300	0.079200
2010:07:07	0.00250	1.229200	0.128600	0.011031	0.723700	1.477900	0.254700	0.566300	0.147000	0.000111	0.312000	0.079780
2010:07:14	0.00354	1.220800	0.128500	0.011282	0.715300	1.507100	0.254500	0.558100	0.147300	0.000110	0.308100	0.077960
2010:07:21	0.00333	1.259900	0.128400	0.011407	0.720400	1.517400	0.254500	0.565800	0.147700	0.000111	0.312100	0.076970

APPENDIX - C6
DATA FOR CHAPTER 5

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2010:07:28	0.00292	1.263100	0.128600	0.011309	0.724800	1.510400	0.254400	0.570400	0.147900	0.000111	0.312400	0.078380
2010:08:04	0.00313	1.292400	0.128600	0.011488	0.727900	1.524700	0.254400	0.560700	0.147700	0.000110	0.311400	0.077760
2010:08:11	0.00292	1.299800	0.128700	0.011430	0.734400	1.553200	0.254700	0.568200	0.147800	0.000112	0.314200	0.079010
2010:08:18	0.00292	1.321700	0.128800	0.011632	0.740400	1.592900	0.254200	0.570900	0.147800	0.000114	0.316700	0.079460
2010:08:25	0.00292	1.314700	0.128800	0.011657	0.738600	1.579000	0.254700	0.570400	0.147900	0.000112	0.317700	0.078990
2010:09:01	0.00313	1.287400	0.128700	0.011709	0.738300	1.562400	0.254400	0.571700	0.147400	0.000113	0.316700	0.079290
2010:09:08	0.00313	1.264800	0.128600	0.011856	0.734600	1.542700	0.254300	0.568900	0.147300	0.000111	0.319000	0.077220
2010:09:15	0.00271	1.268300	0.128500	0.011873	0.737900	1.539200	0.253400	0.570300	0.147100	0.000111	0.317800	0.075890
2010:09:22	0.00271	1.275000	0.128700	0.011930	0.741900	1.535300	0.253400	0.579400	0.147500	0.000111	0.320200	0.076780
2010:09:29	0.00313	1.292200	0.128800	0.012019	0.749000	1.546400	0.253600	0.586700	0.148500	0.000113	0.322500	0.077790
2010:10:06	0.00333	1.313900	0.128800	0.011715	0.751100	1.555900	0.253600	0.580000	0.149300	0.000112	0.323200	0.078370
2010:10:13	0.00333	1.350000	0.128900	0.011901	0.757800	1.581400	0.252100	0.585700	0.149700	0.000113	0.323600	0.079830
2010:10:20	0.00250	1.378300	0.128900	0.011997	0.762100	1.587300	0.252700	0.594100	0.149700	0.000113	0.323200	0.079740
2010:10:27	0.00271	1.384900	0.128900	0.012214	0.765100	1.583300	0.253600	0.600300	0.150100	0.000113	0.323200	0.080300
2010:11:03	0.00292	1.384800	0.128900	0.012267	0.765100	1.577300	0.252600	0.594400	0.150700	0.000112	0.321500	0.080240
2010:11:10	0.00271	1.390800	0.128900	0.012321	0.771600	1.582800	0.252900	0.588700	0.150300	0.000112	0.323100	0.080790
2010:11:17	0.00250	1.396500	0.129000	0.012398	0.775800	1.603700	0.252900	0.587900	0.149900	0.000113	0.324100	0.081260
2010:11:24	0.00250	1.388500	0.129000	0.012347	0.777600	1.611400	0.252300	0.589900	0.150700	0.000114	0.322800	0.081850
2010:12:01	0.00292	1.357700	0.129000	0.012022	0.768600	1.600300	0.252100	0.578900	0.150800	0.000113	0.319400	0.081150
2010:12:08	0.00313	1.352800	0.128900	0.012007	0.765200	1.590500	0.251900	0.578700	0.150700	0.000112	0.319900	0.080970
2010:12:15	0.00333	1.306500	0.128800	0.011916	0.757600	1.555300	0.251200	0.582800	0.150200	0.000112	0.316200	0.080100
2010:12:22	0.00292	1.333200	0.128800	0.012083	0.766800	1.576400	0.251600	0.597600	0.150700	0.000112	0.318300	0.080850
2010:12:29	0.00292	1.341000	0.128600	0.011993	0.768200	1.584100	0.252000	0.591000	0.150500	0.000113	0.319900	0.080770
2011:01:05	0.00271	1.314600	0.128600	0.011947	0.760900	1.550900	0.251800	0.589300	0.150400	0.000112	0.319100	0.080760
2011:01:12	0.00250	1.319600	0.128500	0.012139	0.770900	1.543600	0.251900	0.593700	0.151100	0.000112	0.323700	0.081060
2011:01:19	0.00292	1.335300	0.128700	0.012195	0.777600	1.554600	0.251900	0.603600	0.151600	0.000113	0.326600	0.081760
2011:01:26	0.00292	1.294900	0.128600	0.012039	0.771700	1.557400	0.251700	0.593100	0.151300	0.000112	0.325700	0.081970
2011:02:02	0.00333	1.334900	0.128600	0.012109	0.778200	1.595800	0.251400	0.597800	0.152100	0.000112	0.327300	0.083450
2011:02:09	0.00333	1.364300	0.128300	0.012135	0.780800	1.589400	0.251200	0.599500	0.152100	0.000112	0.328100	0.082940
2011:02:16	0.00313	1.374800	0.128300	0.012233	0.783900	1.608400	0.249900	0.601600	0.151900	0.000112	0.327200	0.082840
2011:02:23	0.00271	1.362500	0.128500	0.012167	0.785900	1.611000	0.249500	0.599700	0.152800	0.000113	0.330700	0.083370
2011:03:02	0.00229	1.350700	0.128300	0.011970	0.781100	1.608400	0.248800	0.600700	0.151900	0.000114	0.327900	0.082920
2011:03:09	0.00250	1.363300	0.128400	0.012040	0.781700	1.616800	0.248500	0.600400	0.152200	0.000114	0.328700	0.082710
2011:03:16	0.00250	1.381500	0.128400	0.012195	0.787000	1.628000	0.248300	0.602900	0.152400	0.000114	0.329500	0.082710
2011:03:23	0.00188	1.393900	0.128400	0.012128	0.789200	1.618100	0.248500	0.605300	0.152600	0.000114	0.330000	0.083100
2011:03:30	0.00188	1.394800	0.128300	0.012295	0.783500	1.609600	0.248300	0.600800	0.152200	0.000114	0.326300	0.083550
2011:04:06	0.00188	1.421900	0.128300	0.012345	0.791000	1.634600	0.247900	0.601200	0.152700	0.000115	0.330500	0.083530
2011:04:13	0.00188	1.409200	0.128300	0.012198	0.792300	1.599600	0.247300	0.603000	0.152600	0.000115	0.330400	0.083630
2011:04:20	0.00104	1.420100	0.128600	0.011847	0.793300	1.619700	0.247300	0.622200	0.153100	0.000116	0.331300	0.084490
2011:04:27	0.00104	1.444600	0.128700	0.011894	0.795300	1.629100	0.246900	0.633100	0.153100	0.000116	0.330600	0.084950
2011:05:04	0.00104	1.427100	0.128600	0.012122	0.802100	1.628200	0.245900	0.631200	0.153400	0.000116	0.331200	0.085340
2011:05:11	0.00104	1.459100	0.128700	0.012237	0.810100	1.648000	0.245100	0.637900	0.153700	0.000116	0.333800	0.086300
2011:05:18	0.00042	1.481500	0.128700	0.012348	0.815800	1.655700	0.244800	0.631700	0.154100	0.000117	0.336400	0.086670
2011:05:25	0.00042	1.435200	0.128700	0.012414	0.811400	1.637200	0.245600	0.619900	0.154100	0.000117	0.335400	0.086210
2011:06:01	0.00083	1.417400	0.128600	0.012300	0.801100	1.622400	0.245100	0.613300	0.153800	0.000117	0.329000	0.085140
2011:06:08	0.00104	1.407800	0.128600	0.012208	0.802100	1.614100	0.245100	0.613000	0.153900	0.000118	0.327900	0.085430
2011:06:15	0.00083	1.437800	0.128600	0.012301	0.811100	1.649400	0.245500	0.630300	0.154500	0.000119	0.333000	0.086430
2011:06:22	0.00083	1.463900	0.128600	0.012472	0.813700	1.640200	0.244900	0.634700	0.154500	0.000118	0.333600	0.085290
2011:06:29	0.00104	1.444100	0.128500	0.012450	0.811600	1.639400	0.244800	0.631600	0.154400	0.000118	0.330200	0.084590
2011:07:06	0.00021	1.436100	0.128400	0.012474	0.810500	1.621900	0.244500	0.628300	0.154600	0.000117	0.330000	0.084600
2011:07:13	0.00042	1.431200	0.128400	0.012365	0.806000	1.598100	0.243900	0.634300	0.154500	0.000116	0.330900	0.084290
2011:07:20	0.00000	1.448200	0.128500	0.012342	0.815100	1.607400	0.243500	0.643000	0.154900	0.000119	0.332700	0.086270
2011:07:27	0.00000	1.397900	0.128300	0.012527	0.815100	1.588300	0.244000	0.634200	0.154700	0.000117	0.330600	0.084840
2011:08:03	0.00042	1.414300	0.128300	0.012653	0.822500	1.610300	0.243000	0.636700	0.154800	0.000117	0.333200	0.085500
2011:08:10	0.00146	1.446600	0.128400	0.012806	0.830500	1.636000	0.242500	0.651100	0.155500	0.000118	0.338600	0.086140
2011:08:17	0.00021	1.422600	0.128300	0.012938	0.830700	1.629500	0.243200	0.640200	0.155700	0.000119	0.339600	0.085150
2011:08:24	0.00021	1.423300	0.128100	0.012945	0.821400	1.630500	0.240600	0.619100	0.155500	0.000118	0.330900	0.080740
2011:08:31	0.00000	1.440900	0.128300	0.013021	0.832000	1.639100	0.242600	0.631200	0.157000	0.000118	0.339200	0.081680
2011:09:07	0.00021	1.441200	0.128200	0.013039	0.829700	1.649900	0.239400	0.624400	0.156800	0.000117	0.337400	0.081230
2011:09:14	0.00021	1.446900	0.128300	0.013024	0.829300	1.635200	0.239100	0.628900	0.157000	0.000118	0.335600	0.080230
2011:09:21	0.00021	1.407100	0.128300	0.012963	0.827400	1.605500	0.237900	0.606000	0.156700	0.000118	0.335600	0.079870
2011:09:28	0.00000	1.366800	0.128200	0.012989	0.807700	1.582900	0.238400	0.586400	0.156400	0.000116	0.329000	0.077750
2011:10:05	0.00000	1.366100	0.128300	0.013067	0.792100	1.569900	0.238100	0.559300	0.156800	0.000113	0.320800	0.075960
2011:10:12	0.00021	1.355900	0.128300	0.013077	0.778100	1.560100	0.238200	0.548700	0.156800	0.000112	0.317000	0.074490
2011:10:19	0.00000	1.321800	0.128400	0.013034	0.760900	1.541700	0.237500	0.530400	0.156600	0.000112	0.311700	0.071540
2011:10:26	0.00021	1.363100	0.128500	0.013043	0.780700	1.562700	0.237500	0.570100	0.157500	0.000113	0.318900	0.075280
2011:11:02	0.00042	1.373300	0.128600	0.013022	0.787200	1.574100	0.237100	0.566400	0.156700	0.000113	0.320800	0.074310
2011:11:09	0.00021	1.391600	0.128600	0.013146	0.791900	1.599600	0.236200	0.570800	0.157100	0.000113	0.319600	0.074700
2011:11:16	0.00000	1.375800	0.128700	0.012783	0.789300	1.600400	0.235500	0.582900	0.157300	0.000113	0.322400	0.074110
2011:11:23	0.00000	1.377700	0.128700	0.012829	0.787500	1.606900	0.235200	0.573500	0.157900	0.000112	0.320500	0.074630
2011:11:30	0.00000	1.357900	0.128500	0.012980	0.774800	1.587400	0.234300	0.567000	0.157600	0.000113	0.318100	0.073930
2011:12:07	0.00021	1.351000	0.128400	0.012988	0.768400	1.564500	0.234900	0.553600	0.157100	0.000111	0.314500	0.071540
2011:12:14	0.00021	1.333700	0.128300	0.012830	0.770400	1.556000	0.234600	0.540900	0.157000	0.000110	0.315900	0.071580
2011:12:21	0.00000	1.338600	0.128700	0.012861	0.778800	1.562200	0.233100	0.560200	0.157700	0.000111	0.318500	0.074040
2011:12:28	0.00000	1.316400	0.128500	0.012842	0.768300	1.557900	0.234600	0.545800	0.156900	0.000111	0.316700	0.072450
2012:01:04	0.00000	1.304600	0.128500	0.012834	0.767300	1.558600	0.233100	0.538700	0.157000	0.000110	0.314600	0.072280
2012:01:11	0.00000	1.306900	0.128600	0.012838	0.772200	1.564600	0.233200	0.538800	0.157600	0.000111	0.316300	0.072030
2012:01:18	0.00021	1.300500	0.128700	0.013024	0.776100	1.557900	0.232900	0.539200	0.158200	0.000111	0.317300	0.072450
2012:01:25	0.00021	1.278000	0.128800	0.013015	0.774900	1.547300	0.232200	0.549100	0.158600	0.000110	0.318700	0.073340
2012:02:01	0.00063	1.273000	0.128800	0.013027	0.777800	1.535500	0.232200	0.562500	0.158700	0.000110	0.320000	0.074150
2012:02:08	0.00083	1.301000	0.128900	0.012937	0.788300	1.557300	0.231000	0.570600	0.158900	0.000112	0.321700	0.075950
2012:02:15	0.00104	1.315100	0.128900	0.013107	0.797000	1.574700	0.231300	0.573100	0.158900	0.000112	0.329000	0.077200
2012:02:22	0.00167	1.315600	0.129000	0.013034	0.801900	1.583200	0.230900	0.580400	0.159000	0.000112	0.332400	0.079050
2012:02:29	0.00208	1.315900	0.129000	0.012823	0.792000	1.571500	0.230300	0.582700	0.159000	0.000112	0.328900	0.078520
2012:03:07	0.00167	1.324400	0.129000	0.012545	0.796900	1.582400	0.230000	0.582700	0.158900	0.000111	0.331500	0.078660

Date	3m0 T-Bill (% weekly)	DEM2USD	HKD2USD	JPY2USD	SGD2USD	GBP2USD	ARS2USD	BRL2USD	CNY2USD	IDR2USD	MYR2USD	MXN2USD
2012:03:14	0.00167	1.343200	0.129000	0.012427	0.798000	1.585000	0.229900	0.587200	0.158800	0.000111	0.332400	0.077810
2012:03:21	0.00167	1.317100	0.128800	0.012322	0.792900	1.580700	0.230900	0.573000	0.158500	0.000110	0.331300	0.077560
2012:03:28	0.00167	1.313100	0.128900	0.012117	0.794700	1.566700	0.230200	0.555900	0.158100	0.000109	0.330600	0.079200
2012:04:04	0.00188	1.322500	0.128800	0.011970	0.793400	1.587000	0.229400	0.549500	0.158200	0.000110	0.326000	0.078990
2012:04:11	0.00167	1.334700	0.128800	0.012054	0.795800	1.596700	0.229100	0.550800	0.158400	0.000109	0.326900	0.079070
2012:04:18	0.00146	1.332200	0.128800	0.012174	0.798800	1.600100	0.228700	0.546700	0.158600	0.000110	0.328400	0.078580
2012:04:25	0.00188	1.310100	0.128800	0.012312	0.793100	1.587800	0.228600	0.548700	0.158300	0.000109	0.326600	0.076720
2012:05:02	0.00125	1.312900	0.128900	0.012409	0.800300	1.591900	0.227800	0.541800	0.158500	0.000109	0.326500	0.076030
2012:05:09	0.00188	1.317200	0.128900	0.012327	0.801800	1.613500	0.227100	0.532300	0.158400	0.000109	0.326500	0.076000
2012:05:16	0.00167	1.324500	0.128900	0.012512	0.808800	1.622400	0.226900	0.524600	0.158700	0.000109	0.331000	0.077050
2012:05:23	0.00188	1.302600	0.128800	0.012520	0.802100	1.616200	0.225700	0.519500	0.158600	0.000109	0.327700	0.075600
2012:05:30	0.00188	1.281200	0.128800	0.012504	0.795200	1.606300	0.225400	0.501800	0.158300	0.000108	0.324900	0.072940
2012:06:06	0.00167	1.276900	0.128800	0.012555	0.788200	1.580100	0.224200	0.489100	0.158400	0.000108	0.320700	0.072940
2012:06:13	0.00125	1.252600	0.128800	0.012578	0.782900	1.566800	0.224700	0.503900	0.158000	0.000107	0.317900	0.071790
2012:06:20	0.00167	1.247400	0.128900	0.012748	0.777100	1.537300	0.223800	0.489700	0.157900	0.000107	0.313200	0.070370
2012:06:27	0.00188	1.249100	0.128900	0.012586	0.778900	1.551800	0.223000	0.485500	0.158100	0.000107	0.314700	0.071220
2012:07:04	0.00167	1.263000	0.128900	0.012662	0.789100	1.569400	0.222600	0.487700	0.158700	0.000107	0.317100	0.072640
2012:07:11	0.00167	1.249900	0.128900	0.012576	0.781300	1.560400	0.221900	0.484500	0.158300	0.000106	0.313400	0.072140
2012:07:18	0.00167	1.259300	0.128900	0.012541	0.791400	1.569200	0.221200	0.502900	0.158600	0.000107	0.317300	0.075060
2012:07:25	0.00188	1.228800	0.129000	0.012586	0.788300	1.551700	0.221500	0.492200	0.158500	0.000107	0.314800	0.075080
2012:07:18	0.00188	1.227800	0.128900	0.012661	0.792200	1.563800	0.220100	0.492300	0.158600	0.000106	0.316200	0.075810
2012:07:25	0.00188	1.210000	0.128900	0.012783	0.793500	1.551600	0.219200	0.490500	0.158400	0.000106	0.315100	0.073390

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DATA FOR CHAPTER 7

Date	TOPIX	Dividend Yield (TOPIX)	JPY/USD	Japanese Household Consumption (SA)	Japan CPI	Japan Disc. Rate
1987M12	1,725.83	0.59	123.50	191,693.65	88.885	0.002083
1988M01	1,929.50	0.60	127.20	191,618.62	88.585	0.002083
1988M02	2,078.07	0.55	128.00	192,941.63	88.385	0.002083
1988M03	2,147.90	0.52	125.40	187,767.53	88.785	0.002083
1988M04	2,195.39	0.51	124.85	191,534.39	89.185	0.002083
1988M05	2,128.58	0.51	125.25	192,374.83	89.285	0.002083
1988M06	2,183.10	0.50	132.40	190,129.86	89.085	0.002083
1988M07	2,247.03	0.51	132.55	194,068.11	88.985	0.002083
1988M08	2,128.02	0.51	135.00	196,534.06	89.185	0.002083
1988M09	2,151.36	0.53	134.55	194,518.45	89.885	0.002083
1988M10	2,156.44	0.53	125.75	195,495.82	90.385	0.002083
1988M11	2,285.75	0.51	121.75	194,641.74	89.985	0.002083
1988M12	2,357.03	0.49	125.85	196,122.69	89.685	0.002083
1989M01	2,464.83	0.46	129.15	196,163.55	89.585	0.002083
1989M02	2,447.23	0.46	127.00	191,199.14	89.285	0.002083
1989M03	2,469.15	0.47	132.05	200,673.83	89.685	0.002083
1989M04	2,488.52	0.47	132.45	194,787.09	91.285	0.002083
1989M05	2,537.14	0.46	142.70	196,458.92	91.885	0.002708
1989M06	2,449.38	0.47	144.10	200,584.47	91.785	0.002708
1989M07	2,628.90	0.49	138.35	198,778.94	91.585	0.002708
1989M08	2,603.38	0.47	144.30	199,686.22	91.485	0.002708
1989M09	2,702.22	0.47	139.30	203,965.85	92.285	0.002708
1989M10	2,692.65	0.46	142.30	202,327.79	92.985	0.003125
1989M11	2,829.54	0.46	142.95	205,339.12	91.985	0.003125
1989M12	2,881.37	0.43	143.45	203,317.03	92.085	0.003542
1990M01	2,737.57	0.45	144.15	204,365.90	92.485	0.003542
1990M02	2,565.54	0.46	148.40	207,924.59	92.585	0.003542
1990M03	2,227.48	0.52	157.20	205,847.46	92.985	0.004375
1990M04	2,205.96	0.58	159.35	208,915.01	93.784	0.004375
1990M05	2,435.74	0.53	151.70	211,723.53	94.184	0.004375
1990M06	2,343.36	0.53	152.90	209,647.40	93.884	0.004375
1990M07	2,252.56	0.57	147.35	209,438.64	93.684	0.004375
1990M08	1,973.97	0.66	144.25	212,173.30	94.084	0.005000
1990M09	1,570.95	0.73	137.80	210,625.38	94.784	0.005000
1990M10	1,856.12	0.75	129.35	213,530.05	95.784	0.005000
1990M11	1,652.01	0.76	133.35	212,427.81	95.684	0.005000
1990M12	1,733.83	0.76	134.40	219,275.88	95.584	0.005000
1991M01	1,710.93	0.78	131.20	217,271.01	96.184	0.005000
1991M02	1,960.32	0.71	132.00	214,016.13	95.884	0.005000
1991M03	1,970.73	0.67	141.00	217,889.42	96.384	0.005000
1991M04	1,963.42	0.67	137.40	218,608.95	96.984	0.005000
1991M05	1,964.77	0.68	137.90	219,691.04	97.384	0.005000
1991M06	1,819.01	0.70	137.90	220,708.28	97.084	0.005000
1991M07	1,859.12	0.75	137.80	222,926.46	96.984	0.004583
1991M08	1,732.10	0.77	137.15	219,818.22	97.184	0.004583
1991M09	1,832.20	0.76	132.85	220,438.85	97.284	0.004583
1991M10	1,887.45	0.72	130.90	224,835.65	98.384	0.004583
1991M11	1,731.30	0.75	130.05	223,807.89	98.584	0.004167
1991M12	1,714.68	0.80	125.20	228,625.68	98.084	0.003750
1992M01	1,630.94	0.83	125.75	224,186.09	97.884	0.003750
1992M02	1,554.49	0.85	129.28	234,112.73	97.784	0.003750
1992M03	1,418.52	0.91	133.20	230,602.01	98.284	0.003750
1992M04	1,317.46	1.04	133.50	222,834.32	99.284	0.003125
1992M05	1,376.32	0.98	128.25	228,402.70	99.383	0.003125
1992M06	1,236.20	1.04	125.50	236,399.71	99.284	0.003125
1992M07	1,219.25	1.06	127.20	231,374.03	98.584	0.002708
1992M08	1,385.51	1.11	122.90	229,234.80	98.884	0.002708
1992M09	1,310.60	0.97	119.20	229,035.86	99.284	0.002708
1992M10	1,278.91	1.02	123.20	224,393.77	99.383	0.002708
1992M11	1,323.35	1.05	124.70	229,606.98	99.184	0.002708

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Date	TOPIX	Dividend Yield (TOPIX)	JPY/USD	Japanese Household Consumption (SA)	Japan CPI	Japan Disc. Rate
1992M12	1,307.66	1.01	124.75	226,408.53	99.184	0.002708
1993M01	1,298.88	1.04	124.60	227,627.73	99.084	0.002708
1993M02	1,284.21	1.03	117.70	228,398.17	99.184	0.002083
1993M03	1,431.87	0.98	116.35	231,852.07	99.483	0.002083
1993M04	1,620.79	0.86	111.15	232,270.21	100.183	0.002083
1993M05	1,636.60	0.83	106.50	228,700.24	100.283	0.002083
1993M06	1,580.25	0.83	106.75	227,023.45	100.183	0.002083
1993M07	1,659.91	0.79	105.90	231,256.66	100.483	0.002083
1993M08	1,693.09	0.77	104.20	230,001.31	100.683	0.002083
1993M09	1,626.25	0.77	105.15	231,051.30	100.783	0.001458
1993M10	1,630.59	0.78	108.20	230,405.50	100.683	0.001458
1993M11	1,374.06	0.84	108.95	232,305.72	100.183	0.001458
1993M12	1,439.31	0.89	111.85	234,203.35	100.283	0.001458
1994M01	1,629.22	0.84	109.90	234,972.82	100.383	0.001458
1994M02	1,631.71	0.80	104.15	236,086.90	100.383	0.001458
1994M03	1,563.21	0.79	103.15	232,321.12	100.783	0.001458
1994M04	1,603.33	0.79	102.50	230,350.47	100.983	0.001458
1994M05	1,682.50	0.78	104.47	231,218.49	101.083	0.001458
1994M06	1,673.32	0.76	99.05	234,863.60	100.683	0.001458
1994M07	1,637.41	0.72	99.75	229,576.32	100.283	0.001458
1994M08	1,640.39	0.72	99.55	234,931.00	100.683	0.001458
1994M09	1,576.89	0.75	98.45	234,717.32	100.983	0.001458
1994M10	1,584.66	0.75	97.38	235,921.18	101.483	0.001458
1994M11	1,520.41	0.78	98.92	236,851.58	101.183	0.001458
1994M12	1,559.09	0.78	99.74	229,675.48	100.883	0.001458
1995M01	1,463.84	0.80	98.55	228,348.48	100.883	0.001458
1995M02	1,348.39	0.84	97.05	224,769.73	100.583	0.001458
1995M03	1,307.89	0.91	89.35	226,209.93	100.483	0.001458
1995M04	1,331.82	0.91	83.75	229,990.57	100.783	0.000833
1995M05	1,254.11	0.91	83.20	232,659.37	100.983	0.000833
1995M06	1,196.99	0.97	84.60	230,629.36	100.883	0.000833
1995M07	1,336.10	0.91	88.43	231,874.19	100.383	0.000833
1995M08	1,427.58	0.85	99.10	230,547.33	100.483	0.000833
1995M09	1,438.16	0.81	98.30	235,548.00	101.083	0.000417
1995M10	1,411.14	0.82	101.70	229,882.31	100.783	0.000417
1995M11	1,482.21	0.81	101.55	226,954.64	100.483	0.000417
1995M12	1,577.70	0.76	102.83	231,778.84	100.483	0.000417
1996M01	1,613.11	0.73	107.25	231,704.77	100.383	0.000417
1996M02	1,560.46	0.73	104.70	236,058.50	100.183	0.000417
1996M03	1,636.88	0.75	106.28	227,733.90	100.383	0.000417
1996M04	1,712.42	0.70	104.80	235,078.44	100.983	0.000417
1996M05	1,680.57	0.70	108.20	232,482.70	101.183	0.000417
1996M06	1,712.45	0.69	109.42	238,647.48	100.883	0.000417
1996M07	1,584.43	0.72	107.92	225,279.86	100.783	0.000417
1996M08	1,543.49	0.74	108.44	233,257.18	100.683	0.000417
1996M09	1,627.55	0.74	110.97	226,349.06	101.083	0.000417
1996M10	1,550.55	0.74	113.80	230,781.51	101.283	0.000417
1996M11	1,562.80	0.75	113.77	234,146.19	100.983	0.000417
1996M12	1,470.94	0.78	116.00	236,217.97	101.083	0.000417
1997M01	1,372.48	0.85	122.00	240,181.80	100.983	0.000417
1997M02	1,390.59	0.85	120.78	236,340.10	100.783	0.000417
1997M03	1,373.26	0.86	124.05	239,778.67	100.883	0.000417
1997M04	1,441.19	0.86	126.85	236,918.47	102.983	0.000417
1997M05	1,486.89	0.79	116.45	231,212.84	103.183	0.000417
1997M06	1,553.81	0.77	114.40	235,766.74	103.183	0.000417
1997M07	1,544.04	0.80	118.25	238,393.19	102.783	0.000417
1997M08	1,427.99	0.83	119.35	236,973.06	102.883	0.000417
1997M09	1,388.32	0.87	121.00	240,795.44	103.583	0.000417
1997M10	1,277.12	0.91	119.95	240,387.95	103.883	0.000417
1997M11	1,252.22	0.99	127.55	236,644.41	103.183	0.000417

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Date	TOPIX	Dividend Yield (TOPIX)	JPY/USD	Japanese Household Consumption (SA)	Japan CPI	Japan Disc. Rate
1997M12	1,175.03	1.02	129.95	236,427.80	102.983	0.000417
1998M01	1,267.51	1.01	126.90	233,547.84	102.883	0.000417
1998M02	1,272.45	0.96	127.25	235,878.05	102.783	0.000417
1998M03	1,251.70	0.96	132.05	239,166.74	103.183	0.000417
1998M04	1,222.98	1.00	132.30	233,695.38	103.383	0.000417
1998M05	1,221.49	1.00	139.05	234,981.21	103.683	0.000417
1998M06	1,230.38	1.02	140.85	235,045.81	103.283	0.000417
1998M07	1,262.04	0.96	143.70	232,955.61	102.683	0.000417
1998M08	1,106.49	1.03	141.46	233,978.03	102.583	0.000417
1998M09	1,043.57	1.11	135.25	237,073.12	103.383	0.000417
1998M10	1,035.60	1.17	116.40	234,232.23	104.083	0.000417
1998M11	1,143.50	1.05	123.65	243,995.36	103.983	0.000417
1998M12	1,086.99	1.05	115.60	234,837.12	103.583	0.000417
1999M01	1,125.26	1.08	116.20	236,907.38	103.083	0.000417
1999M02	1,120.03	1.06	119.40	229,992.52	102.683	0.000417
1999M03	1,267.22	0.97	120.40	233,220.62	102.783	0.000417
1999M04	1,337.12	0.88	119.33	234,520.43	103.283	0.000417
1999M05	1,297.19	0.88	121.42	238,598.30	103.283	0.000417
1999M06	1,416.20	0.84	121.10	239,426.96	102.983	0.000417
1999M07	1,478.93	0.73	115.20	238,206.98	102.583	0.000417
1999M08	1,457.02	0.73	110.82	235,232.36	102.883	0.000417
1999M09	1,495.55	0.72	106.85	230,737.50	103.183	0.000417
1999M10	1,518.76	0.71	104.85	229,198.41	103.383	0.000417
1999M11	1,641.53	0.66	102.50	231,126.36	102.783	0.000417
1999M12	1,722.20	0.65	102.20	230,359.92	102.483	0.000417
2000M01	1,707.96	0.64	106.85	229,744.86	102.383	0.000417
2000M02	1,718.94	0.62	110.18	235,367.60	101.983	0.000417
2000M03	1,705.94	0.63	105.85	233,887.87	102.183	0.000417
2000M04	1,648.87	0.64	106.55	233,863.93	102.483	0.000417
2000M05	1,522.84	0.66	106.65	231,579.41	102.583	0.000417
2000M06	1,591.60	0.67	105.40	227,289.93	102.383	0.000417
2000M07	1,453.15	0.67	109.50	228,600.70	101.983	0.000417
2000M08	1,511.44	0.69	106.40	230,112.50	102.383	0.000417
2000M09	1,470.78	0.69	107.85	227,384.62	102.183	0.000417
2000M10	1,379.96	0.69	109.05	230,156.10	102.183	0.000417
2000M11	1,362.66	0.72	111.17	226,294.71	101.883	0.000417
2000M12	1,283.67	0.75	114.90	234,108.11	101.983	0.000417
2001M01	1,300.23	0.78	116.15	216,993.11	101.983	0.000417
2001M02	1,241.48	0.79	116.40	221,071.28	101.683	0.000292
2001M03	1,277.27	0.80	124.60	217,790.54	101.483	0.000208
2001M04	1,366.46	0.73	123.45	212,984.99	101.683	0.000208
2001M05	1,310.81	0.70	119.20	222,834.51	101.783	0.000208
2001M06	1,300.98	0.74	124.05	215,865.57	101.483	0.000208
2001M07	1,190.31	0.82	124.80	216,634.72	101.183	0.000208
2001M08	1,103.67	0.86	118.95	215,794.57	101.583	0.000208
2001M09	1,023.42	0.98	119.30	209,365.75	101.383	0.000083
2001M10	1,059.37	0.94	121.82	216,961.68	101.383	0.000083
2001M11	1,050.57	0.96	123.95	218,017.12	100.883	0.000083
2001M12	1,032.14	0.99	131.80	214,265.47	100.783	0.000083
2002M01	971.77	1.00	132.90	217,537.82	100.583	0.000083
2002M02	1,013.80	1.03	133.90	215,173.90	100.083	0.000083
2002M03	1,060.19	0.93	133.20	214,879.80	100.283	0.000083
2002M04	1,082.06	0.94	128.00	216,315.37	100.583	0.000083
2002M05	1,120.08	0.92	124.40	216,998.71	100.883	0.000083
2002M06	1,024.89	0.96	119.45	218,252.58	100.783	0.000083
2002M07	965.00	0.94	119.85	222,302.17	100.383	0.000083
2002M08	941.64	0.98	117.95	216,887.96	100.683	0.000083
2002M09	921.05	1.03	121.55	220,447.96	100.683	0.000083
2002M10	862.24	1.08	122.45	217,541.84	100.483	0.000083
2002M11	892.71	1.10	122.30	216,108.33	100.483	0.000083

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Date	TOPIX	Dividend Yield (TOPIX)	JPY/USD	Japanese Household Consumption (SA)	Japan CPI	Japan Disc. Rate
2002M12	843.29	1.10	119.90	218,283.10	100.483	0.000083
2003M01	821.18	1.09	118.95	215,821.57	100.183	0.000083
2003M02	818.73	1.10	117.75	213,974.78	99.883	0.000083
2003M03	788.00	1.14	120.15	216,696.13	100.183	0.000083
2003M04	796.56	1.16	119.60	216,560.60	100.483	0.000083
2003M05	837.70	1.11	118.35	213,535.83	100.683	0.000083
2003M06	903.44	1.04	119.85	222,288.78	100.383	0.000083
2003M07	939.40	1.03	120.10	212,787.77	100.183	0.000083
2003M08	1,002.01	1.01	117.05	215,656.83	100.383	0.000083
2003M09	1,018.80	0.94	111.20	217,899.68	100.483	0.000083
2003M10	1,043.36	0.91	108.76	218,087.29	100.483	0.000083
2003M11	999.75	0.96	109.50	215,808.69	99.983	0.000083
2003M12	1,043.69	0.95	107.10	219,918.84	100.083	0.000083
2004M01	1,050.13	0.90	105.97	218,335.01	99.883	0.000083
2004M02	1,082.47	0.91	109.00	221,195.79	99.883	0.000083
2004M03	1,175.51	0.84	104.30	218,737.60	100.083	0.000083
2004M04	1,186.31	0.80	110.20	221,272.54	100.083	0.000083
2004M05	1,139.94	0.86	110.50	219,249.81	100.183	0.000083
2004M06	1,189.60	0.83	108.38	217,638.80	100.383	0.000083
2004M07	1,139.30	0.97	112.08	218,568.81	100.083	0.000083
2004M08	1,129.55	1.00	109.65	219,002.22	100.183	0.000083
2004M09	1,102.11	0.99	111.00	215,531.54	100.483	0.000083
2004M10	1,085.43	1.01	106.13	216,129.32	100.983	0.000083
2004M11	1,098.79	1.01	103.18	220,972.97	100.783	0.000083
2004M12	1,149.63	1.00	104.12	213,388.66	100.283	0.000083
2005M01	1,146.14	0.97	104.00	219,199.69	100.083	0.000083
2005M02	1,177.41	0.96	104.73	217,177.23	99.783	0.000083
2005M03	1,182.18	0.94	107.35	218,521.88	100.083	0.000083
2005M04	1,129.93	0.98	105.89	216,266.17	100.183	0.000083
2005M05	1,144.33	1.00	108.08	219,030.18	100.283	0.000083
2005M06	1,177.20	0.99	110.40	218,378.16	99.883	0.000083
2005M07	1,204.98	1.15	112.22	216,283.22	99.783	0.000083
2005M08	1,271.29	1.10	111.30	218,833.44	99.883	0.000083
2005M09	1,412.28	1.02	113.15	220,458.15	100.183	0.000083
2005M10	1,444.73	0.96	115.70	217,165.53	100.183	0.000083
2005M11	1,536.21	0.89	119.63	218,747.80	99.783	0.000083
2005M12	1,649.76	0.83	117.97	214,699.99	99.883	0.000083
2006M01	1,710.77	0.81	117.71	214,732.30	99.983	0.000083
2006M02	1,660.42	0.81	116.25	215,576.38	99.683	0.000083
2006M03	1,728.16	0.80	117.40	212,481.62	99.883	0.000083
2006M04	1,716.43	0.77	114.30	213,766.42	100.083	0.000083
2006M05	1,579.94	0.82	112.24	216,967.92	100.383	0.000083
2006M06	1,586.96	0.91	114.95	217,129.72	100.383	0.000083
2006M07	1,572.01	1.16	114.80	215,638.27	100.083	0.000333
2006M08	1,634.46	1.12	117.32	214,119.35	100.783	0.000333
2006M09	1,610.73	1.12	117.80	213,145.14	100.783	0.000333
2006M10	1,617.42	1.10	117.65	217,132.91	100.583	0.000333
2006M11	1,603.03	1.13	116.40	216,337.99	100.083	0.000333
2006M12	1,681.07	1.09	118.95	215,486.05	100.183	0.000333
2007M01	1,721.96	1.05	121.68	215,688.70	99.983	0.000333
2007M02	1,752.74	1.02	118.48	217,522.92	99.483	0.000625
2007M03	1,713.61	1.05	117.65	218,210.54	99.783	0.000625
2007M04	1,701.00	1.06	119.60	219,646.61	100.083	0.000625
2007M05	1,755.68	1.05	121.62	222,168.49	100.383	0.000625
2007M06	1,774.88	1.04	123.23	215,764.52	100.183	0.000625
2007M07	1,706.18	1.17	118.95	216,881.23	100.083	0.000625
2007M08	1,608.25	1.29	116.20	217,182.45	100.583	0.000625
2007M09	1,616.62	1.32	115.05	216,692.22	100.583	0.000625
2007M10	1,620.07	1.27	114.75	219,348.59	100.883	0.000625
2007M11	1,531.88	1.36	110.30	218,222.99	100.683	0.000625

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Date	TOPIX	Dividend Yield (TOPIX)	JPY/USD	Japanese Household Consumption (SA)	Japan CPI	Japan Disc. Rate
2007M12	1,475.68	1.36	114.00	221,712.62	100.883	0.000625
2008M01	1,346.31	1.54	106.36	223,107.24	100.683	0.000625
2008M02	1,324.28	1.54	104.73	222,107.16	100.483	0.000625
2008M03	1,212.96	1.66	100.10	219,816.37	100.983	0.000625
2008M04	1,358.65	1.59	104.08	218,888.56	100.883	0.000625
2008M05	1,408.14	1.50	105.66	214,745.30	101.683	0.000625
2008M06	1,320.10	1.50	106.40	218,450.58	102.183	0.000625
2008M07	1,303.62	1.79	107.99	225,454.68	102.383	0.000625
2008M08	1,254.71	1.86	109.10	213,682.81	102.683	0.000625
2008M09	1,087.41	1.99	104.30	219,964.92	102.683	0.000625
2008M10	867.12	2.56	98.30	217,972.05	102.583	0.000417
2008M11	834.82	2.68	95.25	218,521.75	101.683	0.000417
2008M12	859.24	2.76	90.75	216,787.38	101.283	0.000250
2009M01	794.03	2.79	89.60	216,701.89	100.683	0.000250
2009M02	756.71	2.99	97.55	214,651.11	100.383	0.000250
2009M03	773.66	3.01	98.10	217,484.07	100.683	0.000250
2009M04	837.79	2.74	97.60	216,554.23	100.783	0.000250
2009M05	897.91	2.59	96.50	215,068.39	100.583	0.000250
2009M06	929.76	2.46	95.95	217,380.00	100.383	0.000250
2009M07	950.26	2.17	95.33	216,113.34	100.083	0.000250
2009M08	965.73	2.04	92.70	216,153.11	100.383	0.000250
2009M09	909.84	2.09	89.77	216,209.91	100.383	0.000250
2009M10	894.67	2.18	91.38	213,585.23	99.983	0.000250
2009M11	839.94	2.29	86.75	221,829.58	99.783	0.000250
2009M12	907.59	2.19	92.06	213,120.42	99.583	0.000250
2010M01	901.12	2.09	89.85	213,823.37	99.383	0.000250
2010M02	894.10	2.18	89.25	211,248.67	99.284	0.000250
2010M03	978.81	2.07	93.25	222,732.71	99.583	0.000250
2010M04	987.04	1.93	94.06	214,652.34	99.583	0.000250
2010M05	880.46	1.84	91.30	214,192.52	99.683	0.000250
2010M06	841.42	1.83	88.60	216,688.36	99.683	0.000250
2010M07	849.50	1.89	86.50	213,861.43	99.184	0.000250

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Date	S&P500	S&P500 Div. Index	US Household Consumption (SA)	US CPI	US 3mo T-Bill
1987M12	247.08	8.810	2,736.65	115.400	5.68
1988M01	257.07	8.857	2,765.14	115.700	5.64
1988M02	267.82	8.903	2,774.31	116.000	5.62
1988M03	258.89	8.950	2,809.74	116.500	5.71
1988M04	261.33	9.043	2,817.05	117.100	5.98
1988M05	262.16	9.137	2,840.48	117.500	6.43
1988M06	273.50	9.230	2,861.87	118.000	6.56
1988M07	272.02	9.307	2,889.47	118.500	6.95
1988M08	261.52	9.383	2,916.12	119.000	7.30
1988M09	271.91	9.460	2,924.42	119.800	7.25
1988M10	278.97	9.550	2,954.53	120.200	7.36
1988M11	273.70	9.640	2,967.33	120.300	7.83
1988M12	277.72	9.730	2,979.60	120.500	8.10
1989M01	297.47	9.813	3,005.70	121.100	8.39
1989M02	288.86	9.897	3,024.30	121.600	8.71
1989M03	294.87	9.980	3,033.82	122.300	8.90
1989M04	309.64	10.087	3,059.03	123.100	8.41
1989M05	320.52	10.193	3,080.21	123.800	8.61
1989M06	317.98	10.300	3,090.70	124.100	7.99
1989M07	346.08	10.423	3,104.90	124.400	7.80
1989M08	351.45	10.547	3,119.20	124.600	7.89
1989M09	349.15	10.670	3,139.23	125.000	7.91
1989M10	340.36	10.797	3,159.07	125.600	7.77
1989M11	345.99	10.923	3,173.20	125.900	7.59
1989M12	353.40	11.050	3,212.59	126.100	7.55
1990M01	329.08	11.140	3,213.97	127.400	7.74
1990M02	331.89	11.230	3,242.62	128.000	7.77
1990M03	339.94	11.320	3,273.38	128.700	7.80
1990M04	330.80	11.437	3,290.61	128.900	7.79
1990M05	361.23	11.553	3,309.45	129.200	7.75
1990M06	358.02	11.670	3,340.28	129.900	7.74
1990M07	356.15	11.727	3,354.59	130.400	7.49
1990M08	322.56	11.783	3,387.49	131.600	7.39
1990M09	306.05	11.840	3,402.84	132.700	7.14
1990M10	304.00	11.927	3,411.36	133.500	7.11
1990M11	322.22	12.013	3,416.76	133.800	7.02
1990M12	330.22	12.100	3,417.10	133.800	6.44
1991M01	343.93	12.107	3,422.33	134.600	6.19
1991M02	367.07	12.113	3,436.41	134.800	6.04
1991M03	375.22	12.120	3,455.42	135.000	5.74
1991M04	375.35	12.130	3,469.61	135.200	5.51
1991M05	389.83	12.140	3,496.04	135.600	5.53
1991M06	371.16	12.150	3,498.48	136.000	5.54
1991M07	387.81	12.193	3,515.80	136.200	5.53
1991M08	395.43	12.237	3,524.53	136.600	5.33
1991M09	387.86	12.280	3,532.76	137.200	5.11
1991M10	392.46	12.253	3,539.36	137.400	4.82
1991M11	375.22	12.227	3,564.90	137.800	4.35
1991M12	417.09	12.200	3,579.09	137.900	3.88
1992M01	408.79	12.240	3,629.14	138.100	3.84
1992M02	412.70	12.280	3,638.19	138.600	3.93
1992M03	403.69	12.320	3,664.58	139.300	4.05
1992M04	414.95	12.320	3,679.34	139.500	3.70
1992M05	415.35	12.320	3,693.99	139.700	3.70
1992M06	408.14	12.320	3,704.25	140.200	3.57
1992M07	424.21	12.343	3,737.66	140.500	3.18
1992M08	414.03	12.367	3,749.93	140.900	3.16
1992M09	417.80	12.390	3,779.09	141.300	2.69
1992M10	418.68	12.387	3,802.12	141.800	2.96
1992M11	431.35	12.383	3,825.49	142.000	3.27

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Date	S&P500	S&P500 Div. Index	US Household Consumption (SA)	US CPI	US 3mo T-Bill
1992M12	435.71	12.380	3,841.95	141.900	3.08
1993M01	438.78	12.413	3,838.85	142.600	2.90
1993M02	443.38	12.447	3,866.41	143.100	2.95
1993M03	451.67	12.480	3,865.92	143.600	2.89
1993M04	440.19	12.493	3,885.05	144.000	2.91
1993M05	450.19	12.507	3,904.12	144.200	3.06
1993M06	450.53	12.520	3,923.64	144.400	3.03
1993M07	448.13	12.520	3,940.55	144.400	3.03
1993M08	463.56	12.520	3,958.46	144.800	3.01
1993M09	458.93	12.520	3,979.91	145.100	2.92
1993M10	467.83	12.540	3,991.99	145.700	3.03
1993M11	461.79	12.560	4,008.16	145.800	3.14
1993M12	466.45	12.580	4,021.64	145.800	3.00
1994M01	481.61	12.623	4,035.29	146.200	2.97
1994M02	467.14	12.667	4,068.89	146.700	3.36
1994M03	445.77	12.710	4,080.54	147.200	3.47
1994M04	450.91	12.753	4,090.24	147.400	3.86
1994M05	456.50	12.797	4,106.66	147.500	4.17
1994M06	444.27	12.840	4,136.47	148.000	4.14
1994M07	458.26	12.870	4,150.65	148.400	4.27
1994M08	475.49	12.900	4,184.93	149.000	4.56
1994M09	462.69	12.930	4,195.43	149.400	4.67
1994M10	472.35	13.013	4,214.92	149.500	5.02
1994M11	453.69	13.097	4,220.22	149.700	5.55
1994M12	459.27	13.180	4,239.36	149.700	5.53
1995M01	470.42	13.180	4,254.81	150.300	5.84
1995M02	487.39	13.180	4,263.99	150.900	5.75
1995M03	500.71	13.180	4,283.41	151.400	5.70
1995M04	514.71	13.243	4,301.32	151.900	5.69
1995M05	533.40	13.307	4,332.00	152.200	5.63
1995M06	544.75	13.370	4,358.43	152.500	5.43
1995M07	562.06	13.440	4,363.21	152.500	5.42
1995M08	561.88	13.510	4,384.27	152.900	5.27
1995M09	584.41	13.580	4,393.54	153.200	5.24
1995M10	581.50	13.650	4,400.01	153.700	5.31
1995M11	605.37	13.720	4,429.30	153.600	5.32
1995M12	615.93	13.790	4,454.18	153.500	4.96
1996M01	636.02	13.893	4,465.33	154.400	4.91
1996M02	640.43	13.997	4,495.50	154.900	4.88
1996M03	645.50	14.100	4,529.29	155.700	5.00
1996M04	654.17	14.157	4,556.09	156.300	5.01
1996M05	669.12	14.213	4,571.74	156.600	5.04
1996M06	670.63	14.270	4,589.49	156.700	5.03
1996M07	639.95	14.400	4,608.51	157.000	5.18
1996M08	651.99	14.530	4,623.45	157.300	5.14
1996M09	687.31	14.660	4,643.18	157.800	4.91
1996M10	705.27	14.740	4,670.36	158.300	5.01
1996M11	757.02	14.820	4,691.42	158.600	4.99
1996M12	740.74	14.900	4,723.36	158.600	5.05
1997M01	786.16	14.953	4,741.86	159.100	5.01
1997M02	790.82	15.007	4,766.28	159.600	5.07
1997M03	757.12	15.060	4,776.22	160.000	5.17
1997M04	801.34	15.093	4,794.48	160.200	5.10
1997M05	848.28	15.127	4,802.78	160.100	4.82
1997M06	885.14	15.160	4,824.96	160.300	5.05
1997M07	954.29	15.217	4,866.78	160.500	5.10
1997M08	899.47	15.273	4,889.13	160.800	5.09
1997M09	947.28	15.330	4,915.74	161.200	4.97
1997M10	914.62	15.387	4,946.84	161.600	5.06
1997M11	955.40	15.443	4,954.96	161.500	5.06

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Date	S&P500	S&P500 Div. Index	US Household Consumption (SA)	US CPI	US 3mo T-Bill
1997M12	970.43	15.500	4,981.10	161.300	5.20
1998M01	980.28	15.550	4,992.52	161.600	5.04
1998M02	1049.34	15.600	5,020.40	161.900	5.18
1998M03	1101.75	15.650	5,045.86	162.200	4.99
1998M04	1111.75	15.750	5,066.49	162.500	4.85
1998M05	1090.82	15.850	5,096.82	162.800	4.89
1998M06	1133.84	15.950	5,137.95	163.000	4.97
1998M07	1120.67	16.017	5,158.72	163.200	4.95
1998M08	957.28	16.083	5,180.05	163.400	4.76
1998M09	1017.01	16.150	5,207.36	163.600	4.25
1998M10	1098.67	16.167	5,226.37	164.000	4.21
1998M11	1163.63	16.183	5,246.91	164.000	4.42
1998M12	1229.23	16.200	5,282.30	163.900	4.35
1999M01	1279.64	16.283	5,315.91	164.300	4.36
1999M02	1238.33	16.367	5,330.08	164.500	4.55
1999M03	1286.37	16.450	5,362.38	165.000	4.36
1999M04	1335.18	16.370	5,415.15	166.200	4.43
1999M05	1301.84	16.290	5,433.86	166.200	4.51
1999M06	1372.71	16.210	5,451.59	166.200	4.67
1999M07	1328.72	16.293	5,484.71	166.700	4.62
1999M08	1320.41	16.377	5,523.05	167.100	4.85
1999M09	1282.71	16.460	5,569.55	167.900	4.71
1999M10	1362.93	16.467	5,597.63	168.200	4.96
1999M11	1388.91	16.473	5,630.30	168.300	5.15
1999M12	1469.25	16.480	5,710.97	168.300	5.17
2000M01	1394.46	16.573	5,691.63	168.800	5.53
2000M02	1366.42	16.667	5,755.86	169.800	5.64
2000M03	1498.58	16.760	5,830.82	171.200	5.72
2000M04	1452.43	16.740	5,836.55	171.300	5.65
2000M05	1420.60	16.720	5,865.56	171.500	5.49
2000M06	1454.60	16.700	5,909.83	172.400	5.70
2000M07	1430.83	16.580	5,931.59	172.800	6.02
2000M08	1517.68	16.460	5,954.88	172.800	6.11
2000M09	1436.51	16.340	6,013.58	173.700	6.03
2000M10	1429.40	16.317	6,031.25	174.000	6.15
2000M11	1314.95	16.293	6,053.64	174.100	6.01
2000M12	1320.28	16.270	6,099.92	174.000	5.73
2001M01	1366.01	16.170	6,127.24	175.100	4.84
2001M02	1239.94	16.070	6,123.50	175.800	4.72
2001M03	1160.33	15.970	6,130.88	176.200	4.18
2001M04	1249.46	15.877	6,167.33	176.900	3.83
2001M05	1255.82	15.783	6,210.43	177.700	3.54
2001M06	1224.42	15.690	6,206.59	178.000	3.56
2001M07	1211.23	15.707	6,226.65	177.500	3.44
2001M08	1133.58	15.723	6,248.31	177.500	3.28
2001M09	1040.94	15.740	6,192.25	178.300	2.30
2001M10	1059.78	15.740	6,258.02	177.700	2.01
2001M11	1139.45	15.740	6,257.02	177.400	1.73
2001M12	1148.08	15.740	6,281.32	176.700	1.67
2002M01	1130.20	15.737	6,299.29	177.100	1.72
2002M02	1106.73	15.733	6,329.52	177.800	1.72
2002M03	1147.39	15.730	6,354.21	178.800	1.74
2002M04	1076.92	15.830	6,395.42	179.800	1.73
2002M05	1067.14	15.930	6,412.68	179.800	1.71
2002M06	989.81	16.030	6,442.75	179.900	1.66
2002M07	911.62	15.950	6,471.26	180.100	1.66
2002M08	916.07	15.870	6,475.56	180.700	1.64
2002M09	815.28	15.790	6,495.65	181.000	1.53
2002M10	885.76	15.883	6,541.73	181.300	1.42
2002M11	936.31	15.977	6,561.88	181.300	1.20

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Date	S&P500	S&P500 Div. Index	US Household Consumption (SA)	US CPI	US 3mo T-Bill
2002M12	879.82	16.070	6,585.10	180.900	1.18
2003M01	855.70	16.120	6,638.26	181.700	1.15
2003M02	841.15	16.170	6,665.79	183.100	1.17
2003M03	848.18	16.220	6,698.29	184.200	1.09
2003M04	916.92	16.203	6,698.50	183.800	1.10
2003M05	963.59	16.187	6,705.09	183.500	1.09
2003M06	974.50	16.170	6,746.01	183.700	0.84
2003M07	990.31	16.310	6,794.25	183.900	0.93
2003M08	1008.01	16.450	6,856.19	184.600	0.96
2003M09	995.97	16.590	6,884.54	185.200	0.93
2003M10	1050.71	16.857	6,891.27	185.000	0.93
2003M11	1058.20	17.123	6,928.81	184.500	0.91
2003M12	1111.92	17.390	6,963.56	184.300	0.91
2004M01	1131.13	17.600	7,036.15	185.200	0.90
2004M02	1144.94	17.810	7,052.91	186.200	0.93
2004M03	1126.21	18.020	7,089.36	187.400	0.92
2004M04	1107.30	18.213	7,110.67	188.000	0.95
2004M05	1120.68	18.407	7,165.07	189.100	1.05
2004M06	1140.84	18.600	7,195.51	189.700	1.30
2004M07	1101.72	18.787	7,228.32	189.400	1.41
2004M08	1104.24	18.973	7,258.62	189.500	1.57
2004M09	1114.58	19.160	7,309.98	189.900	1.67
2004M10	1130.20	19.253	7,369.97	190.900	1.87
2004M11	1173.82	19.347	7,415.28	191.000	2.18
2004M12	1211.92	19.440	7,450.07	190.300	2.18
2005M01	1181.27	19.703	7,474.77	190.700	2.42
2005M02	1203.60	19.967	7,525.90	191.800	2.69
2005M03	1180.59	20.230	7,560.52	193.300	2.72
2005M04	1156.85	20.463	7,614.31	194.600	2.84
2005M05	1191.50	20.697	7,619.84	194.400	2.88
2005M06	1191.33	20.930	7,653.73	194.500	3.06
2005M07	1234.18	21.113	7,706.31	195.400	3.33
2005M08	1220.33	21.297	7,781.37	196.400	3.43
2005M09	1228.81	21.480	7,871.40	198.800	3.47
2005M10	1207.01	21.727	7,917.43	199.200	3.81
2005M11	1249.48	21.973	7,909.20	197.600	3.86
2005M12	1248.29	22.220	7,927.29	196.800	3.98
2006M01	1280.08	22.410	7,974.18	198.300	4.37
2006M02	1280.66	22.600	8,021.37	198.700	4.51
2006M03	1294.83	22.790	8,051.56	199.800	4.51
2006M04	1310.61	23.007	8,104.19	201.500	4.65
2006M05	1270.09	23.223	8,151.56	202.500	4.72
2006M06	1270.20	23.440	8,168.88	202.900	4.86
2006M07	1276.66	23.660	8,233.09	203.500	4.93
2006M08	1303.82	23.880	8,268.31	203.900	4.91
2006M09	1335.85	24.100	8,276.84	202.900	4.76
2006M10	1377.94	24.360	8,303.49	201.800	4.94
2006M11	1400.63	24.620	8,321.74	201.500	4.89
2006M12	1418.30	24.880	8,400.45	201.800	4.89
2007M01	1438.24	25.083	8,439.51	202.416	4.97
2007M02	1406.82	25.287	8,482.85	203.499	4.99
2007M03	1420.86	25.490	8,526.57	205.352	4.89
2007M04	1482.37	25.717	8,569.67	206.686	4.72
2007M05	1530.62	25.943	8,592.78	207.949	4.59
2007M06	1503.35	26.170	8,621.13	208.352	4.67
2007M07	1455.27	26.437	8,657.46	208.299	4.81
2007M08	1473.99	26.703	8,686.13	207.917	3.99
2007M09	1526.75	26.970	8,719.28	208.490	3.70
2007M10	1549.38	27.223	8,750.07	208.936	3.82
2007M11	1481.14	27.477	8,832.32	210.177	3.07

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Date	S&P500	S&P500 Div. Index	US Household Consumption (SA)	US CPI	US 3mo T-Bill
2007M12	1468.36	27.730	8,884.81	210.036	3.14
2008M01	1378.55	27.920	8,911.35	211.080	1.87
2008M02	1330.63	28.110	8,917.48	211.693	1.78
2008M03	1322.70	28.300	8,975.13	213.528	1.27
2008M04	1385.59	28.437	9,018.05	214.823	1.34
2008M05	1400.38	28.573	9,054.91	216.632	1.85
2008M06	1280.00	28.710	9,124.72	218.815	1.71
2008M07	1267.38	28.757	9,145.57	219.964	1.63
2008M08	1282.83	28.803	9,112.97	219.086	1.69
2008M09	1166.36	28.850	9,106.88	218.783	0.90
2008M10	968.75	28.697	9,065.80	216.573	0.44
2008M11	896.24	28.543	8,951.58	212.425	0.02
2008M12	903.25	28.390	8,867.68	210.228	0.12
2009M01	825.88	28.010	8,901.29	211.143	0.22
2009M02	735.09	27.630	8,913.64	212.193	0.25
2009M03	797.87	27.250	8,887.34	212.709	0.20
2009M04	872.81	26.697	8,897.58	213.240	0.12
2009M05	919.14	26.143	8,900.37	213.856	0.13
2009M06	919.32	25.590	8,948.41	215.693	0.18
2009M07	987.48	25.027	8,953.12	215.351	0.17
2009M08	1020.62	24.463	9,004.88	215.834	0.13
2009M09	1057.08	23.900	9,028.76	215.969	0.12
2009M10	1036.19	23.403	9,066.17	216.177	0.05
2009M11	1095.63	22.907	9,080.00	216.330	0.05
2009M12	1115.10	22.410	9,116.56	215.949	0.05
2010M01	1073.87	22.243	9,141.82	216.687	0.07
2010M02	1104.49	22.077	9,177.75	216.741	0.12
2010M03	1169.43	21.910	9,190.73	217.631	0.15
2010M04	1186.69	21.953	9,197.13	218.009	0.16
2010M05	1089.41	21.997	9,217.45	218.178	0.15
2010M06	1030.71	22.040	9,219.29	217.965	0.17
2010M07	1101.60	22.147	9,249.77	218.011	0.14