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by

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Factors Correlated with Equity Market Risk Premiums in Developed and Emerging Markets

Abstract

This paper re-examines how three theory-suggested factors affect equity returns - specified as risk-premiums - and how the results differ between developed and emerging markets. Traditional time series or cross-sectional regression procedures have yielded inconclusive evidence on maintained hypotheses about the determinants of equity premiums. However, on pooling observations, our estimated coefficients are much more accurate. Using panel data regression, we find that the risk premiums of developed appear to be affected by variation in the three factors *within* the equity markets of countries. In the emerging Asian markets, the risk premiums are affected more by the variation *over time* in at least one of the same three factors.

Key words: panel data test method; risk premiums; international finance; within effect; between effect; pooled regression

JEL Classification: F14 & G17

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1. Introduction

This paper applies a new approach to study how risk-premiums are determined in a multi-country setting, which is an important ongoing research topic in international finance, especially given the dichotomy of developed versus emerging markets. Our aims are to measure and describe risk-premiums in a large number of equity markets and then identify key factors correlated with the risk-premiums using panel data test method: we use data from 22 developed and emerging share markets. Existing studies using Black-Jensen-Scholes or Fama-MacBeth, which are more generally cross-sectional tests or even time-series tests over time have failed to identify if the measured factor effects in any of the several multi-factor asset pricing models is from variations *within* the country variables or variations *between* the country variables over time. We try to overcome this problem, while it also improves the robustness of the findings. The traditional methods also wrongly assume that variations from left-out variables are random, and would not affect the robustness of the test results (see Baltagi, 1989). It has been demonstrated in his and other later studies that both cross-sectional and time series regression ignores the variations that come from within- and between subject variations.

The panel data test method, which has been applied to resolve the very same vexing modelling problems in micro-economic applications (example, in modelling energy demand function) is more efficient than cross-sectional or time series regressions, which are traditionally the popular approaches of most researchers in social sciences, in particular, in finance. This new approach helps to identify the sources of the correlations as to whether they are from within-country variations or between-country variations across time. Consequently, the measured factor effects can be correctly attributed to factors entered cross-sectionally (*within*) or over time (*between*). Besides, given the dichotomy of developed and emerging markets, it is important also to identify if the multi-factor effects arise from cross-country or time-varying behaviour of the factors. Further, the measured coefficients using this new method are known to be more efficient estimators than those obtained, for example, in a Fama-MacBeth type cross-sectional, or Stone's time series regressions. The new findings using this approach, thus being robust, are likely to shed new insights as to why there are conflicting findings in the international finance literature on the topic of risk-premium using either time series and/or cross-sectional approaches.

A limited number of studies exist in the international finance literature relating a number of price-relevant factors for a country's equity returns. Lessard's (1975) and Solnik's (1974) studies extended the mean-variance framework and the covariance risk of CAPM to the international setting, establishing the relevance of country-specific *systematic risk* of equity returns (or risk-premiums, which is country's equity return less the riskless return). Stone (1974) identified the relevance of interest rates as the second factor in addition to the systematic risk of equity returns. A number of studies to be reviewed in another section of this paper extended these ideas, and have also empirically tested the relevance of these and other factors for the pricing of equity markets in a multi-country setting. However, these studies used either cross-sectional, or time-series regressions, which, given the panel data test method's appropriateness for this research question as applied here, are not as efficient as has already been documented in the 1990s in the micro-economics literature. This paper builds on these existing ideas, but uses a more intuitive approach to identify if the following factors known in theoretical literature as determinants of risk-premium: systematic risk, inflation, changes in GDP, and changes in exchange rates. Another finding that arises from this study is the behaviour of a set of emerging Asian markets which were severely affected by the Asian financial crisis. We partition the data prior to the crisis to see how these emerging markets behaved in a normal and financial stressed period as well as examining if the factor effects differ across the types of markets.

The rest of the paper is organized as follows. Section 2 identifies the research issues that are related to the country equity risk-premiums as reviewed in Section 3. The data sources and methodology are described in Section 4. The findings are reported in Section 5 and the conclusions are in Section 6. Not only are the country systematic risk and exchange rates found to be significantly relevant for country equity returns across 22 selected countries, the effect of the exchange rate, often observed to be not significant in time series and pooled cross-section tests, is in fact significant across all countries when the within- and between effects are investigated. GDP growth rate appears to arise from changes across time, thus, not a country specific factor.

2. Research Questions

The international finance literature suggests two sets of findings on country equity returns. The first refers to international diversification effect, which measures the extent to which equity returns of any pair of equity markets is *not* (or is negatively) correlated: see Solnik (1974) who extended Markowitz (1959) theory to an international setting. Appendix 1 is a summary of the cross-correlations for the countries in this study. This literature does not answer what factors are driving the returns in the international markets. The second relates to the identification of factors that are correlated with the country equity returns (or equivalently in this paper, just the risk premiums). Five factors have been identified in research reports: systematic risk of a country equity market, the interest rate changes, the growth in GDP, changes in inflation, and changes in exchange rates.[1] These five factors may be thought of as the variables in a multi-factor Arbitrage Pricing Theory in a similar manner as in Ross's (1977) arbitrage pricing theory applied to individual stocks in a market setting. In this study by subtracting the risk-free rate from a given market's total returns, we remove the need to consider inflation and to some extent the interest rate effects. That leaves (1) risk of an equity market in the world setting, (2) the economic growth factor (GDP) and (3) the exchange rate factor. The findings from such studies relating to how these five factors are jointly correlated with returns in a *multi-country setting* have also not produced consistent findings. That is the subject matter of this study hoping to resolve the conflicting findings.

This paper proceeds with the investigation as described here. Let the return ratio over a year, t and t-1, of an equity market be R_c with c representing country as:

$$R_c = (P_{ct} - P_{ct-1})\ (P_{ct-1}) \qquad (1)$$

where, P_{ct} is the index value of the aggregate market price in a given country observed over a period using the index value of prices a year before. The index used is the Morgan Stanley Composite Index (MSCI), which is widely used by investors in the industry: R_c is the average return over all years ($R_c = 1/T + \sum_{t=1..T} Rct$) provides

[1] There are several multi-factor models in the literature. We chose the simpler one for the test purpose,

observations needed for cross-sectional regression across countries c = 1,2, …, N. R_c observed each year in a given country provides observations across time as $R_{c,t}$ with t = 1,2,… T years, which can then be used for running a time series regression for each country included. Further, pooling the observations of all countries over all periods preserves valuable information lost in either a cross-section or time series regression. Pooling produces more efficient estimates of the coefficients compared to those from either cross-sectional or time-series regressions (see Balatagi and Griffin, 1983; p. 125).

Therefore, the first research question is the investigation of the factor effects of five factors found in the literature as being correlated in a multi-factor model of return generation in an international setting. We apply, after running a time series regression for each country, a pooled regression to improve the results normally obtained from a cross-sectional or time series regression since econometric/statistics literature extols the efficiency of pooled regression. The next aim of this paper is to investigate the origin of the factor effects in the pooled regression. By conducting within-country, and between-country tests, we identify if a given factor effect is from factor variation within the country equity markets or variations that occur over time. If for example, the factor effect of country systematic risk is significant in the between test, then it suggests that the changes over time in the systematic risk determines the equity returns, and not the intrinsic systematic risk level within countries included in the tests. Similarly, finding the systematic risk to be significant or not significant in a cross-sectional test or in a time series test alone is insufficient to answer the factor effect research question. Essentially, these two research issues can be addressed first

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and note that other models such as the Fama-French model can also be tested using our approach.

by doing a time series tests for each country, then a pooled tests, followed by a within- and between tests. Breauch-Pagan test is then applied to test the significance of the identified source(s) in the between and within regressions.

3. What we know about Country Equity Returns

3.1 Cross-Sectional Studies

In order to test the effectiveness of the CAPM in justifying the observed cross-sectional variability of returns, Black *et al*. (1972) and Fama and MacBeth (1973) developed almost similar cross-sectional regression approaches, which have been widely applied to-date. The latter researchers designed a two-step regression method, which in essence overcame the problem of estimating systematic risk, in place of a simpler cross-sectional regression developed by the former. Two decades later, Fama and French (1992) can be described as a multi-factor variation of the two-step cross-sectional regression, this time to test the explanatory power of five factors and not one factor for pricing individual stocks (Fama-French (1992: 1994) and for pricing country equity markets (Asness *et al*., 1997). Similar studies are: Heckman *et al*. (1996), Macedo, (1995) and Keppler and Taub (1993). These studies have produced a set of results about factor effects in multi-country settings using the traditional methods.

Another study (Solnik, 1998) reports that country risk tends to be low in the long run and the exchange rates also tend towards the fundamental values in the long run in the eight countries over 1971-97 test period. Exchange rate does not appear to affect the country risk. Erb Harvey and Viskanta (1996), using time series and cross sectional regressions, found that country risk measures are correlated with equity returns in the period 1984-95 in 114 countries. This finding is anomalous to that in the former study. Ferson and Harvey (1996) found that fundamental factors (a battery of three sets) are correlated with country equity returns: GDP growth rate, inflation and interest rates were three of the factors in this study covering 1970-95 for 21 countries.

3.2 Time Series Studies

Stone (1974) is an extension of Sharpe's time series Market Model. There are several more studies that used time series models. In the international context Erb, Harvey and Viskanta (1996) used time series regression to measure the impact of volatility on the expected returns in 135 country markets. However, the literature has identified several variables much more than the ones employed in that study. Such variables may indeed provide additional sources of risk. Few studies that tested the two-factor model of Stone *op cit.* also used time series regression, and reported significant effect from interest rate changes on equity returns.

The time series method to study changes in correlation over time is inefficient according to Solnik and Roulet (2000). They examined the time series and cross section methods for investigating the equity returns across 15 developed markets covering the period 1971-95. They claim that combinations of both methods are more suitable than the time series model: the panel data method of Baltagi is such a model.

3.3 Conditional Studies

Given the time-varying nature of beta, alpha and error variance, some researchers resorted to conditional measures while still doing cross-sectional or time series regressions. Ferson and Harvey (1998) applied conditional variables within the asset pricing model using cross-sectional and time-series returns of 21 countries. They found that the effects of the fundamental factors on the expected stock returns and the role of conditional risk factor were different across countries. This led them to conclude that, perhaps by scaling the attributes of each country, further research may improve their mixed findings.

3.4 Unresolved Issue

There is an unsettled issue about how returns in a multi-country setting must be studied: cross-sectionally or via time series or some other method(s). The micro-economics empirical literature on demand modelling has tackled similar issues, and has recently developed the panel data test method to resolve inefficient estimations problems produced by cross-sectional or time series regression. The recent findings that book-to-market ratio is a price-relevant factor in some studies and not others have placed urgency on re-examining this old issue with newer approaches. Conditional asset pricing models focus more on misspecifications of times-series or cross-sectional analyses without resorting to newer approaches to resolve the evident defects in these popular test methods.

4. Data, Variables and Methodology

4.1 *Data and Variables*

The data for this study are obtained from the Datastream and the emerging markets databases available at the Monash University library system. The data span over 1989 to 2006 for 22 countries, carefully selected to include both developed markets across the world and the more established Asian emerging markets. The market index data are the MSCI values at the end of each month for the share markets: the risk-free rates are the 1-year Treasury yields in local currencies available on a monthly basis. By using MSCI, we limited the possible measurement error on returns from different indices constructed differently. The real GDP growth rate data were accessed from the International Financial Statistics (IFS) CD-Rom. The Exchange rates are the month-end exchange rates for the IMF currency, for the special drawing rights, SDRs, we use this so that we could include the US market. Returns are calculated first on a monthly basis, and then *annualised* for each year in each country. All observations are on annual basis. As described in Section 2, the risk-premium of each country is estimated and then converted to natural logarithm. To be consistent, all other variables are redefined in natural logarithm by first adding 1 to the ratios and then taking the natural logarithm.

Risk-premium of a country's equity market can be identified as the difference between the country's equity market return over a time period, t and t-1, less the risk-free return in that country. Utilising the definitions used previously, risk-premium of country c is therefore:

$$R_{pc} = R_c - R_F \qquad (2)$$

where, R_F is the riskless return ratio of a 1-year Treasury bond yield during the matched time period. If this is measured over several years and averaged for a country, then it is the average R_{pc} for cross-sectional test across countries, c = 1,2, …, R_F . If measured over each year for each country, then R_{pct} are the country equity returns over time periods t = 1,2,…, T. To conduct regression tests using a multi-factor model, we redefine the risk-premiums in natural logarithm as:

$$R_{Pct} = \ln (1 + R_{pct}) \qquad (3)$$

R_c at a point in time can be decomposed as:

$$R_c = rr + E(Inf) + R_{pc} \qquad (4)$$

where, rr is the real return, and $E(Inf)$ is the expected inflation. But $R_F = rr + E(Inf)$. Hence, the two variables namely the inflation and interest rate often suggested as factors pricing the equity markets can be easily incorporated in equity returns by doing the analysis with risk premiums as in Equation (3). Risk premiums can then be related to the remaining three factors namely the systematic risk, GDP growth and exchange rate changes without facing the multi-country linearity problem if inflation and interest rates are included in the multi-factor regression model. Note also that we limit our test to this simple 3-factor case, and acknowledge that there can be other factors as suggested in Fama-French or Chen-Roll-Ross papers.

4.2 *Estimation Techniques*

The panel data multi-factor regression model to investigate a country's risk premium is:

$$Ln(R_{Pct}) = \beta_1 Ln\,(R_{wt}) + \beta_2\,Ln\,(GDP_{ct}) + \beta_3 Ln\,(ER_{ct}) \qquad (5)$$

where

$Ln(R_{Pct})$: natural logarithm of country's equity index annualised return,

$Ln\,(R_{wt})$: natural logarithm of world equity index annualised return,

$Ln\,(GDP_{ct})$: natural logarithm of country's yearly rate of change in GDP, and

$Ln\,(ER_{ct})$: natural logarithm of country's yearly rate of change in exchange rate to SDR rate.

The data for the tests are a 22 X 17 matrix panel data, representing 22 markets over 17 years: there are three independent and one dependent variable. The sample is divided into OECD developed markets to be compared with Asian emerging markets. The model suggests that three factors namely the world-index (hence the systematic risk as in Stone, 1974), GDP growth and exchange rate changes affect the risk premiums in a deterministic manner (we need not include inflation and interest rate as explained earlier). It is possible that the model is not fixed, and there may be a random effect model. For this purpose, we also test a random effect model to verify if the effects are any different from the fixed effect modelling, as a robustness test.

Estimation techniques: The estimation techniques follow Baltagi and Griffin (1983): the tests they used for the long-term demand models were done with annual data. The first step is simply to conduct country-by-country time series estimates of the effects of the three variables on the risk premiums over time. In general notation, the individual country time series model is:

$$Y_{ct} = \alpha_c + \sum_{K} \beta_{CK} X_{ct,k} + u_{ct} \quad c = 1, \ldots, N, \quad t = 1, \ldots, T. \qquad (6)$$

where, R_{Pct} are redefined as Y_{ct}, c denotes the cth country, and t the tth time period. This model provides albeit less efficient estimates than those from later steps. The X_k are the three factors on the right-hand side of the Equation (5) with the factor effects measured as three elasticity measures represented by β_k for each country.

The next step involves a pooled regression using observations of all the countries over all years in an OLS regression as:

$$Y_{ct} = \alpha_c + \sum_{K} \beta_{CK} X_{ct,k} + u_{ct}, \qquad \text{with } u_{ct} = \mu_c + \nu_{ct} \qquad (7)$$

where, μ_c is the cth country, time-invariant country effect and ν_{ct} is the remainder coming from other than within country effect.

Equation (7) is more efficient than time series (or for that matter, cross-section) regressions as it gains from pooling of all information. The cross-sectional regression throws away periodic observations whereas time series regression ignores the joint effects coming across time for different countries. The error term can be decomposed as μ_c and v_{ct}, which can be reanalysed using error component modelling, where μ_c represents within country variance and v_{ct} represents between country variance or across time variations. Within country variance can be estimated by running regression of the following equation:

$$(Y_{ct} - Y_c) = \sum_k \beta_{ck} \, (X_{ct,k} - X_{c,k}) + (u_{ct} - \overline{u_c}) \qquad (8)$$

The next and final step is running a between-country test. The variance needed for decomposition in this step is obtained by performing the following OLS estimate

$$Y_c = \alpha + \sum_k \beta_{ck} X_{c,k} + u_c \qquad (9)$$

Equations (8) and (9) are referred to as fixed effect models, where $\mu_c s$ are not random. $\mu_c s$ may be generated by a random process, which is a reasonable assumption given the literature on the random process of at least the beta and exchange rates. Then this residual will have zero mean and variance of $\sigma^2\mu$, which are independent of each other and the $v_{ct}s$. Then the OLS estimates should be transformed into Generalized Least Square (GLS) estimates (see Baltagi, 1989 for more details). The transformed GLS estimates are referred to as random effect coefficients. Within country GLS estimate is:

$$(Y_{ct} - \overline{Y_i}) = \alpha^* + \sum_k \beta_{ck} \, (X_{ct,k} - \theta \, \overline{X}_{c,k} + u_{ct}^* \qquad (10)$$

where, $\alpha^* = \alpha\,(1-\theta)$ and $u_{ct}{}^*$ is a GLS transformed disturbance term which now has a homoskedastic variance-covariance matrix $\sigma_v^2 I_{NT}$, where σ_v^2 is the variance of v_{ct} and

I_{NT} is an identity matrix of dimension NT, and $\theta = (1-\sigma_V/\sigma_1)$ and $\sigma_1^2 = \sigma_V^2 + T\sigma_\mu^2$. σ_μ^2 can be obtained from Fuller and Battese (1974) transformation method, which is the mean square error (MSE) of the following equation.

$$(Y_{ct} - \overline{Y}_i - \overline{Y}_t + \overline{Y}) = \sum_k \beta(X_{ct} - \overline{X}_c - \overline{X}_t + X_c) \qquad (11)$$

σ_V^2 can be obtained from the mean square error of Equation (9).

Having got the values of σ_μ^2 and σ_V^2, one can obtain GLS estimate of Equation (10). The GLS transformation of between–country variance can be found using the following equation:

$$Y_c / \sqrt{T} = \alpha\sqrt{T} + \sum_k \beta_{ck} X_{c,k}\sqrt{T} + u_c / \sqrt{T} \qquad (12)$$

where, $Y_c = \Sigma_t Y_{ct}$

4.3 Hypotheses

The maintained hypothesis is that the three factors commonly accepted as relevant for return generation process in an international setting are in fact significantly correlated with the risk premiums of countries and that this relationship is either same or different in developed and emerging markets. We want to test if these predictions are true; if true, estimates will be the elasticity, β_k, of the three variables over a recent 17-year period for 22 countries. It will be an important finding if we could identify the sources of these effects. Therefore, there are four aspects. First, there is a need to identify more efficient estimates of the factor effects from pooled regressions. Second, a distinction must be made as to where the factor effects are coming from, is it from within-country variations or otherwise by testing the within and between effects. Third, by testing two forms of the within effects (fixed versus random), this study enables the hypothesis to be tested under two widely accepted models of return generation. Fourth, are the factor effects coming from within or between for both types of markets

5. Identified Factors Affecting the Risk Premiums

5.1 *Descriptive Statistics*

The descriptive statistics are given in Table 1. It can be observed that the average world *risk premium* (that is after deducting riskless rate) is 14.48 per cent (median is 10.4%) per year over the last seventeen years.

Table 1: The Variables Used in the Study over 1989-2006

Descriptive statistics measured on annual basis	R_c-R_F	R_m-R_F	GDP	Change in Exchange Rate
Mean (%)	14.48	10.73	7.53	0.19
Standard Error	2.122	0.948	0.515	1.076
Median	10.379	16.154	5.814	-0.025
Standard Deviation	34.424	15.387	8.366	17.462
Sample Variance	1185	236	70.001	304
Kurtosis	6.974	1.487	57.2	16.88
Skewness	1.603	-1.046	5.52	-1.45
Range	288	104	119	182
Minimum	-54.75	-34.5	-19.77	-99.43
Maximum	233	70.15	99.74	83.09
Sum	3808	2821	1981	50.45
Count	263	263	263	263
Confidence Level (95.0%)	4.179	1.868	1.015	2.120

This number makes intuitive sense: the US risk-premium (not in the table) is about 7 per cent, hence the world risk premium is about twice that of the less risky US market. The standard deviation is 34.4 per cent, which is again twice that of New York Exchange. The world index return less risk-free return is 10.7 per cent per annum with a standard deviation equal to 16.15 per cent. The world GDP growth rate of the 22 countries is 7.53 per cent per year. The exchange rates, using special drawing rights, show an appreciation by 0.19 per cent per year over the period. That is, the cumulative decline, using median, in other currencies is about 2.5 per cent over the test period.

5.2 *Country Time Series Estimates*

The time series regression results of 22 countries are summarised in Table 2 with interesting results, which represent the kind of results that one gets in the international finance research reports. The results are very mixed. The multi-factor model appears to hold significantly for all but three countries as can be judged by the significance of the F-values (see the last column). This is reassuring to find that the model fits well with explained variation as indicated by R-squared ranging from 26 per cent in Ireland and 80 per cent in Spain: most values are in excess of 50 per cent.

However, the factor effects are not so impressive. Taking the worst case of exchange rate effect on risk premiums, it is seen that 9 countries had positive signs and 13 countries had negative signs. This may be explained as the result of some countries having improved the exchange rates, where the factor effect is positive whereas for some with depreciating currencies, the effect is negative. The size of the coefficients ranges from as large as 2.51 for Belgium to –2.41 for Malaysia. In the cases of two emerging economies Malaysia and Thailand, the exchange rates had significant effect on the risk-premiums. The reason is simple simply due to the severity of the Asian financial crisis that affected these two countries. The maintained hypothesis that the exchange rate will significantly affect the risk premium cannot be accepted

Table 2: Time Series Regression Results of Multi-factor Determinants of Risk Premiums: 1989-2006

OECD Developed countries	***Ln(World)***	***Ln(GDP)***	***Ln(Ex-Rate)***	***Adj R-square***	***MSE***	***F-VALUE***
Australia	0.809	-1.22	-0.044	0.57	0.009	5.914*
t-values	(4.01)*	(-1.139)	(-0.139)			
New Zealand	1.011	-3.177	1.824	0.55	0.027	5.623*
t-values	(3.248)*	(-1.33)	(2.18)*			
Belgium	1.258	-0.691	0.101	0.66	0.017	8.40*
t-values	(4.76)*	(-0.292)	(2.511)*			
Denmark	1.072	2.852	1.176	0.53	0.032	5.29*
t-values	(2.713)*	(0.739)	(1.198)			
France	1.27	1.126	-0.039	0.76	0.012	12.97*
t-values	(5.74)*	(0.46)	(-0.556)			
Germany	1.144	-0.778	0.031	0.78	0.009	14.54*
t-values	(5.627)*	(-1.16)	(0.176)			
Greece	-0.01	-0.859	0.12	0.3	0.126	0.149
t-values	(-0.02)	(-0.662)	(0.059)			
Ireland	-0.449	1.00	-0.28	0.26	0.077	0.223
t-values	(-0.65)	(0.26)	(-0.40)			
Italy	1.322	-4.03	0.321	0.63	0.021	7.30*
t-values	(4.58)*	(-1.09)	(1.30)			
Netherlands	0.979	-1.30	0.141	0.74	0.007	11.59*
t-values	(5.726)*	(-0.514)	(1.014)			
Portugal	1.20	-3.16	0.035	0.54	0.04	5.40*
t-values	(2.87)*	(-2.25)*	(0.813)			
Spain	1.30	-3.743	0.03	0.8	0.013	16.44*
t-values	(5.65)*	(-2.84)*	(1.23)*			
Sweden	1.48	-0.26	0.487	0.72	0.018	10.65*
t-values	(5.00)*	(-0.127)	(-0.43)			
Switzerland	1.05	-2.70	-0.271	0.53	0.019	5.13*
t-values	(3.23)*	(-1.05)	(-0.43)			
UK	0.625	0.143	-0.56	0.67	0.005	8.41*
t-values	(4.35)*	(0.113)	(-2.03)*			
USA	0.627	-3.10	-0.07	0.52	0.006	5.01*
t-values	(2.76)*	(-1.35)	(-0.09)			
Japan	1.383	2.394	-1.299	0.63	0.024	7.359*
t-values	(4.33)*	(1.33)	(-1.87)			
Asian Countries						
India	1.328	-0.56	-1.91	0.35	0.05	2.97
t-values	(2.29)*	(-0.37)	(-1.19)			
Malaysia	1.00	2.068	-2.413	0.48	0.07	4.42*
t-values	(1.73)*	(0.93)	(-3.22)*			
Philippines	0.96	-2.14	-1.65	0.33	0.149	2.84
t-values	(1.27)	(-0.45)	(-1.93)			
Thailand	1.425	2.97	-1.47	0.38	0.157	3.27
t-values	(1.716)*	(1.56)	(-2.157)*			
Indonesia	1.01	0.91	-1.80	0.3	0.269	2.46
t-values	(1.24)	(0.74)	(-1.91)			

(.) indicates the t-values. * indicates significance at or better than .05 level.

unequivocally for all countries since the t-values of only 7 out of 22 coefficients are statistically significant.

In the case of the coefficients on GDP growth (this was found to be significant in Chen-Roll-Ross study), the maintained hypothesis has better support. The greater the GDP growth rate the safer the equity market and so the factor effect is negative on risk premium, meaning that growth reduces the riskiness and hence the risk-premium is smaller. Steadily growing economies are safer. The coefficients for GDP have negative slopes in 14 cases and positive slopes in 8 cases. Importantly, only 3 of the coefficients are statistically significant, which means that the maintained hypothesis is again not supported in this kind of test procedure. Turning to the systematic risk as determined by the world market index, it is found that two countries had anomalous signs: Greece and Ireland. However, the 16 coefficients have the correct sign, and are statistically significant at or better than 0.05 confidence levels. That is, the systematic risk is statistically significantly correlated with the risk premiums in 16 out of 22 cases. The coefficients range from 1.425 (Thailand) to 0.625 (United Kingdom). Since these values are the systematic risk, the magnitude is higher for more risky markets such as Thailand, Portugal, etc., and is lower for less risky markets such as the United Kingdom and the United States.

In short, the results found in these tests produce the same kind of mixed results all too familiar when time series tests just ignores the information on the panel data by restricting the analyses to a country at a time. By pooling the observations, the next set of results provide a bit more reliable and consistent results with the maintained hypotheses.

5.3 Pooled OLS Estimates

Tables 3 and 4 provide summaries of tests using the entire data and the data prior to the onset of the Asian Financial Crisis – i.e. up to year 1996 - that affected the world markets over July 1997 to 1998. Since the impact of the Crisis was more severe for the emerging Asian bourses (see Ariff and Khalid, 2000, 2005), the results are derived separately for the 1989-1996 period so as to see if the Crisis had changed the underlying structure of the markets.

Just looking at the pooled regression tests for all countries at the top panels of the two tables, it is evident that the results are more robust than in the time series regressions discussed in the previous sub-section. The F-ratios are 28.31 and 26.1 (prior to Crisis in Table 4) indicating that, in the two pooled cases, there is a very good model fit. The R-squared values for the total sample is about half that of the average for the individual countries. Further, the exchange rate factor is not significant if the entire data set is used: using the data set prior to the onset of the Crisis (1989-1996 as in Table 4), it is found that the exchange rate did affect the risk premiums significantly with a coefficient of -0.621 with a significant t-value of –3.50. Overall, the exchange rate appears to be a return-relevant factor for risk premium although at individual country level as discussed in the previous sub-section, this hypothesis did not get much support because of the inefficiency of the time series regression results in Table 2. The other two factors, GDP growth and world market index, also did affect the risk premiums significantly. In the test period prior to the Crisis (Table 4), the risk premium changed by 0.11 unit for one unit change in GDP growth rate: tests including the Crisis period yielded insignificant results.

Table 3: Within and Between Effects of Factors in Multi-factor models: 1989-2006

	ln(Beta)	*ln(GDP)*	*ln(Ex-Rate)*	*Constant*	*Adj. R-Square*	*MSE*	*SE*	*F-value*
All countries (1989-2006)								
OLS	0.89	-0.17	0.007	0.025	0.23	0.06	0.3	26.70*
(t-value)	(8.68)*	(-0.75)	(0.24)	(1.00)				
WITHIN(Fixed effect Model)	0.907	-0.63	-0.04	-0.04	0.23	0.09	0.3	28.26*
(t-value)	(8.28)*	(-2.07)*	(-0.68)	(-2.34)*				
WITHIN(Random effect Model)	0.88	-0.63	-0.01	0.006	0.25	0.07	0.3	29.61*
(t-value)	(8.51)*	(-2.23)*	(-0.39)	(0.030)				
BETWEEN	0.24	0.609	0.252	0.170	0.34	0.03	0.2	3.20
	(0.31)	(1.738)	(0.968)	(0.670)				
Hausman specification test (p-value)	0.0021							
Developed OECD Countries (Including AUS &NZ)								
OLS	0.96	-0.46	0.03	0.06	0.4	0.03	0.2	42.65*
(t-value)	(11.19)*	(-1.65)	(1.71)	(2.61)*				
WITHIN(Fixed effect Model)	0.987	-1.58	0.06	-0.01	0.45	0.03	0.2	51.84*
(t-value)	(8.28)*	(-3.95)*	(1.70)	(-1.25)				
WITHIN(Random effect Model)	0.974	-1.13	0.05	0.03	0.44	0.03	0.2	49.69*
(t-value)	(11.68)*	(-3.29)	(1.73)	( )				
BETWEEN	-0.004	0.48	0.278	0.31	0.4	0.02	0.1	3.51
	-0.007	(1.59)	(1.258)	( )				
Hausman specification test (p-value)	0.003							
Asian countries								
OLS	0.77	1.09	-1.5	-0.07	0.34	0.11	0.3	12.02*
(t-value)	(3.07)*	(2.30)*	(-5.04)*	(-1.20)				
WITHIN(Fixed effect Model)	0.77	0.73	-1.92	-0.11	0.4	0.15	0.4	15.22*
(t-value)	(2.87)*	(1.46)	(-5.68)*	(-0.89)				
WITHIN(Random effect Model)	0.735	0.688	-1.79	-0.07	0.4	0.12	0.4	15.42*
(t-value)	(2.88)	(1.38)	(-5.72)*	(-1.60)				
BETWEEN	-0.32	1.56	0.133	-0.03	0.96	0	0.1	41.49*
	(-0.49)	(3.46)*	(0.343)	(-0.893)				
Hausman specification test (p-value)	0.01							

(.) indicates the t-values. * indicates significance at or better than .05 level.

Table 4: Within and Between Effects of Factors in Multi-factor models Prior to Asian Financial Crisis: 1989-1996

	ln(Beta)	*Ln (GDP)*	*Ln(Ex-Rate)*	*Constant*	*Adj. R-Square*	*MSE*	*SE*	*F-value*
All countries (1989-1996)								
OLS	0.96	0.11	-0.621	0.013	0.28	0.06	0	28.31*
(t-value)	(8.86)*	(0.38)	(-3.50)*	(0.449)				
WITHIN(Fixed effect Model)	1.00	-0.12	-0.83	-0.02	0.3	0.07	0	30.89*
(t-value)	(9.06)*	(-0.24)	(-4.18)*	(-1.28)				
WITHIN(Random effect Model)	0.98	-0.07	-0.72	0.008	0.29	0.06	0	30.37*
(t-value)	(9.06)*	(-0.18)	(-3.93)*	(0.31)				
BETWEEN	-0.48	0.08	0.87	0.35	0.15	0.02	0	1.1
	(-0.90)	(0.16)	(1.21)	(2.70)*				
Hausman specification test (p-value)	0.001							
Developed OECD Countries (Including AUS & NZ)								
OLS	0.93	-0.62	0.47	0.05	0.45	0.03	0	42.83*
(t-value)	(10.14)*	(-2.18)*	(2.49)*	(2.33)*				
WITHIN(Fixed effect Model)	0.97	-1.4	0.429	-0.02	0.47	0.03	0	47.2*
(t-value)	(10.50)*	(-3.39)*	(2.01)	(-1.31)				
WITHIN(Random effect Model)	0.95	-1.08	0.439	0.03	0.47	0.03	0	46.49*
(t-value)	(10.47)*	(-3.04)*	(2.22)*	(0.05)				
BETWEEN	-0.36	0.08	0.87	0.35	0.15	0.02	0	0.2
	(-0.90)	(0.16)	(1.21)	(2.70)*				
Hausman specification test (p-value)	0.025							
Asian countries								
OLS	0.833	2.42	-1.45	-0.23	0.4	0.1	0	12.49**
(t-value)	(3.10)*	(2.64)*	(-4.69)*	(-1.97)				
WITHIN(Fixed effect Model)	0.87	2.57	-1.78	-0.06	0.43	0.13	0	14.31*
(t-value)	(3.22)*	(2.28)*	(-5.18)*	(-1.33)				
WITHIN(Random effect Model)	0.855	2.41	-1.62	-0.15	0.42	0.11	0	13.54*
(t-value)	(3.20)*	(2.27)*	(-5.02)*	(-1.70)				
BETWEEN	-1.44	2.69	-1.03	0.007	0.97	0	0	21.84*
	(.50)*	(3.91)*	(-1.20)	(0.07)				
Hausman specification test (p-value)	.0001							

(.) indicates the t-values. * indicates significance at or better than .05 level.

The systematic risk is measured to be 0.96 (pre-Crisis period in Table 4) and 0.89 (entire test period) and the maintained hypothesis is supported since the t-values are all significant. This is an important finding based on the robustness of the tests used.

While there is a large debate about the death of beta for firms (thus lots of evidence for this within a market) particularly after 1992, it appears that the systematic risk appears to be a significant factor in the pooled as well as the time series tests at an international setting, both developed and emerging markets. These results for the total sample as well as the sub-samples of OECD and Asian markets attest to the greater efficiency of the pooling method to carefully identify the underlying structure of the country equity markets.

5.4 Fixed versus Random Effects

The fixed versus random effects were investigated using separate models as described in the methodology section. These results are shown along the rows marked "within (fixed effect Model) and within (random effect Model)" in tables 3 and 4. For this purpose, it is better to examine the results summarised separately for the "Developed OECD countries" and "Asian Countries" for the simple reason that these results are more focused because of underlying structural differences as will be verified (to support the fourth hypothesis). In both tables 3 and 4, these results appear to yield about the same set of findings as far as the within effect is concerned. This can be seen by the magnitudes of the coefficients for the three factors (as well as the model F-value and R-square statistics). For example, the *fixed* effect coefficients for OECD countries are 0.97 for systematic risk, -1.40 for GDP growth and 0.429 for exchange rates. The corresponding values for the *random* effect model are 0.95, -1.08 and 0.439. All of them are significant unlike in the previous time series regressions or individual country tests as shown in Table 2. These test statistics suggest that the use of random model is not making much difference to the estimated factor effects. Moreover, Hausman specification test results indicate significant p-values, which indicates that

Fixed effect model is more appropriate for our modelling. For instance, the factor effect from systematic risk is 0.97 if measured as random effect and it is 0.95 if measured as fixed effect. Therefore, for the developed economies, the differences are not much.

In the cases of emerging Asian economies too the differences are not that big. For instance, the exchange rate effect is negative (as these countries had exchange rate depreciation) but the magnitude of the fixed effect at –1.78 is not much different from the random effect coefficient of –1.62. Note that the exchange rate effect is almost twice as big as that in the OECD countries even before the Crisis (see Table 4). With the Crisis period data included (see Table 4), the exchange rate effect was even larger: -1.92 over the test period for fixed effect and –1.79 for random model.

Similar conclusions can be made about the other two variables, the systematic risk and GDP growth factors. What is significant in these *within* tests is the clear-cut acceptance of the maintained hypotheses, which were only weakly supported in the time series regressions. Further, testing for the two separate groups, it appears that risk premiums of OECD markets have in general smaller factor effect than is the case for the Asian economies, in both pre-Crisis and full-sample period tests. This finding is intuitively appealing, given the greater risk of the Asian equity markets. Now we look for structural differences, as to the sources of these factor effects.

5.5 *Where Does the Factor Effect Come from?*

The final research question addressed is the identification of the source of the factor effects. Are the factor effects coming from variations within the countries or between the countries? This can be judged from the results obtained for the *between* tests shown for all the countries, the OECD countries and Asian countries in tables 3 and 4. If the variation is from differences "within" the countries, then such a factor effect is time-invariant. If the factor effect is arising from "between" then the factor effect arises from time-varying changes in the factor, over time. Examining the results for the test period in Table 3 for the entire period, the OECD country results under "between" row suggests that none of the coefficients on the three factors are significant although these were strongly significant in the "within" tests. This suggests that for these countries, the factor effects are determined by the within-country variations of the three factors rather than the between variations. That is, the level of systematic risk, the GDP growth and exchange rates in each country determined the risk premiums.

This appears to be *not* the case for the emerging Asian countries. In the 17-year full-sample period, the systematic risk and the exchange rate variations are from within country effects. The GDP growth factor effect on risk premiums appears to come from *between* country effects. That is, the risk premiums of the emerging markets are similarly affected by variation within country effect in exchange rates and systematic risk, but not the GDP growth. Thus the maintained hypotheses are supported for all countries as far as two variables are concerned, but not for the third. The GDP factor effect appears to come from *between* effect only in the cases of the emerging countries. Thus, structurally, the noticeable larger factor effects on risk premiums come from systematic risk and exchange rate as within variations in all 22 countries. That the effect on risk premiums from economic growth comes from time-varying change in the GDP. This is a significant new finding, which appears to be consistent with common sense. These countries had rapid rises and falls in GDP during particularly the test year period, and the periodic changes in the GDP growth rate is due to time-varying changes in that variable, which appear to determine the risk premiums in a different way from that applicable to the more stable OECD developed markets.

6. Concluding Remarks

This paper started with a statement that there is a need to have a fresh approach to identify theory-suggested factors in international finance to resolve somewhat conflicting findings in the literature. We chose a simple multi-factor model already verified in research to be a valid model. The new approach used in this paper is an adaptation of the panel data test method that combines some econometric rigour to the same attempt to identify factor effects using the full information in also the commonly used time series panel data. The usual procedure of cross-sectional or time series regressions were shown to yield inefficient estimates compared with (a) pooled regressions and (b) partitioned analysis involving a separation of within and between effects.

The application of this new approach to a specific problem in international finance shows that the panel data test method produces more efficient results while also helping to identify the sources from where the factor effects are emanating, in the cases of the risk premiums of 22 countries over a lengthy recent period. The research design developed in this paper may be applied to other areas of studies that commonly use panel data but only apply the cross-section or time series procedures or the pooled regression in few cases. We believe that the research design adopted here may become handy for resolving a number of conflicting results in the literature by addressing whether a given factor effect comes from within- or between-subject variations.

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Appendix 1: Correlation matrix of risk-free-adjusted returns countries during 1988-2006

	aus	newzea	elgiun	enmar	france	ermany	greece	ireland	italy	etherla	ortuga	spain	weden	vitzerla	uk	usa	japan	ingapor	alaysia	hillipine	hailanc	donesi
aus	1	0.834	0.51	0.54	0.55	0.591	-0.1	0.71	0.461	0.653	0.43	0.644	0.54	0.68	0.719	0.55	0.42	0.433	0.519	0.739	0.47	0.24
newzea	0.834	1	0.17	0.4	0.38	0.569	-0.15	0.61	0.376	0.668	0.51	0.538	0.61	0.67	0.745	0.371	0.466	0.628	0.641	0.8	0.59	0.22
belgium	0.508	0.172	1	0.64	0.71	0.592	-0.07	0.73	0.689	0.571	0.34	0.642	0.45	0.58	0.347	0.414	0.382	-0.01	0.137	0.205	0.08	0.42
denmarl	0.539	0.396	0.64	1	0.78	0.865	0.232	0.8	0.631	0.804	0.56	0.614	0.71	0.6	0.449	0.363	0.592	0.385	0.331	0.272	0.28	0.64
france	0.547	0.385	0.71	0.78	1	0.855	0.167	0.64	0.658	0.762	0.48	0.668	0.87	0.56	0.567	0.491	0.712	0.533	0.388	0.297	0.34	0.6
german	0.591	0.569	0.59	0.87	0.85	1	0.367	0.86	0.83	0.923	0.79	0.78	0.85	0.73	0.704	0.492	0.632	0.544	0.458	0.421	0.42	0.5
greece	-0.1	-0.15	-0.07	0.23	0.17	0.367	1	0.17	0.272	0.106	0.35	0.105	0.12	-0.05	0.148	0.022	0.027	0.23	0.24	0.047	0.28	0.16
ireland	0.711	0.609	0.73	0.8	0.64	0.855	0.172	1	0.806	0.857	0.76	0.802	0.62	0.76	0.63	0.464	0.472	0.269	0.434	0.534	0.36	0.38
italy	0.461	0.376	0.69	0.63	0.66	0.83	0.272	0.81	1	0.786	0.8	0.81	0.58	0.73	0.552	0.413	0.336	0.193	0.153	0.276	0.13	0.16
netherla	0.653	0.668	0.57	0.8	0.76	0.923	0.106	0.86	0.786	1	0.85	0.878	0.78	0.85	0.766	0.56	0.458	0.38	0.374	0.422	0.24	0.32
portugal	0.434	0.508	0.34	0.56	0.48	0.788	0.348	0.76	0.797	0.85	1	0.764	0.48	0.75	0.723	0.473	0.132	0.153	0.224	0.354	0.18	-0.02
spain	0.644	0.538	0.64	0.61	0.67	0.78	0.105	0.8	0.81	0.878	0.76	1	0.65	0.72	0.628	0.56	0.29	0.201	0.293	0.36	0.01	0.13
sweden	0.539	0.615	0.45	0.71	0.87	0.852	0.119	0.62	0.583	0.777	0.48	0.649	1	0.49	0.524	0.306	0.848	0.793	0.602	0.449	0.46	0.66
switzerl	0.678	0.669	0.58	0.6	0.56	0.731	-0.05	0.76	0.732	0.854	0.75	0.724	0.49	1	0.854	0.6	0.199	0.18	0.223	0.435	0.26	0.12
uk	0.719	0.745	0.35	0.45	0.57	0.704	0.148	0.63	0.552	0.766	0.72	0.628	0.52	0.85	1	0.734	0.268	0.38	0.391	0.54	0.46	0.08
usa	0.55	0.371	0.41	0.36	0.49	0.492	0.022	0.46	0.413	0.56	0.47	0.56	0.31	0.6	0.734	1	0.205	0.003	-0.13	-0	-0.05	-0.18
japan	0.42	0.466	0.38	0.59	0.71	0.632	0.027	0.47	0.336	0.458	0.13	0.29	0.85	0.2	0.268	0.205	1	0.778	0.518	0.343	0.54	0.72
singapo	0.433	0.628	-0.01	0.39	0.53	0.544	0.23	0.27	0.193	0.38	0.15	0.201	0.79	0.18	0.38	0.003	0.778	1	0.769	0.595	0.75	0.64
malaysi	0.519	0.641	0.14	0.33	0.39	0.458	0.24	0.43	0.153	0.374	0.22	0.293	0.6	0.22	0.391	-0.13	0.518	0.769	1	0.866	0.83	0.67
phillipin	0.739	0.8	0.2	0.27	0.3	0.421	0.047	0.53	0.276	0.422	0.35	0.36	0.45	0.44	0.54	-0	0.343	0.595	0.866	1	0.81	0.38
thailand	0.472	0.587	0.08	0.28	0.34	0.417	0.277	0.36	0.134	0.244	0.18	0.011	0.46	0.26	0.465	-0.05	0.537	0.75	0.832	0.808	1	0.59
indones	0.239	0.219	0.42	0.64	0.6	0.498	0.161	0.38	0.157	0.322	-0.02	0.13	0.66	0.12	0.076	-0.18	0.722	0.639	0.669	0.383	0.59	1