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AN ANALYSIS OF THE DYNAMIC PROPERTIES OF THE AMERICAN DEPOSITARY RECEIPT CROSS-MARKET PREMIUM

A Dissertation

by

JORGE VIDAL

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AN ANALYSIS OF THE DYNAMIC PROPERTIES OF THE AMERICAN DEPOSITARY RECEIPT CROSS-MARKET PREMIUM

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ABSTRACT

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The American Depositary Receipt (ADR) cross-market premium is studied over a 20 year period. The dynamic properties of the cross-market premium are studied for the first time in a nonlinear smooth error correction framework using a smooth transition error correction model (STECM) and compared against a linear model and two other nonlinear model specifications. The results indicate the ADR cross-market premium is more appropriately estimated when the nonlinearity, smooth transition, and cointegration properties present in the premium are estimated simultaneously with a STECM. The estimates of the STECM indicate arbitrage opportunities in the ADR market are rare and dissipate quickly. The forecasting properties of the STECM are found to be superior to that of the linear model using the squared error prediction error as the criterion. The impact of the 2007 – 2009 financial crisis over the ADR cross-market premium is analyzed by constructing a cross-market premium index. It is found that the financial crisis increased the volatility of the cross-market premium during the crisis and receded after the crisis passed.

DEDICATION

This dissertation is dedicated to my beautiful wife Karen Lozano and amazing sons Jorge Ernesto Vidal and Pablo Marcelo Vidal, without whom it would not have been possible. I could not imagine having better partners in life, with you anything is possible.

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CHAPTER I

INTRODUCTION

The law of one price (LOOP) posits that “in competitive markets free of transaction costs and official barriers to trade, identical goods sold in different countries must sell for the same price when their prices are expressed in terms of the same currency” (Krugman and Obstfeld, 2009). To examine the validity of the LOOP, researchers have econometrically tested the existence of the LOOP in various markets such as the currency markets (Sarno et al., 2004), the agricultural commodity markets (Delpachitra and Hill, 1994; Ejrnaes and Persson, 2000), the European car market (Goldberg and Verboven, 2005), the Canadian lumber market (Nanang, 2005) and the American Depositary Receipt (ADR) market (Maldonado and Saunders, 1983; Yeyati et al., 2008). Researchers have found the LOOP to hold in some cases (Maldonado and Saunders, 1983; Kato et al., 1991; Park and Tavakkol, 1994; Miller and Morey, 1996) while in other cases they have found it not to hold (Froot and Dabora, 1999; Hong and Susmel, 2003; Gagnon and Karolyi, 2004; De Jong et al., 2005)

In the ADR market, the LOOP has been tested using the cross-market premium of dually listed equity shares. The cross-market premium is defined as the percentage price difference between the underlying shares in domestic markets and the corresponding depositary receipts in international markets, adjusted for the exchange rate. Researchers have modeled the ADR cross-market premium using linear (e.g. Miller and Morey, 1996) and nonlinear econometric models (e.g. Yeyati et al., 2008) and the results have been mixed.

Recent empirical research has found that free trade agreements among countries, financial reforms to attract foreign capitals, and the modernization and liberalization of financial markets have caused stock markets worldwide to become increasingly integrated (Bekaert and Harvey, 1995; Gerard et al., 2003; Carrieri et al. 2007). Additionally, researchers like Kenourgios and Samitas (2011) have found that financially integrated markets can be cointegrated. Given the integrated and linked relationship that exists between the depositary receipt in the foreign country and the underlining share in the domestic market, it is hypothesized that the ADR cross-market premium is cointegrated and therefore needs to be modeled using an error correction modeling framework.

The purpose of this study is threefold. First, I will examine the dynamic properties of the ADR cross-market premium to discern how these properties have evolve from 1990 to 2010, a time period in which stock markets experienced a series of shocks. Second, given the possibility that depositary receipts and their underlying shares are cointegrated, I will model the depositary receipt cross-market premium using a smooth threshold error correction model (STECM). Third, I will examine the forecasting properties of the STECM as portfolio managers could use this model to diversify their international equity portfolios.

This study extends the current literature in three distinct manners. Firstly, this study fills a gap in the literature by providing a comprehensive study on the evolution of the dynamic properties of the ADR cross-market premium during a time in which stock markets have undergone a series of structural changes such as deregulation of markets and liberalization of international stock markets. The period under investigation also includes the financial crisis of

2008, a period of high volatility and speculation in stock markets. Previous ADR studies do not offer this long-term perspective and do not account for the financial crisis in 2008. Secondly, while previous studies have independently analyzed nonlinearities, smooth reversion to long run equilibrium, and cointegration in the cross-market premium, this is the first study to simultaneously model these statistical properties using a STECM. Thirdly, the study is also the first one to compare the forecasting performance of linear and nonlinear models in the depositary receipts market. This is an important extension of the literature because an increasing number of corporations are cross listing or simultaneously trade their equity in their domestic equity markets and foreign equity markets. Understanding the forecasting performance of these models will have practical implications for equity investors seeking to diversify their portfolios with foreign equities to develop more accurate pricing forecasting models (Urrutia and Vu, 2006).

The rest of this study is organized as follows. In Chapter II, depositary receipts are described in detailed. The chapter covers the history of depositary receipts from their introduction to equity markets, to how they are created, and a description of the different types of depositary receipts. Chapter III reviews the role of depositary receipts in the LOOP literature and provides a chronology of how the econometric methodology has evolved to study the LOOP in the depositary receipts market. Chapter IV describes the linear and nonlinear methodology used in this study. Chapter V describes the data and its sources and provides descriptive statistics. Chapter VI presents results and discussion and Chapter VII offers conclusions and future research.

CHAPTER II

AMERICAN DEPOSITARY RECEIPT

The globalization, deregulation, and international integration of capital markets have fostered significant competition among major stock exchanges around the world to attract listings and increase trading volume. An increasing number of corporations are cross-listing or simultaneously trading equity in their home country and in foreign equity markets using Depositary Receipts. A Depositary Receipt (DR) is a negotiable certificate evidencing equity ownership in a foreign corporation from a country outside the market in which the DR is traded (Miller and Morey, 1996). Each DR denotes depositary shares, which represent a specific number of underlying shares remaining on deposit in the issuer's home market. The most common type of DR is the American Depositary Receipt (ADR).

ADRs were the first type of DRs introduced to investors. JP Morgan in 1927 developed ADRs to allow British companies to access the US capital market after a law passed in the UK prohibiting British companies from registering shares overseas[1]. Since then, the DR market has shown remarkable growth[2] for several reasons including international portfolio diversification, investor recognition, overcoming market segmentation, value maximization, and access to foreign capital (Koumkwa and Susmel, 2006).

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[1] From the Deutsche Bank Depositary Receipts Handbook

[2] According to the Citigroup Depositary Receipt Services 2007 Full Year Report, new capital raised in the DR market reached $49.5 billion in 2007 (an all time record) and the total DR trading value ($2.6 trillion, up 69% over 2006's total) and ADR trading volume (55.9 billion shares) set new records.

DRs are created when a broker purchases the shares of a company in its home stock market and delivers the shares to a custodian bank which serves as the depositary bank, and then instructs the bank to issue DRs. The DR trades freely, just like any other security, either on an exchange or in the over-the-counter market and can be used to raise capital. DR holders are entitled to all the dividends payable on the underlying foreign shares and to have these paid in the currency in which the DRs are denominated.

When the DR holder sells the DR, the DR can either be sold to another investor or it can be canceled. In the later case, the DR certificate would be surrendered and the shares held with the local custodian bank would be released into the home market and sold to a broker there. Additionally, the DR holder would be able to request delivery of the actual shares at any time. The DR certificate states the responsibilities of the depositary bank with respect to actions such as payment of dividends, voting at shareholder meetings, and handling of rights offerings.

DRs may be called ADRs, Rule 144A Depositary Receipts, Global Depositary Receipts (GDR), International Depository Receipts (IDR), or European Depository Receipts (EDR) when they are denominated in Euros. ADRs are publicly available to U.S. investors on a national stock exchange or in the over-the-counter market. Rule 144A ADRs are privately placed and available only to Qualified Institutional Buyers (QIBs) in the U.S. QIB PORTAL market. GDRs and IDRs are similar to ADRs but are offered for sale globally through international banks. The issuing currency can be either in U.S. dollars or in Euros.

American Depositary Receipts

ADR are U.S. dollar denominated negotiable instruments issued in the U.S. by a depositary bank, representing ownership in non-U.S. companies. ADRs allow U.S. investors to invest in non-U.S. securities denominated in U.S. dollars. One ADR can represent one or several underlying foreign shares, which are on deposit with a non-U.S. bank (e.g. Deutsche Bank in Germany), affiliated with a major U.S. financial institution (e.g. Bank of New York Mellon or Citibank). After the underlying shares are on deposit, the American financial institution oversees the primary issue of U.S. dollar-denominated ADRs. These ADRs may be converted into underlying shares in the home country in the underlying foreign currency. After the primary issue, ADRs are traded in the U.S. secondary markets like any other American company.

ADRs are offered in four different varieties: Level I, Level II, Level III, and Rule 144A. The four varieties differ in important ways including the ability to raise new capital, SEC registration and disclosure requirements, and compliance with U.S. generally accepted accounting practices (GAAP). For a foreign corporation entering the U.S. market the choice of DR program depends on its priorities: expanding its shareholder base, increasing company name and product recognition, or raising new capital. In this study only Level II and Level III ADRs are considered.

Level I ADRs

Level I ADRs are suitable for companies wishing to broaden their presence in the U.S. market with existing shares, Level I ADR issuers may not raise new capital by issuing new shares of stock. Level I ADRs are traded over-the-counter through the OTC Bulletin Board and/or the Pink Sheets[3] and are not listed on an exchange, as such, they are not subject to the stringent listing regulations of the Securities and Exchange Commission (SEC). Specifically

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[3] Pink Sheet stocks are over-the-counter (OTC) securities that do not meet the listing standards required to trade on the major stock exchange due to their limited capitalization and/or the limited number of shares outstanding. Pink Sheet stocks are small issuers with limited trading volume that often carry a great deal of risk. Most Pink Sheet stocks are not very liquid, and as such, bid/ask spreads are often quite wide. The Pink Sheets are published by Pink Sheets LLC which is not registered with the SEC as a stock exchange therefore the commission does not regulate its activities.

Level I ADRs are not obliged to file a Form 20-F[4] with the SEC but must obtain a Rule 12g3-s(b)[5] exemption from it. Level I ADR issuers have total assets not exceeding one million dollars and have fewer than 300 DR holders resident in the U.S.

Level II ADRs

Level II ADRs, like Level I, are appropriate for companies looking to broaden their shareholder base with existing shares. Level II ADRs are listed and traded in the major U.S. stock exchanges such as the NYSE, the Amex, and the NASDAQ giving them more trading volume, more visibility, and wider coverage by the U.S. financial media and analysts than Level I ADRs. Level II ADRs must register with the SEC using Form 20-F and must partially reconcile all financial statements to U.S. GAAP. ADRs in this level provide current and potential investors with increased information about the issuing companies.

Level III ADRs

Level III ADRs are different from the previous two levels in that it allows the companies to raise new capital by issuing new shares to investors in DR form. To conduct the initial public offering (IPO) the foreign company must submit form F-1 to the SEC to register the underlying securities to be offered, fully reconcile its financial statements to U.S. GAAP principles, and with the depositary institution, submit form F-6 to the SEC to register the ADRs. The foreign company must also select an investment bank to underwrite the IPO and to market the ADRs to investors in the U.S.. After the IPO is completed the Level III ADR issuer may raise new capital in subsequent offerings. In summary, under SEC regulations, Level III ADRs and U.S. companies are treated the same and are the most prestigious and costly type of listing.

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[4] A foreign private issuer must register with the SEC using Form 20-F under Section 12 of the Securities Exchange Act of 1934.

[5] Rule 12g3-2(b) is an exemption from reporting under the Securities Exchange Act of 1934 for ADRs.

Rule 144A Depositary Receipts

The last type is the Rule 144A Depositary Receipt (RADRs). These securities, like Level III ADRs, are capital-raising issues in which shares are privately placed to QIBs and do not require reconciled financial statement to U.S. GAAP or SEC disclosure. RADRs trade in PORTAL[6], the quotation system for secondary trading of the National Association of Securities Dealers Inc. (NASD) for Rule 144A securities. RADRs are used by foreign companies to assess the interest for their shares before publicly offering ADRs.

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[6] The Private Offerings, Resales and Trading through Automated Linkages (PORTAL) is a system designed to provide a market for privately traded securities such as RADRs and access to it is available to both investors and market makers.

CHAPTER III

THE LAW OF ONE PRICE AND DEPOSITARY RECEIPTS

According to the LOOP, if markets are efficient, the prices of ADRs and their underlying shares should be the same, as any deviation in their prices will be arbitraged away. If there is a discrepancy in the prices of an ADR and its underlying shares, arbitrageurs will purchase the security where the price is cheaper and sell it where the price is higher to earn an arbitrage profit. Arbitrage profits will persist until the prices converge in the two markets. Thus, when deviations exist between the price of the ADR and the price of its underlying asset, the ADR is said to be “mispriced”.

The literature on ADRs can be divided into two major categories (Grossmann et al., 2007). Studies that investigate reasons why companies issue ADRs in foreign markets fall in the first category[7]. In the second category we find studies that investigate deviations from the LOOP between the ADR and its underlying shares. This dissertation falls within the second category. According to the LOOP, in efficient and financially integrated markets, there should not be significant differences between the price and/or return distribution of locally traded shares and that of the ADR because they represent the same asset, and no arbitrage opportunities will exist. However, if two markets are not completely integrated and the cross-market premium is large

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[7] See Karolyi (1998) and Karolyi (2006) for surveys of why firms list their equity in foreign equity markets.

enough to cover the transaction costs involved in the arbitrage operation, then arbitrageurs can earn risk-free profits. These two positions have been thoroughly investigated in the literature.

Although prior academic studies have investigated arbitrage opportunities in the DR market, there are two opposing views in the literature. Early studies by Maldonado and Saunders (1983), Kato et al. (1991), Park and Tavakkol (1994) and Miller and Morey (1996) found no arbitrage opportunities in the ADR market and therefore conclude the LOOP holds and markets are efficient. Conversely, the early studies by Wahab et al. (1992) and Rosenthal and Young (1990) and more recent studies by Froot and Dabora (1999), Hong and Susmel (2003), Gagnon and Karolyi (2004) and De Jong et al. (2005) conclude there are arbitrage opportunities in the ADR market. For example, for some ADRs Gagnon and Karolyi (2004) find discounts of up to 87 percent and premiums of up to 66 percent between an ADR and its underlying shares.

The validity of the LOOP has important implications in the econometric estimation and testing procedures of the prices of financial assets. If the LOOP holds, then the prices under consideration are cointegrated, and so the markets involved have to be modeled simultaneously, otherwise the estimation may be biased (Nanang, 2000). In this dissertation, I propose to test the hypothesis of no cointegration against the alternative of cointegration in the cross-market premium.

As mentioned above, the literature on ADRs can be divided into two major categories. We can further divide the literature in the second category in terms of the methodology used to investigate the mispricing between the DR and its underlying shares. The mispricing has been analyzed using linear models (Maldonado and Saunders, 1983; Kato et al., 1991; Park and Tavakkol, 1994; Miller and Morey, 1996; De Jong et al., 2005) and nonlinear models (Rabinovitch et al., 2003; Chung et al., 2005; Koumkwa and Susmel, 2005; Suarez, 2005;

Urrutia and Vu, 2006; Chen et al., 2008). Nonlinear models have been found more appropriate because the transaction costs involved in the arbitrage process produce a region in which arbitrage is not profitable because any potential arbitrage profit is smaller than the transaction cost involved in the operation (Yeyati et al., 2009). Thus, the transaction costs generate two different regimes, an arbitrage regime and a non-arbitrage regime. This observable fact of the DR market cannot be appropriately modeled with linear models.

Chronology of Econometric Methodology

In terms of the econometric methodology employed, the ADR literature is very rich. In the following paragraphs I present a chronology of how the econometric methodology has evolved to study the LOOP in the DR market. The purpose of this section is not to provide an exhaustive review of the literature but rather to show how the methodology used in ADR studies has evolved.

The first study of ADR market efficiency, i.e. that investigates whether the LOOP holds or not, is that of Rosenthal (1983) who computed serial correlations to test for weak-form efficiency. He concluded that the market was weak-form efficient, that is abnormal returns cannot be earned from any price dependence and the LOOP was found to hold. Kato et al. (1991) used *t*-tests to test the price differential between an ADR and its underlying shares for ADRs of Australia, England, and Japan. Kato et al. (1991) found no statistical difference between the exchange rate adjusted prices of the ADR and the underlying share prices.

Mathur et al. (1998) used event studies and ordinary least square (OLS) regression to study the LOOP in the ADR market during the 1994 Mexican Peso crisis. Mahur et al. (1998) report that during the event window no arbitrage, or deviations of the LOOP, occurred, however in the days following the events of the Mexican Peso crisis, there were statistically significant arbitrage opportunities. These opportunities are attributed to underlying market segmentation, capital controls and differences in structure and listing regulations across the American and Mexican markets (Mahur et al., 1998).

Kim et al. (2000) used a vector autoregression (VAR) model with a cointegration constraint to study the informational efficiency between an ADR and its corresponding underlying foreign shares for ADRs of Japan, UK, Sweden, Netherlands, and Australia. They found most of the innovation in the prices of ADRs can be explained by innovations in their underlying shares, followed by the exchange rate, and movements in the U.S. market. The impulse response functions (IRF) indicate most of the price adjustments in the ADR market due to an innovation in the price of the underlying shares occur in the same calendar day. Kim et al.'s (2000) study shows that while arbitrage profits are existent, they are hampered by non-synchronous trading of the ADR and the underlying security and transaction costs.

Alaganar and Bhar (2001) examined international efficiency and international diversification using a sample of 24 Australian ADRs using *t*-tests to analyze any mispricing between the ADRs and their underlying shares. The study is interesting because it used daily and monthly returns. Their findings indicate the ADR market is efficiently priced, i.e. no arbitrage profits, and the LOOP holds. Alaganar and Bhar (2001) also used a VAR to study the flow of information in the Australian ADR market. The results indicate the pricing information flows from the underlying stocks to their corresponding ADRs., however at the aggregate level, the pricing information flows from the U.S. markets to the Australian stocks.

Rabinovitch et al. (2003) used a sample of Chilean and Argentinean ADRs to compare the return distributions of ADRs and their underlying shares. During the period of analysis the Argentinean economy did not have legal restriction on foreign investment and cash transfers and it maintained a constant parity with the U.S. dollar. The Chilean economy maintained a floating exchange rate regime and strict regulations against the free flow of cash into and from Chile. The study is interesting because it tests the LOOP in two countries where one imposed restrictions on foreign capital and the other did not. The trading hours of both stock markets coincide with the trading hours in New York avoiding the problem of non-synchronous trading. Rabinovitch et al. (2003) found the Argentinean market to be more efficient than its Chilean counterpart because the speed of convergence between the prices of ADRs and the prices of their underlying shares is faster in the Argentinean ADR market. This is consistent with the LOOP which states that in the absence of capital controls arbitrage opportunities should not exist. As expected, Chile's strict capital controls are not found to be the most important factor affecting the speed of convergence but rather market trading liquidity which they measure by the average daily volume and the numbers of days with non-zero trading volume relative to total trading days. In the case of Chile, it is the lack of liquidity that negatively affects the ability of arbitrageurs to arbitrage profitably because it leads to higher transaction costs.

One of the most important improvements in the DR literature is the use of nonlinear models to account for the presence of transaction costs in the arbitrage process between a DR and its underlying security. Transaction costs may induce discontinuity in arbitrage and adjustment of the cross-market premium to its long run equilibrium because arbitrageurs would act only when they expect future returns to be higher than the transactions costs (Dumas, 1992). Yeyati et al. (2009) used an autoregressive (AR) model to estimate the speed of convergence between ADRs and their underlying shares and non-linear threshold autoregressive (TAR) models to identify the upper and lower limits of the no-arbitrage regime created by transaction costs. Yeyati et al. (2009) estimated the cross-market premium as a proxy of financial integration. If a market is segmented, i.e. not financially integrated with other markets, the speed of convergence of the cross-market premium to its long-run equilibrium will be small. The results of the study reveal integration is stronger for more liquid stocks because the transaction costs are likely to be smaller. Contrary to Rabinovitch et al. (2003), Yeyati et al. (2009) found that regulations on capital flows effectively limit the degree of financial integration between the DR market and its corresponding foreign market.

Furthermore, the presence of transaction costs implies smoothness (Arouri et al., 2010) in the dynamics of the cross-market premium time series because the heterogeneity of transaction costs among small and large investor affects the stock price mean reversion (Anderson, 1997). Thus, the more transaction costs are distinct for investors, the more the adjustment long-run equilibrium is smooth rather than abrupt. Koumka and Susmel (2006) used a smooth threshold autoregressive model (STAR) to study 21 Mexican ADRs. The results indicate that when modeling a smooth nonlinear adjustment the average half- life of a mispricing in the cross-market premium is reduced by more than 57% when compared to the standard linear model.

Summary of the Literature

In conclusion, in this study the ADR literature can by summarized as following. The ADR literature can be initially divided into studies that have looked at the reasons why companies issue ADRs in the American equity markets and studies that analyzed deviations from the LOOP in the ADR market, i.e. discrepancies between the prices of ADRs and their underlying shares. The later studies can further be divided into studies that have analyzed the deviations from the LOOP using linear and nonlinear methodologies. Within the nonlinear studies, we can further divide the literature into studies that have used TAR nonlinearity which assumes an instantaneous reversion to the cross-market premium’s long-run equilibrium when the arbitrage profits exceed the transaction costs, and STAR nonlinearity which assumes a smooth reversion to the long-run equilibrium.

The STAR models are an improvement over the TAR models because they do not assume that all investors are a homogeneous sample acting all simultaneously on arbitrage opportunities. The STAR models used in the literature allow for the modeling of investors as a heterogeneous sample where arbitrage opportunities will not be the same for all because they incur different transaction costs.

CHAPTER IV

METHODOLOGY

As described in the previous chapter, the transaction costs involved in arbitrage operations in the ADR market introduce nonlinearities in the ADR cross-market premium. Evaluating the nonlinear dynamic properties of the ADR cross-market premium is one of the main objectives of this study. This section describes the tests and estimation methods that will be employed to describe the nonlinear dynamic properties of the cross-market premium in the ADR market. The data will initially be tested for normality, stationarity, nonlinearity, cointegration, and STAR nonlinearity. The data will then be used to estimate various models such as those that allow instantaneous reversion to the band, smooth reversion to the band, and methods that combine smooth transition and cointegration effects. Once the models are estimated, the forecasting properties of these will be evaluated. The rest of this section will describe the various tests and model estimation methods.

ADR Premiums and Discounts

Following Grossmann et al. (2007), the daily cross-market premium is calculated as following:

$$PR_t = \frac{UND_t - \frac{ADR_t}{n}}{UND_t}, \tag{1}$$

where PR_t is the cross-market premium of an ADR, UND_t is the share price of the underlying asset, and ADR_t over n is the share price of the ADR adjusted for the ratio of ADR shares to the number of shares of the underlying stock. All prices are in U.S. dollars.

Normality Test

The cross-market premium will be tested for normality using the Jarque-Bera (JB) test (Jarque and Bera, 1987). The JB test is a goodness-of-fit measure of departure from normality and is based on the sample kurtosis and skewness of the data. The null hypothesis of the JB test is a joint hypothesis of the skewness and excess kurtosis being equal to zero.

Stationarity Test

The ADR, the share price of the underlying asset, and the cross-market premium data will be tested for stationarity using the Dickey-Fuller (DF) test (Dickey and Fuller, 1979). The null hypothesis of the DF is the presence of a unit root in the time series or that the time series is integrated of order one, i.e. I(1). When a time series is I(1) it is said to behave as a random walk.

Cointegration Test

Both the ADR and UND time series will be tested for cointegration using the Johansen test (Johansen, 1991). If the test indicates that the ADR and UND time series are I(1), regressing a random walk variable on another random walk variable will yield a spurious result (i.e., it will indicate a relationship exists between the variables when in fact none exists). One solution is to detrend the variables, but information may be lost about the long-run relationship between ADR and UND. Another solution is to find a linear combination of the ADR and UND time series, which will be stationary. If there is at least one linear combination between the ADR and UND time series, then the two time series are said to be cointegrated. In the presence of cointegration, the ADR and UND time series will be jointly modeled in a nonlinear error correction framework.

The time paths of cointegrated variables are influenced by the extent of any deviation from their long-run equilibrium, and the evolution of the ADR and UND time series over time responds to the magnitude of the disequilibrium. The magnitude of the deviation and speed of adjustment will be estimated with a smooth threshold error correction model.

STAR Nonlinearity

Deviations of the cross-market premium from its long-run equilibrium can be modeled under two assumptions. First, we can assume that the corrections from disequilibrium happen instantaneously which will imply that all arbitrageurs act simultaneously on any mispricing between the ADR and UND time series. Second we can model the behavior of the cross-market premium under the assumption that any mispricing between the ADR and UND time series will be arbitraged away gradually and the price correction will occur smoothly. The cross-market premium will be tested for STAR nonlinearity (Franses and van Dijk, 2000) to consider the possibility of a smooth transition.

Linear Model

A linear model is estimated to explain the cross-market premium and to use it as a benchmark to evaluate the forecasting performance of the nonlinear models. Following Yeyati et al. (2000), the degree of financial integration between the ADR and UND time series is measured with an autoregressive (AR) model to estimate the speed of convergence between the prices of an ADR and its underlying shares. A higher convergence speed is indicative of a stronger degree of financial integration. The following AR model is estimated:

$$\Delta PR_t = \beta_1 PR_{t-1} + \sum_{j=1}^{k} \emptyset_j \Delta PR_{t-j} + \varepsilon_t \tag{2}$$

where β_1 measures the speed of convergence of the cross-market premium back to its mean. The constant term or intercept is omitted in Equation 2 because the data generating process is assumed to follow a random walk without a drift (Lo and Zivot, 2001; Yeyatti et al., 2009). The number of lags is chosen based on the Akaike (1974) Information Criterion (AIC).

Yeyati et al. (2009) then use the value of the β_1 coefficients to calculate the half-life[8] of the AR models, estimated as

$$half\ life = \frac{\ln(0.5)}{\ln\,(1+\beta 1)} \qquad (3)$$

Equation (3) is a precise measure of the half-life only for an AR(1) process. For higher order AR(*p*) processes, equation (3) is only an approximation of the half-life because the expression assumes a monotonic rate of decay which is not necessarily true for in higher order AR models. However, Yeyati et al. (2009) justify using equation (3) to estimate the half-life instead of an impulse response because when using daily data, most of the price convergence occurs within a day making the analysis of the impact of liquidity and capital controls on financial market integration impossible with impulse response functions.

Threshold Autoregressive (TAR) Models

The most probable cause of nonlinearity in the linear model describe in the previous section is that arbitrageurs react only to large deviations of the cross-market premium from equilibrium and ignore the small deviations. The nonlinear dynamic structure of the price differential between the ADRs and their underlying shares is best characterized by threshold type nonlinearity. Threshold autoregressive (TAR) models (Tong, 1978, 1983; Tong and Lim, 1980) are used to describe the convergence of ADRs and their underlying shares prices back to their long-run equilibrium in the presence of transaction costs. These transaction costs define two

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[8] The half-life measures the time it takes for a price divergence to decrease by half.

regimes, one where arbitrage is not profitable and the time series follows a random walk and another one where arbitrageurs find the price spread between an ADR and the underlying shares more than covers the transaction costs. In the later case, the actions of the arbitrageurs cause the price disparity to dissipate and the time series behaves as a mean reverting series (Yeyati et al., 2009).

A TAR model works by allowing for regime switching parameters depending on the distance of an observation from the mean. As an added benefit the estimated threshold will indirectly give a measure of the size of the transaction cost. The TAR model takes the form

$$\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \varepsilon_{1,t} \; if \; s_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j} \Delta PR_{t-j} + \varepsilon_{2,t} \; if \; s_{t-d} \geq c \end{cases} \tag{4}$$

where ΔPR_t is the first-difference cross-market premium, s_t is the transition variable, and c is the threshold parameter that determines where the transition occurs. When the transition variable is a function of lagged values of PR_t, i.e. $s_{t-d} = PR_{t-d}$, the model is called self-extracting TAR (SETAR) model and is given by

$$\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j} \Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases} \tag{5}$$

This SETAR model is used in this to estimate the autoregressive parameters in each of the regimes, i.e. the arbitrage and no arbitrage regimes, under the assumption of an instantaneous reversion to the cross-market premium’s long-run equilibrium when there is a price discrepancy between the ADR and its underlying shares.

Smooth Transition Autoregressive (STAR) Models

The problem with the SETAR model described above is that the change between regimes occurs abruptly and it presumes the same speed of adjustment outside the threshold or band. This assumption of SETAR models is unrealistic since large deviations outside the band will trigger more arbitrageurs to act than small deviations outside the band. It is also unlikely that all arbitrageurs will be subject to the same transaction costs, thus they will not act homogeneously on the same deviation from equilibrium. The STAR model employed in this study allows for a smooth and asymmetrical reversion to the band. Following Van Dijk et al. (2002) the basic STAR model, first introduced by Chan and Tong (1986) and Tong (1990), for a univariate time series is given by

$$\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right)$$

$$+\left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t \qquad (6)$$

where ΔPR_t is the first-difference cross-market premium, w_t is a vector of exogenous variables, and the transition function $G(s_t; \gamma, c)$ is a continuous function that is bounded between 0 and 1 where s_t is the transition variable, γ measures the speed or smoothness of the transition from 0 to 1 (the larger the γ, the faster the transition), and c is the threshold parameter that determines where the transition occurs, i.e., c determines the upper and lower limits of the non-transaction band. The transition variable s_t can be assumed to be a lagged value of the cross-market premium, i.e., $s_t = PR_{t-d}$ (Teräsvirta, 1994) or an exogenous variable $(s_t = z_t)$ (Van Dijk et al., 2002). Following Franses and van Dijk (2000), the former specification is used because it is assumed that the switch from one regime to another depends on the past values of the cross-market premium.

Van Dijk et al. (2002) present two possible interpretations for STAR models. On the one hand, the STAR model describes a regime-switching model that allows for two regimes (inside and outside the non-transaction band), associated with the extreme values of the transaction function, $G(s_t;\gamma,c)=0$ and $G(s_t;\gamma,c)=1$, where the transition from one regime to the other is smooth. On the other hand, the STAR model allows for a continuum of regimes, one for each of the values $G(s_t;\gamma,c)$ can take between 0 and 1. In this study only the two-regime interpretation is considered because for the case of the ADR cross-market premium there are only two possible regimes, a regime where arbitrage is profitable and a regime where it is not because the transaction costs exceed arbitrage profits.

Logistic and Exponential STAR Models

There are two popular choices for the transition function $G(s_t;\gamma,c)$, each one describing different types of regime-switching behavior, depending upon the shape of the transition function. The first choice, the logistic function, takes the following form

$$G(s_t;\gamma,c)=\frac{1}{1+e^{-\gamma(s_t-c)}},\ \gamma>0 \tag{7}$$

and the model is called the logistic STAR (LSTAR) model. In the LSTAR model the two regimes under consideration (inside and outside the band of no action) are associated with small and large values of the transition variable s_t (relative to c). The LSTAR is used to capture asymmetries in the time series, for example Skalin and Teräsvirta (2002) use a LSTAR model to capture the asymmetries in unemployment rates associated with expansions and contractions of the business cycle.

The second choice, the exponential function, takes the following form

$$G(s_t;\gamma,c)=1-e^{-\gamma(s_t-c)^2},\ \gamma>0 \tag{8}$$

and the model is called the exponential (ESTAR) model. In the ESTAR model the two regimes are associated with small and large absolute values of s_t, relative to c.

Smooth Threshold Error Correction Model (STECM)

To investigate the possibility of cointegration (Granger, 1981, 1986; Engle and Granger, 1987) between an ADR and its underlying shares with a smooth transition between the arbitrage and no arbitrage regimes, the following STECM is employed

$$\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right)$$

$$+\left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t \qquad (9)$$

where $G(s_{t-d}; \gamma, c)$ is a bounded transition function that has values between 0 and 1, s_{t-d} is the transition variable, the parameter γ denotes the speed of the transition from 0 to 1 (the larger the γ the faster the transition), and c is the threshold parameter that determines where the transition between regimes occurs. The STECM employed in the study models simultaneously the nonlinearity, smoothness, and cointegration present in the ADR cross-market premium.

Summary of the Methodology

In conclusion, the models used in this dissertation can be summarized as following. The AR model will be used to estimate the parameters under a linear framework and use them as a benchmark to evaluate the forecasting performance of the nonlinear models in the ADR cross-market premium. The SETAR model will be used as part of the comprehensive study of the nonlinear dynamic properties of the ADR cross-market premium under the assumption of an instantaneous reversion to the long-run equilibrium. The STAR model will be used to model the smooth reversion to the ADR cross-market premium to its long-run equilibrium induced be the heterogeneity of investors. Lastly, the STECM will be used to model within a nonlinear framework the cointegration of the ADR prices and the underlying shares prices.

CHAPTER V

DATA

The ADR database for this study is compiled from the Bank of New York Mellon DR Directory (http://www.adrbnymellon.com/dr_directory.jsp). The directory includes the ADR name, the country of origin, the industry the ADR operates in, the ratio of underlying shares to ADR shares, and the American stock exchange where the ADRs shares are traded. ADRs from Asia, Europe, and Latin America will be included in the sample. The price per share of ADRs and underlying shares are obtained from Thomson Reuters Datastream. Prices per share are downloaded in U.S. dollars. Datastream uses Closing Spot Rates, these rates are fixed daily Monday – Friday at 16:00 hours U.K. Time. The data are sampled at a daily frequency and cover the period January 1st 1990 to October 29th 2010. ADRs with less than two years of data are excluded from the sample to reliably estimate the AR, TAR, STAR, and STECM models (Yeyati et al., 2009). The ADR database is restricted to stocks publicly traded either on the NASDAQ or the NYSE, i.e. Level II and Level III ADRs.

Inspection of the Data

Table 1 reports the descriptive statistics of the daily ADR cross-market premium. There are 178 ADRs in the sample with Europe having the largest representation, followed by Asia and then Latin America. The daily average cross-market premium for all ADRs in the sample is 11.3 percent however the daily average cross-market premium for Latin American Level II ADRs is

39.7 percent due to two ADRs with unusually high premiums. Excluding these two ADRs the daily average cross-market premium is 4.6 percent or 16.9 percent expressed on an annual basis. Overall the data is negatively skewed and leptokurtic. This reflects the fact that the tails of the distributions of the cross-market premiums are fatter than the tails of the normal distribution, i.e. large observations occur more often than one might expect for a normally distributed time series.

The Jarque-Bera test of normality indicates that the cross-market premiums for are not normal. The rejection of the normality hypothesis, the excess kurtosis (leptokurtic), and the asymmetry (skewness) of the data imply the presence of nonlinearities in the adjustment process of the cross-market premium towards equilibrium (Jawadi and Koubaa, 2004). The Johansen test of cointegration indicates that ADRs and their underlying shares have at least one cointegrating vector. This justifies the use of the proposed smooth threshold error correction model described in the methodology section.

Table 1
Descriptive Statistics of the Daily Cross-Market Premium

Region / Level	Number of ADRs	Average	Standard Deviation	Skewness	Kurtosis
Asia Level II	27	0.00053	0.06019	0.36105	14.09396
Asia Level III	36	0.15221	0.18689	-0.99105	22.12122
Europe Level II	44	0.06370	0.06987	-0.84485	19.92579
Europe Level III	34	0.05856	0.07015	-0.82794	15.53668
Latin America Level II	16	0.39713	0.34062	-3.01771	15.85356
Latin America Level III	21	0.00850	0.04947	0.27372	10.87515
Average		0.11326	0.12953	-0.84113	16.40106

Notes: The table shows summary statistics for the cross-market premium. The cross-market premium is defined as the percentage difference between the dollar price of the stock in the domestic market and the price of the corresponding DR in New York. The regions' summary statistics are the simple average of the premium of the stocks in each country's portfolio.

The complete database constructed for this study including the names of the ADRs, the home country, the exchange in which they trade, the industry in which they operate, the ratio of ordinary shares to depositary receipt shares, and descriptive statistics is located in appendix A.

CHAPTER VI

RESULTS AND DISCUSSIONS

To examine the evolution of the dynamic properties of the ADR cross-market premium, to analyze the smooth nonlinear properties of the ADR cross-market premium within an error correction framework, and to compare the forecasting performance of a STECM in the ADR cross-market premium against a linear model and other nonlinear model specifications, the statistical tests and econometric models described in the methodology section are estimated from 1/1/1990 to 12/31/2008 in GAUSS, Eviews, and JMulTi. The period from 1/1/2009 to 10/29/2010 is excluded from the estimation of the models to evaluate their out-of-sample forecast performance of the STECM. The models are estimated for each ADR in the study. In this section only averages for the three regions (Asia, Europe, and Latin America) and the two ADR Levels (Levels I and II) are analyzed. The individual estimation results for each ADR in the study can be found in the appendices. Appendix B reports the individual ADR cross-market premium LM tests for STAR nonlinearity. Appendix C reports the individual ADR cross-market premium AR and half-lives estimates. Appendices D, E, and F report the individual ADR cross-market premium SETAR, STAR, and STECM estimates, respectively. Appendices G, I, and J report the individual ADR cross-market premium Johansen cointegration tests, the Jarque-Bera tests of normality, and the Dickey-Fuller unit root tests, respectively. Appendix H reports the mean squared prediction errors used to evaluate the forecasting performance of the nonlinear models used in the study against the linear specification.

Evolution of the Dynamic Properties of the Cross-Market Premium

In this section, the behavior of the cross-market premium over the time period under study is analyzed. To this effect, an ADR cross-market premium index was developed and employed in this study. Although prior studies have examined the ADR cross-market premium at the level of the firm, the use of an ADR cross-market premium index diminishes idiosyncratic fluctuations associated with each ADR (Stigler et al., 2010). Making use of an ADR cross-market premium index also facilitates the inspection of movements and structural changes in the ADRs of a region in general.

For each region (Asia, Europe, and Latin America) and for each ADR level (Level II and Level III) an ADR cross-market premium index is constructed by computing the mean of the ADR cross-market premiums for the ADRs used in this study. Two indices are computed: a long- and a short-index. The long-index covers the period 1/1/1990 – 10/29/2010 and the short-index covers the period 1/1/2001 – 10/29/2010. The long-index is computed with fewer ADRs because only a few ADRs go back to 1/1/1990. In Latin America, none of the ADRs go back to 1990 so only the short-index is computed for this region. To highlight longer-term trends in the indices, the 200-day moving average and 200-day moving standard deviation, which smooth out short-term fluctuations in the ADR cross-market premium, are estimated and over impose on the ADR cross-market premium indices (Tsai et al, 2007).

Table 2 reports the descriptive statistics for the ADR cross-market premium long and short indices over the entire period of study. Compared to the average ADR cross-market premiums reported in Table 1for individual ADRs, the average cross-market premiums of the long and short indices are smaller. The short and long indices seem to indicate that the arbitrage opportunities in the ADR market are lesser than the individual ADRs in the study suggest because when the cross-market premium is smaller than the transaction cost, it makes the arbitrage operation unprofitable. To study the effect of the 2007-2009 financial crisis on the ADR cross-market premium, three periods are defined: The pre-crisis period, the crisis period, and the post-crisis period. The crisis period is established based on the Business Cycle Dating Committee of the National Bureau of Economic Research (NBER). According to the NBER, the economic recession that sparked the financial crisis started in December of 2007 and ended in June of 2009. Table 3 reports the descriptive statistics for the three periods. The descriptive statistics indicate the standard deviation during the period of the financial crisis is greater than in the pre- and post-periods which would indicate a greater degree of volatility during the crisis period. A careful look at Table 3 shows the standard deviation is greater during the crisis period for the Levels II and III and for the three regions (Asia, Europe, and Latin America).

Table 2
ADR Cross-Market Premium Index Descriptive Statistics

	Level II			Level III		
	Asia	Europe	Latin America	Asia	Europe	Latin America
Panel A: Long-index						
Number of ADRs in index	7	9	-	4	6	-
Average	0.004640	-0.057624	-	-0.000991	-0.022889	-
Standard Deviation	0.097428	0.020199	-	0.009034	0.015475	-
Skewness	-0.288328	1.320592	-	0.109387	-0.408922	-
Kurtosis	-1.047351	1.587443	-	7.912135	2.657002	-
Panel B: Short-index						
Number of ADRs in index	16	34	12	22	20	11
Average	0.037909	-0.051745	-0.001517	0.034767	-0.022252	0.004633
Standard Deviation	0.018221	0.019171	0.026456	0.026867	0.025531	0.018481
Skewness	-0.478369	1.061122	0.946170	0.004822	-1.888297	-0.976364
Kurtosis	2.203227	5.663365	2.397040	-0.324192	5.976121	5.744532

Note: The index is computed as the mean of the individual ADR cross-market premiums. The long-index covers the period 1/1/1990 – 10/29/2010. The short-index covers the period 1/1/2001 – 10/29/2010. The long-index is not computed for Latin America because none of the ADRs in the region began trading as far back as 1990.

Table 4 reports the ratios of the standard deviation during the financial crisis to the standard deviation during the pre- and post- financial crisis periods. A ratio greater than one indicates the standard deviation during the crisis is greater than during the pre- and post-crisis periods. The ratios confirm the standard deviation of the ADR cross-market premium index is in 16 out of 20 cases greater during the financial crisis than before and after the crisis, that is the volatility in the ADR market was higher during the 2007-2009 crisis than in the periods before and after. For Level II ADRs the standard deviation ratio is highest for Latin America and for Level III ADRs it is highest for Europe. In the next section, the graphs of the ADR cross-market premium long and short indices are presented along with the 200-day moving average and 200-day moving standard deviation.

Table 3

ADR Cross-Market Premium Index Descriptive Statistic: Pre-, During-, and Post-Crisis

	Level II			Level III		
	Asia	Europe	Latin America	Asia	Europe	Latin America
Panel A: Long-index						
Number of ADRs in index	7	9	-	4	6	-
Pre-Crisis Period						
Average	-0.013154	-0.063638	-	-0.001260	-0.025248	-
Standard Deviation	0.093375	0.012272	-	0.007888	0.014206	-
Skewness	-0.084824	0.609135	-	-0.428987	-0.582373	-
Kurtosis	-0.949488	0.357681	-	5.878627	3.295359	-
Crisis Period						
Average	0.109555	-0.035006	-	0.001212	-0.010093	-
Standard Deviation	0.020921	0.015574	-	0.017519	0.018704	-
Skewness	0.138805	-1.121727	-	0.308356	-1.071038	-
Kurtosis	2.083987	6.134803	-	2.668272	4.550706	-
Post-Crisis Period						
Average	0.119461	-0.003609	-	0.000019	-0.006358	-
Standard Deviation	0.011544	0.007263	-	0.008294	0.008596	-
Skewness	0.320699	-0.236661	-	0.346473	-0.259797	-
Kurtosis	0.664313	4.728049	-	0.569434	4.311361	-
Panel B: Short-index						
Number of ADRs in index	16	34	12	22	20	11
Pre-Crisis Period						
Average	0.032967	-0.058044	-0.004957	0.031241	-0.024411	0.001944
Standard Deviation	0.016441	0.008290	0.028259	0.027575	0.022081	0.019226
Skewness	-0.952478	-0.504427	1.064717	-0.029971	-1.626104	-1.217441
Kurtosis	2.383289	4.302753	2.125134	-0.740926	3.257417	5.585438
Crisis Period						
Average	0.047467	-0.055714	0.015961	0.053571	-0.032656	0.019260
Standard Deviation	0.020755	0.018386	0.020644	0.025350	0.034873	0.013850
Skewness	-0.100541	-2.744117	1.530227	-0.195711	-2.011428	0.634955
Kurtosis	1.977877	19.303656	5.430860	0.359806	4.873975	5.972412
Post-Crisis Period						
Average	0.052222	-0.014372	-0.004372	0.030793	0.001265	0.001262
Standard Deviation	0.009834	0.018225	0.009089	0.010922	0.011571	0.008468
Skewness	0.397655	0.017150	-0.438312	0.312617	-0.185807	0.206611
Kurtosis	0.530657	-0.904969	0.706105	0.664264	0.791088	1.257757

Table 4
Pre- and Post- Financial Crisis Standard Deviation Ratios

	Level II			Level III		
	Asia	Europe	Latin America	Asia	Europe	Latin America
Panel A: Long-index						
crisis/pre-crisis	0.2	1.3	-	2.2	1.3	-
crisis/post-crisis	1.8	2.1	-	2.1	2.2	-
Panel B: Short-index						
crisis/pre-crisis	1.3	2.2	0.7	0.9	1.6	0.7
crisis/post-crisis	2.1	1.0	2.3	2.3	3.0	1.6

Note: The entries in Table 4 represent the ratio of the standard deviation during the financial crisis to the standard deviation during the pre- and post-crisis periods. A ratio greater than one indicates the volatility in the ADR cross-market premium index is greater during the crisis period than during the pre- and post- crisis periods.

Cross-Market Premium Index: Level II Asian ADRs

In Figure 1, the ADR cross-market premium index for Level II Asian ADRs is plotted. The shaded area in the graph represents the 2007-2009 financial crisis as determined by the NBER. In the figure it is clear the ADR cross-market premium (or discount) was higher and more volatile than during the pre- and post-crisis periods. The dashed line in Figure 1 represents the 200-day moving standard deviation and the solid black line represents the 200-day moving average. It can be seen in the figure that during the crisis, the ADR cross-market premium index fluctuates considerably more around its 200-day moving average than during the pre- and post crises periods, indicative of higher volatility. The 200-day moving standard deviation also indicates a higher volatility during the crisis period. It can be observed in Figure 1 that during the crisis period (inside the shaded area) the 200-day moving standard deviation rises and then gradually declines after the crisis, indicative of higher volatility during the crisis period. In Figure 2, the same pattern can be observed for the long-index, however it can also be seen that Level II Asian ADRs went through a period of turbulence around 1998 during the dot-com bubble.

Figure 1
Level II Asian Cross-Market Premium Short-Index: 2001 - 2010

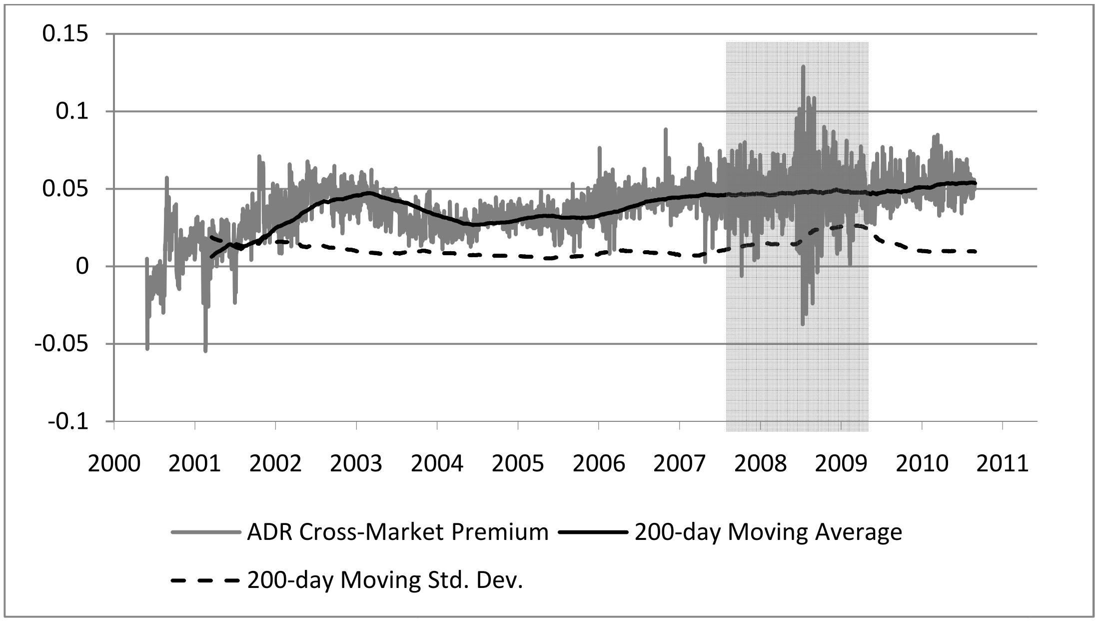
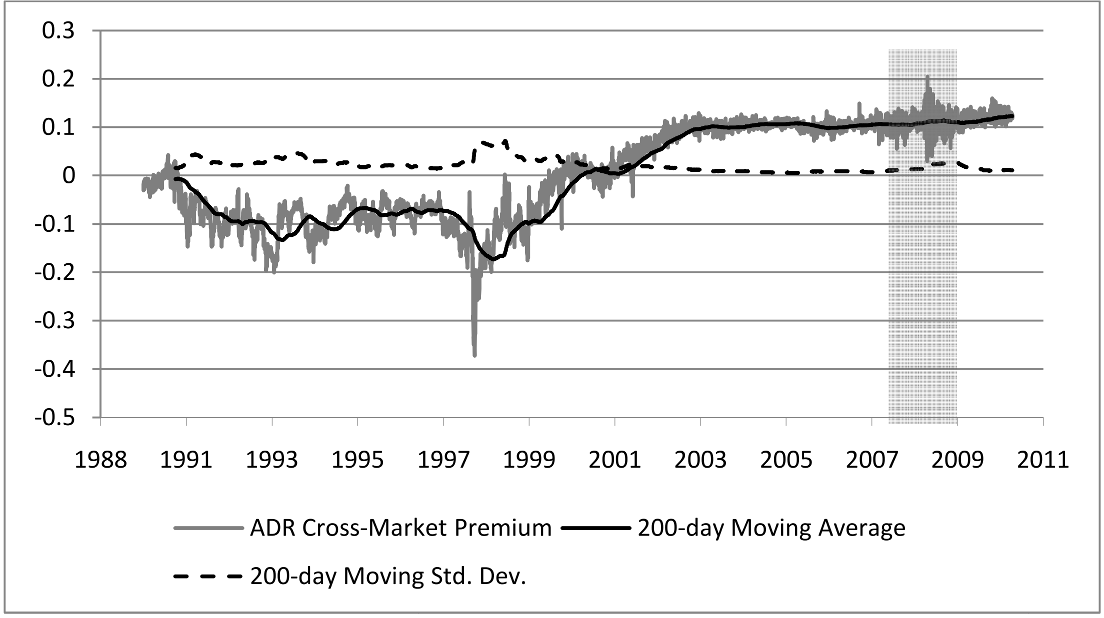


Figure 2
Level II Asian Cross-Market Premium Long-Index: 1990 - 2010



Cross-Market Premium Index: Level III Asian ADRs

The Level III Asian cross-market premium long- and short-indices show a similar behavior to that of the Level II Asian ADR cross-market premium long and short indices. In

Figure 4, it can be seen how the cross-market premium index shows a higher volatility during periods of financial turbulence, the 200-day moving standard deviation rises during the financial crisis 2007-2009 and then fades. The short-index 200-day moving standard deviation (Figure 3) rises too during the financial crisis and the falls. In Figure 3, the 200-day moving average rises leading up to the financial crisis and picks half way through the crisis to return to the pre-crisis level.

Figure 3
Level III Asian Cross-Market Premium Short-Index: 2001 – 2010

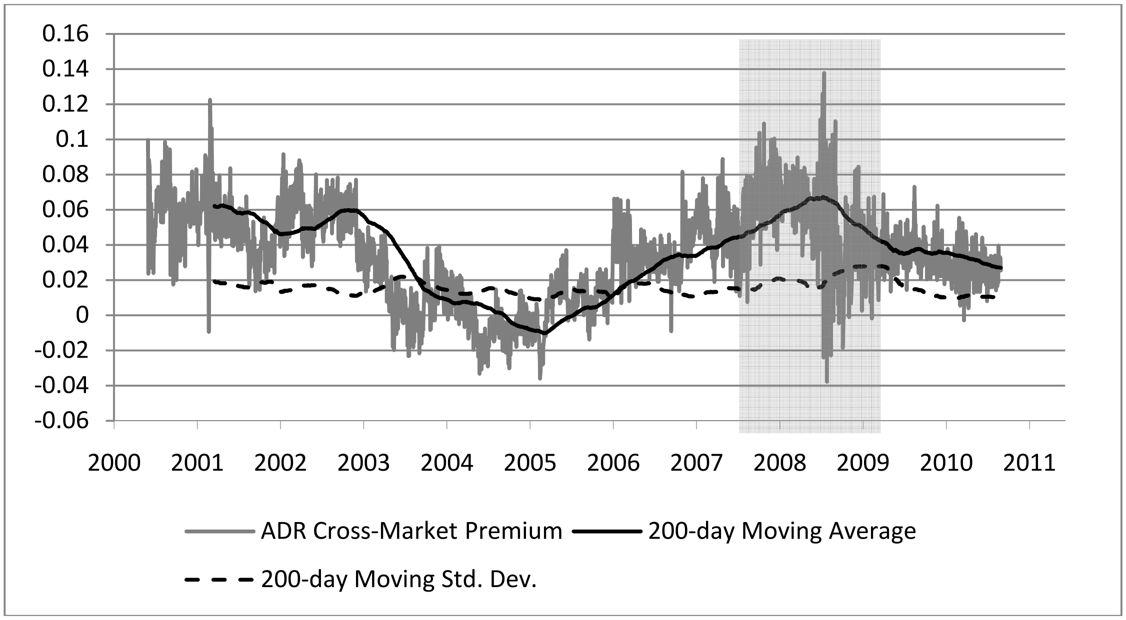
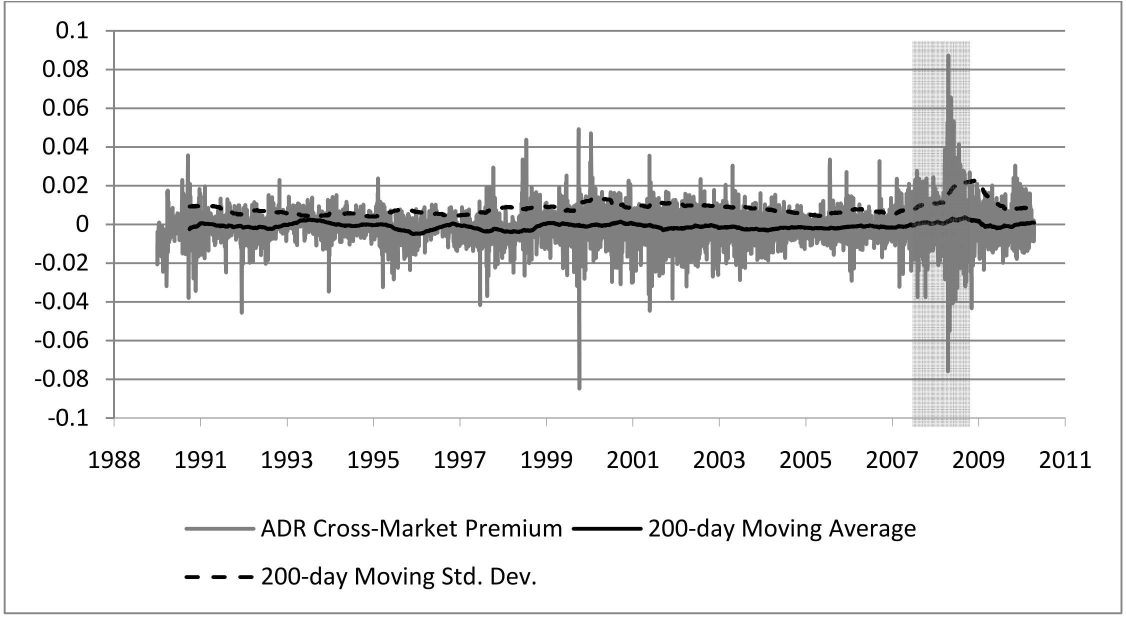


Figure 4
Level III Asian Cross-Market Premium Long-Index: 1990 - 2010



Cross-Market Premium Index: Level II European ADRs

For the case of Level II European ADRs, it is apparent from Figures 5 and 6 that the 2007-2009 financial crisis had a great impact on the European ADR cross-market premium long- and short-indices. The 200-day moving standard deviation rises in the short- and long-indices and then declines right after the end of the financial crisis. It can also be observed the higher fluctuation in the cross-market premium index around the 200-day moving average. The long-index (Figure 6) exhibits higher volatility during other periods but the highest volatility occurred during the 2007-2008 financial crisis.

Figure 5
Level II European Cross-Market Premium Short-Index: 2001 – 2010

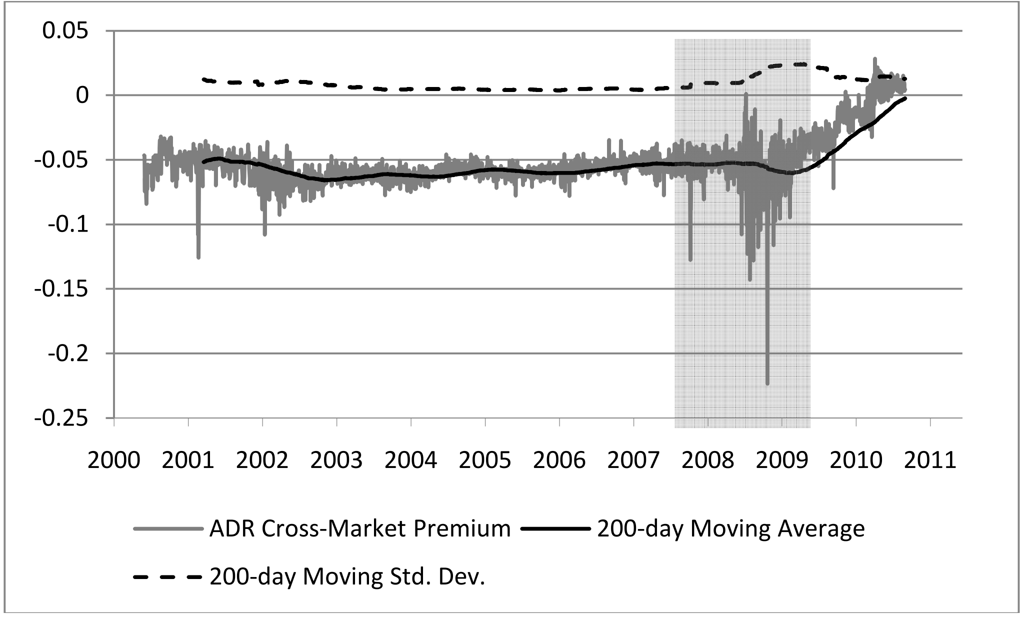
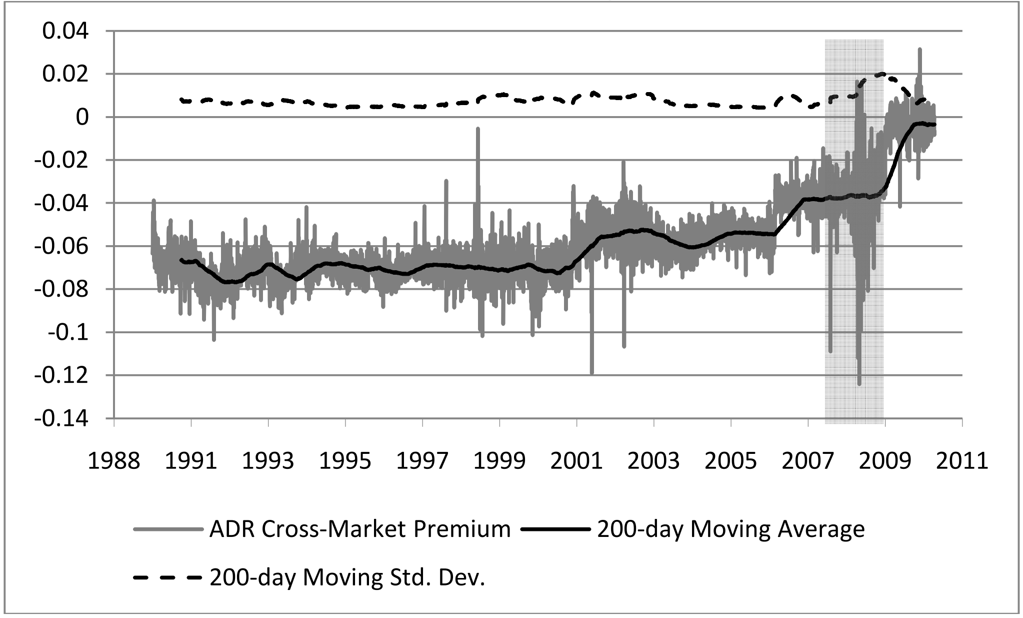


Figure 6
Level II European Cross-Market Premium Long-Index: 1990 – 2010



Cross-Market Premium Index: Level III European ADRs

In the short-index of Level III European cross-market premium index (Figure 7) there is a substantial rise in the 200-day moving standard deviation and a considerable drop in the cross-market premium index during the financial crisis. This behavior is consistent with the Level II European ADRs and with the Level II and Level III Asian ADRs. The Level III European cross-market premium long-index (Figure 8)

Figure 7
Level III European Cross-Market Premium Short-Index: 2001 – 2010

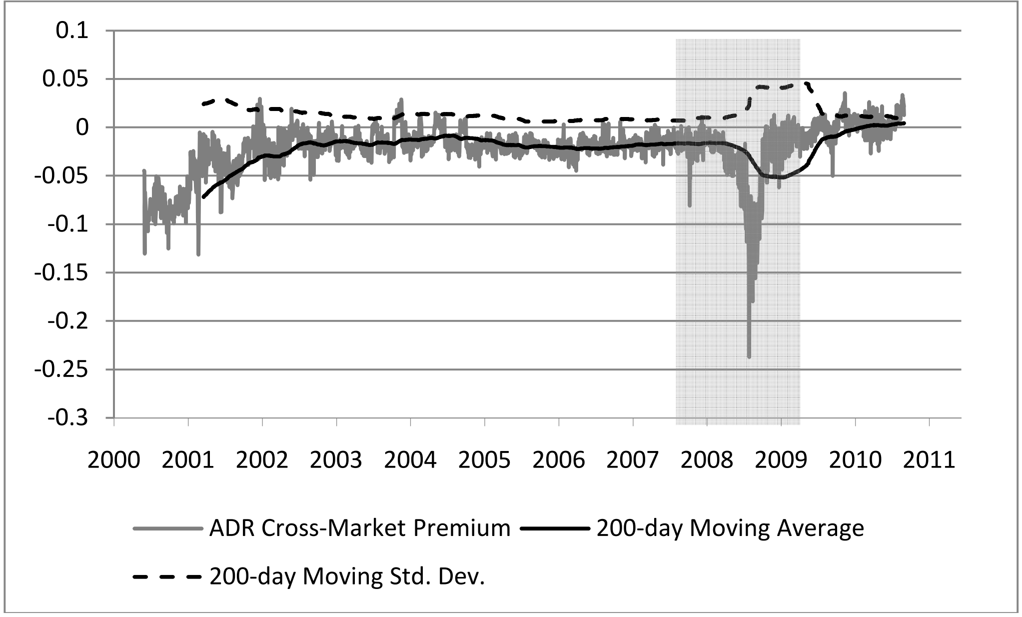
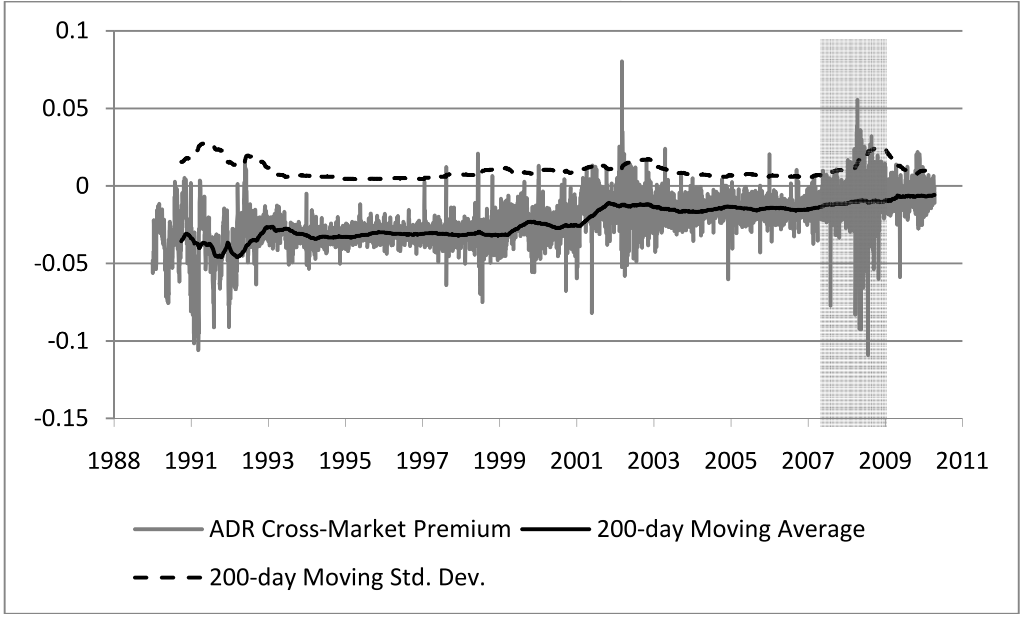


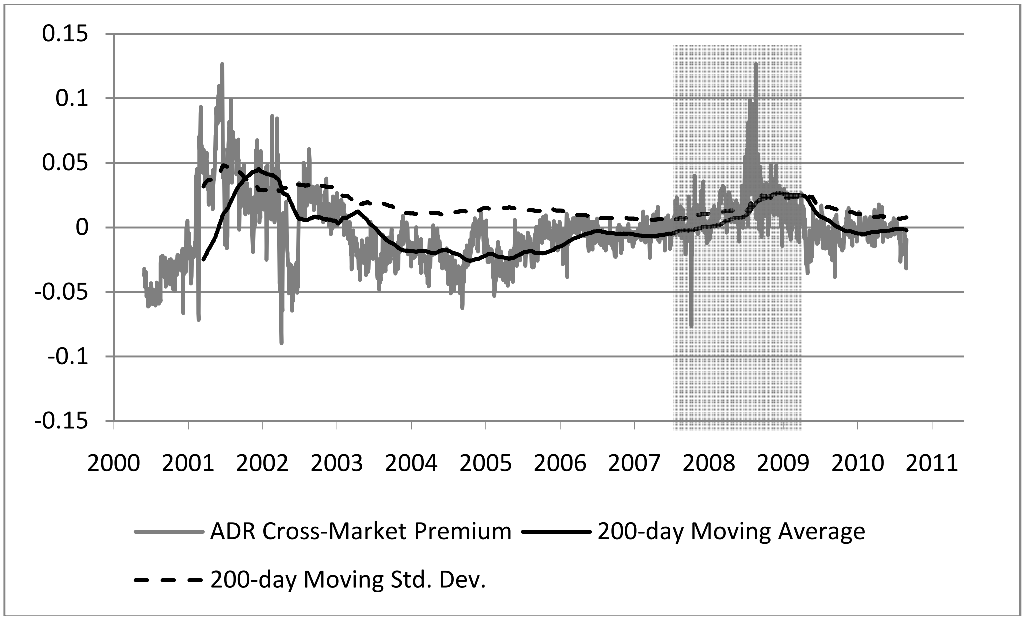
Figure 8
Level III European Cross-Market Premium Long-Index: 1990 – 2010



Cross-Market Premium Index: Level II Latin American ADRs

Level II and Level III Latin American ADR cross-market premium short- and long- indices (Figures 9 and 10, respectively) also exhibit the same increase in volatility during the 2007 – 2009 financial crisis than Asian and European ADRs. However, these ADR also exhibit a high degree of volatility between 2001 and 2003, a period during which the U.S. economy experienced an economic recession during the period 3/2001 – 11/2001. It is possible Latin America experienced higher volatility during the 2001-2003 period because this region's principal trading partners is the U.S.

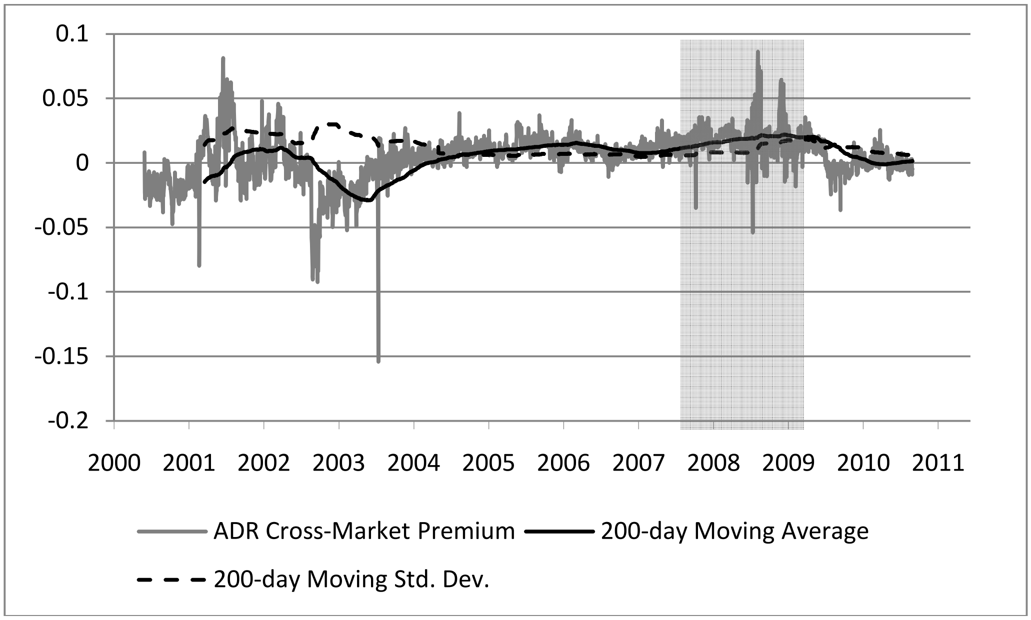
Figure 9
Level II Latin American Cross-Market Premium Short-Index: 2001 – 2010



Summary

All the ADR cross-market premium indices exhibit higher volatility during some periods than others but all the indices consistently exhibit higher volatility around the 200-day moving average during the 2007 – 2009 financial crisis period. The standard deviation ratios also indicate that during the financial crisis the volatility in the ADR cross-market premium index was higher than during the pre- and post-crisis periods.

Figure 10
Level III Latin American Cross-Market Premium Short-Index: 2001 – 2010



STECM and the ADR Cross-Market Premium

This section analyzes the cointegration between an ADR and its underlying shares in a nonlinear framework. All the ADRs in the study are tested for normality, stationarity, linearity and cointegration before estimating the AR, SETAR, STAR, and STECM models. Only the averages of the individual results are reported in this section, the individual results for each ADR in the study can be found in the appendices.

Normality Test

The Jarque-Bera test (Jarque and Bera, 1987) of normality strongly rejects the null hypothesis of normality for all ADR cross-market premiums in the study's database. The results confirm the skewness and kurtosis reported in Table 1.The results are found in appendix B and include the Jarque-Bera statistic for each ADR cross-market premium in the study with its corresponding *p*-value. The null hypothesis of normality can be rejected for all of the ADR cross-market premiums except for one Asian Level III ADR (*p*-value 0.2836).

Stationarity Test

The Dickey-Fuller test (Dickey and Fuller, 1979) of a unit root present in the data cannot be rejected at conventional levels. The DF test results strongly indicate the ADR cross-market premiums in this study are I(1). The results are found in appendix J and include the *t*-statistic of the DF test for each ADR cross-market premium in the study with its corresponding *p*-value. The null hypothesis of a unity root cannot be rejected for any of the ADR cross-market premiums in the study.

Linear Model

To formally examine the extent of financial integration between the ADR and UND time series, AR models for each of the time series in the sample of Asian, European, and Latin American ADR cross-market premiums are estimated. The lag selection is based on the Akaike information criterion (AIC) (Akaike, 1974). The parameter of the autoregressive factor β_1 is used to calculate the half-life of the AR models, estimated as $\ln(0.5)/\ln(1+\beta_1)$. This measure provides a characterization of the convergence of the ADR cross-market premium to its long-run equilibrium in a linear framework (Yeyati et al. 2008). The individual results for each ADR cross-market premium, including the AR coefficients and the half-lives estimates, are reported in appendix C.

Table 5 reports the average half-lives for Level II and Level III ADRs for Asia, Europe, and Latin America. The overall average half-life for all ADRs in the sample is 2.6 days. The results indicate that on average Level III ADRs converge approximately one day earlier than

Level II ADRs. The faster convergence of Level III ADRs could be explained by the higher quality of the financial statements these firms must produce when they register with the SEC. Level II ADRs must register with the SEC and must partially reconcile all financial statements to U.S. GAAP while Level III ADRs must fully reconcile their financial statements to U.S. GAAP principles. Additionally, Level III ADRs can raise new capital in subsequent offerings, therefore Level III ADRs and U.S. companies are treated the same. It is possible that any mispricing between Level III ADRs and their underlying shares dissipates quicker because there is less asymmetric information between investors in the U.S. and investors in the home countries.

Across regions, on average, the cross-market premiums of Asian and European ADRs converge approximately one day quicker than the cross-market premiums of Latin American ADRs, independently of the Level classification. This result indicates that despite a greater degree of contemporaneous trading[9] for Latin American ADRs over Asian and European ADRs, the Asian and European market exhibit a greater degree of financial integration with the American markets. For some Level II Latin American ADRs, the half-lives are as high as 23 days.

Self-Extracting Threshold Autoregressive (SETAR) Models

To account for the threshold nonlinearity induced by transaction costs and to calculate the size of the band of no arbitrage, SETAR[10] models for each ADR cross-market premium in the sample are estimated. SETAR models assume the band of no arbitrage is determined by lagged

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[9] Contemporaneous trading refers to observations corresponding to dates in which trading takes place in both markets (the domestic market and New York).

[10] The estimation of the SETAR models was performed in GAUSS. The GAUSS programs were written by Philip Hans Franses and Dick van Dijk and can be downloaded from http://people.few.eur.nl/djvandijk/nltsmef/nltsmef.htm.

Table 5
ADR Daily Cross-Market Premium AR Estimates and Half-Lives.

	Asia	Europe	Latin America	Average all regions
Level II ADR	2.9	2.2	3.8	3.0
Level III ADR	1.8	2.5	2.6	2.3
Average levels II and III	2.4	2.4	3.2	-

Notes: This table reports the per-country average half-life based on AR and TAR models and TAR thresholds. The country estimates correspond to the simple average of the AR half-lives. Half-lives are equal to ln(0.5)/ ln(1 + β). Estimates for each ADR are in appendix C. Results are based on daily values of the ADR cross-market premium from 1/1/1990 to 12/31/2008.

values of the ADR cross-market premium, i.e. the regime is determined by the value of the cross-market premium relative to a threshold value, which it is denoted as *c*. In addition to lagged values of the cross-market premium, a measure of volatility is considered as a candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last *j* days, that is,

$$\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}| \tag{10}$$

Following Franses and can Dijk (2000) $\upsilon_{t-1,j}$ with $j = 1,\ldots, 4$ are considered possible threshold variables[11]. The advantage of using $\upsilon_{t-1,j}$ as candidate for threshold variable is that it is possible to obtain a SETAR model with a smaller AIC. Lagged values of the cross-market premiums PR_{t-d} are considered for $d = 1,\ldots, 4$. The selection of the threshold variable and the lag are chosen by the minimization of AIC criterion, only SETAR models in which the AR orders in the two regimes are equal, and not larger than $p = 5$ are considered.

Table 6 reports SETAR estimations of the average size of the band of no arbitrage for the cross-market premiums. The complete estimation for each ADR cross-market premium in the study is found in appendix D. The tables in appendix D report the chosen threshold variable

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[11] Note that this measure of volatility uses lagged values of the ADR cross-market premium; hence the model is still considered a SETAR.

(lagged values of either PR_{t-i} or υ_{t-j}), the estimated size of the threshold, i.e. the band of no arbitrage, and the estimated AR coefficients for each regime, Regime 1 being inside the band and Regime 2 being outside the band of no arbitrage.

The band size, on average, is greater for Level III ADRs than Level II ADRs, suggesting that the mispricing between an ADR and its underlying shares has to be larger for the former to realize arbitrage profits. When comparing the three regions, Asia, Europe, and Latin America, the results show that the band size is on average largest in Latin American. These results indicate that the transaction costs in Latin American are higher than in the other two regions. The result is consistent with less developed equity markets which tend to operate with less competition and historically have had greater controls on capital flows (Yeyati et al., 2008; Arouri et al., 2010). The results also show that the cross-market premium remains inside the band approximately 70 percent of the time and 30 percent outside the band, in other words, the opportunities for arbitrage profits, after transaction costs, occur on average only 30 percent of the time.

It is important to recall that SETAR models model an instantaneous reversion to the band of no arbitrage because they implicitly assume all investors possess all the information available at the same time and face equal transaction costs. In the next section the possibility of a smooth transition back to the band is analyzed.

Table 6
ADR Daily ADR Cross-Market Premium SETAR Estimates

	Asia	Europe	Latin America	Average All Regions
Level II ADR				
C	5.26	5.95	9.73	6.98
In	70.7	66.4	68.9	68.7
Out	29.3	33.6	31.1	31.3
Level III ADR				
C	9.14	6.83	10.79	8.92
In	67.2	67.3	74.1	69.5
Out	33.8	32.3	25.9	30.7

Note: c is the size of the band of no arbitrage expressed as a percentage. The rows In and Out report the percentage of observations laying inside and outside the band of no arbitrage. Results are based on daily values of the ADR cross-market premium from 1/1/1990 to 12/31/2008.The SETAR models are corrected for heteroskedasticity. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$. The complete estimation for each ADR cross-market premium is found in appendix C.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Smooth Threshold Autoregressive (STAR) Nonlinearity

Before the analysis of the ADR cross-market premium under STAR nonlinearity to consider the possibility of a smooth rather than abrupt transition to the band, the null hypothesis of linearity against STAR nonlinearity is evaluated. Failing to reject the null hypothesis would indicate that the cross-market premium is better modeled with a SETAR model.

Since failing to account for heteroskedasticity in the ADR cross-market premium may lead to spurious rejection of the null hypothesis of linearity (Franses and van Dijk, 2000), the Lagrange Multiplier (LM) test is corrected for heteroskedastic errors. Table 7 contains the LM test against STAR nonlinearity based on an AR(2) model. The individual LM tests for all ADR cross-market premiums are in appendix B. Table 7 contains only the average LM test values and the average p-values. The average p-values for Level II ADRs from Asia, Europe, and Latin

America are 0.16, 0.13, and 0.04, respectively. The results indicate that on average, the null hypothesis of linearity can only be rejected for Level II ADRs from Latin America at standard significant levels. However, removing two ADRs from Asia and two from Europe with unusual high p-values yields average p-values significant at the 0.1 level for these two regions.

For the case of Level III ADRs, the null hypothesis of linearity can be rejected for Asia, Europe, and Latin America at the 0.1 level (the average p-values for the three regions are significant at the 0.1 level). Furthermore, 65 percent of all Level II ADRs and 86 percent of all Level III ADRs in the sample are significant at the 0.01 level. These results clearly indicate that the null hypothesis of linearity can be strongly rejected in favor of the alternative STAR nonlinearity hypothesis, and indicate that the ADR cross-market premium is more appropriately modeled with nonlinear models that incorporate a smooth reversion to the threshold or band of no arbitrage. Koumkwa and Susmel (2007) found a similar result for a sample of 21 Mexican ADRs, in their study the average half-life of a misprice between the ADR and their underlying shares is reduced by more than 50 percent when compared to a linear arbitrage model.

Table 7
LM Test for STAR Nonlinearity for Daily ADR Cross-Market Premiums

	Average LM test	Average p-value
Level II		
Asia	32.14	0.16
Europe	48.68	0.13
Latin America	45.27	0.04
Level III		
Asia	35.41	0.06
Europe	35.00	0.10
Latin America	35.74	0.10

Notes: The LM test allows for heteroskedastic errors and is based on an AR(2) model. 65 percent of all Level II ADRs and 86 percent of all Level III ADRs in the sample are significant at the 0.01 level. The individual LM tests for all ADR cross-market premiums are in appendix A. Results are based on daily values of the ADR cross-market premium from 1/1/1990 to 12/31/2008.

Smooth Threshold Autoregressive (STAR) Model

In the previous section the null hypothesis of linearity against the alternative STAR nonlinearity is strongly rejected. This section estimates the size of the no arbitrage band under the assumption that investors do not represent a homogenous sample, i.e. they do not possess all the information available at the same time and their transaction costs are not equal. Given the strong rejection of linearity in the previous section, it is not adequate to assume that institutional and retail investors have the same transaction costs when conducting a trade (Tse, 2001). On economic grounds, STAR[12] models seem to be more appropriate than SETAR.

In the STAR models reported in the study, the parameter c represents the threshold between the two regimes corresponding to $G(s_t;\gamma,c)=0$ and $G(s_t;\gamma,c)=1$. The results are reported in Table 8. In terms of the size of the band, c, the STAR results are similar to the SETAR estimates. When comparing the three regions (Asia, Europe, and Latin America) the results show that the band size seems to be larger in Latin American with the exception of Level III Asian ADRs where the size of the band of no arbitrage is unusually high. This implies that transaction costs are, on average, higher in Latin America possibly because the equity markets of Argentina, Colombia, Chile, and Venezuela remain small and illiquid with very thin trading volume (Arouri et al., 2010). The large band of no arbitrage in Level III Asian ADRs is explained by three Chinese ADRs with high volatility (as measured by the standard deviation) and an unusually high ratio of underlying shares to ADR shares (100:1). Removing these three Chinese ADRs from the average leaves Asia as the region with the largest band of no arbitrage.

The parameter γ in the transition function $G(s_t;\gamma,c)$ in equation (6) determines the speed of the transition from one regime to the other. The average transition smooth parameter for all

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[12] The estimation of the STAR models was performed in GAUSS. The GAUSS programs were written by Philip Hans Franses and Dick van Dijk and can be downloaded from http://people.few.eur.nl/djvandijk/nltsmef/nltsmef.htm.

cross-market premiums in the sample is 2.88 which is indicative of a smooth transition rather than an abrupt one (Franses and van Dijk, 2000). As γ becomes very large, the change of $G(s_t;\gamma,c)$ from 0 to 1 becomes almost instantaneous at $PR_{t-1} = c$, however in simulations run by Franses and van Dijk (2000) this occurs as γ approaches 10. The average speed of transition between the arbitrage regime and the no arbitrage regime in this study (γ = 2.88) provides support for the assumption that investors are a heterogeneous group who act differently when there is a mispricing between an ADR and its underlying shares. Large institutional investors will act first because they possess better information and their transaction cost is relatively small. Small retail investors will act only when the mispricing is large enough to cover their larger transaction costs. Investors getting easier access to new information would prefer to immediately react to and exploit the information acquired as rapid as possible to maximize their trading profits.

Table 8
ADR Daily Cross-Market Premium STAR Estimates

	Asia	Europe	Latin America	Average All Regions
Level II ADR				
c	9.08	9.30	14.98	11.12
γ	2.53	5.72	3.57	3.94
Level III ADR				
c	18.09	9.36	10.87	12.77
γ	2.91	1.16	1.41	1.83
Average Levels II and III				
c	13.59	9.33	12.93	-
γ	2.72	3.44	2.49	-

Note: c is the size of the band of no arbitrage expressed as a percentage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. Results are based on daily values of the ADR cross-market premium from 1/1/1990 to 12/31/2008. The complete estimation for each ADR cross-market premium is found in appendix D. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d};\gamma,c) + \varepsilon_t$

Table 8 also shows that Level II ADR cross-market premiums have a speed of transition between regimes double that of Level III ADR cross-market premiums. European Level II ADR cross-market premiums have the fastest transition to the band of no arbitrage of the group while European Level III ADR cross-market premiums have the smoothest transition. At the firm level (see individual ADR cross-market premium results in appendix E), most of the ADRs in the study exhibit a smooth transition between regimes, for example BE Semiconductor Industries NV, an electronics firm in the Netherlands, the transition parameter $(\boldsymbol{\gamma})$ equals 0.39. Some of the ADRs exhibit an instantaneous transition between regimes like Embotelladora Andina S.A. “A”, it has a transition parameter $(\boldsymbol{\gamma})$ equal to 499.

Johansen Cointegration Test

As stated previously, the ADR and UND time series are tested for cointegration using the Johansen cointegration test (Johansen, 1991). Under the Johansen procedure, the null hypothesis of zero cointegration vectors is tested against the alternative of at least one cointegration vector. Table 9 shows the average eigenvalues and *p*-values for the Asian, European, and Latin American ADRs. The individual tests for each ADR in the sample can be found in appendix G. The results indicate the null hypothesis can be rejected in 86 percent of all ADR cross-market premiums in the sample. On average, the null hypothesis of no cointegration vectors can be rejected at the .05 level for all the ADRs in the sample, however removing the pairs of ADRs and UNDs for which the null hypothesis cannot be rejected at the 0.1 level produces an average *p*-value of 0.005.

Table 9
Johansen Cointegration Test.

	Eigenvalues	p-values
Level II ADR		
Asia	0.0792	0.0630
Europe	0.0642	0.0449
Latin America	0.0536	0.0485
Level III ADR		
Asia	0.0517	0.0492
Europe	0.0612	0.0280
Latin America	0.0665	0.0424

Notes: Null hypothesis: No cointegration vectors. The eigenvalues and p-values in the table represent the averages for all the ADR cross-market premiums in the study.

Smooth Threshold Error Correction Models (STECM)

The results in the previous section point to a strong rejection of the null hypothesis of no cointegration. The cointegration between the ADR and UND time series indicates that the ADR cross-market premium should be analyzed in an error correction framework in addition to the nonlinear and smooth transition frameworks studied in previous sections of this chapter. Table 10 reports the estimates for the STECM[13]. The size of the band is not comparable with the estimates from the SETAR and STAR models because the transition variable in the STECM is not lagged values of the ADR cross-market premium. In the STECM, the error correction term between the ADR and UND time series is the transition variable.

In terms of the speed of transition (γ in equations 6 and 9) to the long-run equilibrium, i.e. the reversion to the band of no arbitrage, the results from the STECM indicate that the transition is faster than the STAR models suggest. Overall, the speed of adjustment estimated with the STECM is 2 times faster than the speed of adjustment estimated with the STAR models. Also, while the STAR models indicate that the speed of adjustment among the three regions considered

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[13] The STECM is estimated in JMulTi. The software runs built-in GAUSS programs in a more interactive environment.

in this study is slowest in Latin America, the STECM points to a faster reversion to the band in Latin American ADRs. Two possible explanations to these divergent results between STAR models and STECMs are nonsynchornous trading (Yeyati et al., 2008) and stock market liberalization (Arouri et al., 2010).

While it is true that European and Asian equity markets are generally considered more advanced and more integrated with the American markets, the increase of cross-border investments, capital exports, and foreign investor participations in Latin America in response to extensive economic and financial reforms, including stock market liberalization, have considerably increased the integration between these two regions (Arouri et al., 2010). Thus, Latin American equity markets receive today much more important afflux of information and liquidity (Kim and Singal 2000) and have become more integrated with the American markets (Bekaert and Harvey 1995; Carrieri et al. 2007). This pattern has induced rapid changes in their financial infrastructure and has affected directly the stock price adjustment dynamics (Arouri et al., 2010). And because there is a greater degree of contemporaneous trading between Latin American and American equity markets, investors in Latin American equities are getting easier access to new information and immediately react to and exploit the information acquired as rapid as possible to maximize their arbitrage profits.

Therefore, the STAR methodology is not able to capture the faster reversion of Latin American ADRs to the band of not arbitrage because STAR models do not take into account the cointegration between ADRs and their underlying shares. This is an important result for investors in the U.S. seeking to diversify their portfolios with international equities. Methodologies which exclude the cointegration between ADRs and their underlying shares underestimate the speed of adjustment to equilibrium in the Latin American ADR market. To complete the analysis of these models in the ADR market, in the next section the forecasting performance of SETAR models, STAR models, and STECMs is analyzed and compare to an AR linear model, which is used as the benchmark for the purpose of comparisons.

Table 10
ADR Daily Cross-Market Premium STECM Estimates

	Asia	Europe	Latin America	Average All Regions
Level II ADR				
C	-0.77	0.55	-0.07	-0.10
γ	5.91	7.73	7.55	7.06
Level III ADR				
C	-0.42	0.06	-0.51	-0.29
γ	4.40	4.19	5.66	4.75
Average Levels II and III				
C	-0.59	0.30	-0.29	-
γ	5.15	5.96	6.61	-

Note: c is the size of the band of no arbitrage expressed as a percentage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. Results are based on daily values of the ADR cross-market premium from 1/1/1990 to 12/31/2008. The complete estimation for each ADR cross-market premium is found in appendix F. The STECM model is estimated as

$$\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$$

The individual ADR cross-market premium STECM estimates used to calculate the averages reported in Table 10 above are located in appendix F. In appendix F the autoregressive coefficients, the coefficients of the error correction terms, the transition parameter ($\boldsymbol{\gamma}$), the size of the threshold variable, and the chosen model, LSTAR or ESTAR, are reported for each ADR.

Forecasting Performance of the Models

The fact that an econometrics model describes the dynamic behavior of a time series within the estimation sample better than others is no guarantee that this model also renders better out-of-sample forecast. This is more relevant with nonlinear models because it is frequently found that, even though a nonlinear time series model describes the characteristics of the time series better than a linear model, the forecasting performance of the linear model is no worse than that of the nonlinear model (Franses and van Dijk, 2000). Franses and van Dijk (2000) point to the fact that the forecasting performance of a nonlinear model may be worse than that of a linear model because the nonlinearity is not present during the forecasting period.

To analyze the forecasting performance of the AR models, SETAR models, STAR models and STECMs employed in this study, the models are estimated using only the first 8 years of data (1/1/1990 – 12/31/2008). The last 22 months (1/1/2009 – 10/29/2010) are used to evaluate the out-of-sample forecasting performance of the models. The out-of-sample mean squared prediction error (MSPE) for each ADR cross-market premium in the ADR database is used to evaluate the forecasting performance of the nonlinear models. The MSPE is calculated as follows:

$$MSPE = E[\sum_{i=1}^{n}(PR_i - \overline{PR})^2] \tag{10}$$

where $\overline{PR}$ is the average ADR cross-market premium over the period 1/1/1990 – 12/31/2008 and PR_i is the daily ADR cross-market premium over the out-of-sample period.

Table 11 reports the average MSPEs for all the ADR cross-market premiums and models used in the study. The individual MSPEs and forecast evaluations for each ADR cross-market premium is found in appendix H.

Table 11
ADR Cross-Market Premium Out-of-Sample Mean Squared Prediction Error

Panel A: Level II ADRs			
Methodology	Asia	Europe	Latin America
AR	0.000124	0.009961	0.000150
SETAR	0.000303	0.008707	0.200585
LSTAR	0.000833	0.033334	0.005513
STECM	0.000304	0.002232	0.000322
Panel B: Level III ADRs			
Methodology	Asia	Europe	Latin America
AR	0.002718	0.006295	0.000113
SETAR	0.019230	0.007869	0.033790
LSTAR	0.057185	0.017434	0.003908
STECM	0.001381	0.000590	0.000088

Note: The out-of-sample forecasting period is 1/1/2009 – 10/29/2010. $MSPE = E[\sum_{i=1}^{n}(PR_i - \overline{PR})^2]$.

The MSPEs in table 11 are used in table 12 to evaluate the forecasting performance of the nonlinear models in the study during the period 1/1/2009 – 10/29/2010. The entries in table 12 are the average ratios of the MSPE for forecasts of the SETAR, STAR, and STECM models. The ratios are calculated by dividing the MSPE of these models by the MSPE of an AR(2) linear model. The AR(2) model is used as the benchmark model to evaluate the performance of the nonlinear models. A ratio less than one indicates the model produces a better forecast than the linear AR(2) model. The complete list of ratios for all ADRs in the study is located in appendix H.

The ratios in table 12 show that the STECM forecasts outperform all the SETAR and STAR forecasts and in four instances (Level II Asia, Level II Europe, Level III Europe, and Level III Latin America) the STECM model outperforms the forecasting performance of the linear AR model. The worst forecasting performance is for SETAR models in Latin America. The poor performance of SETAR models is explained by the failure of this methodology to incorporate the smooth reversion to the band of no arbitrage and the cointegration between an ADR and its underlying shares.

Table 12

Out-of-Sample ADR Cross-Market Premium Forecast Evaluation

Panel A: Level II ADR

Methodology	Asia	Europe	Latin America
SETAR/AR	2.42	0.87	1334.29
LSTAR/AR	3.73	3.34	36.67
STECM/AR	0.42	0.22	2.14

Panel B: Level III ADR

Methodology	Asia	Europe	Latin America
SETAR/AR	2.86	1.25	299.73
LSTAR/AR	7.17	2.77	34.67
STECM/AR	1.48	0.09	0.78

Notes: The entries in the table 9 are the average ratio of the MSPE for forecasts of the SETAR, STAR, and STECM models. The ratios are calculated by dividing the MSPE of these models by the MSPE of an AR(2) linear model. A ratio less than one indicates the model produces a better forecast than the linear AR(2) model.

The out-of-sample forecast evaluation period is 1/1/2009 – 10/29/2010.

The average MSPEs in table 12 do not show the extent to which STECMs outperform the other methodologies (SETAR and STAR models). Table 13 reports the percentage of times the nonlinear models used in the study outperform the forecasting performance of the linear model based on the MSEP criterion. The percentages are calculated by dividing the number of ADRs for which the SETAR and STAR models and the STECMs outperform the AR model forecast by the total number of ADRs in each level and region. The STECM outperforms the linear model minimum 60 percent of the time (Level II Latin American ADRs) and maximum 100 percent of the time (Level II Asian ADRs). The SETAR and STAR model do not come close to the STECM forecasting performance.

Table 13
Out-of-Sample ADR Cross-Market Premium Forecast Evaluation

Panel A: Level II ADR			
Methodology	Asia	Europe	Latin America
SETAR	36.00%	48.57%	36.36%
STAR	8.00%	21.88%	40.00%
STECM	100.00%	73.68%	60.00%
Panel B: Level III ADR			
Methodology	Asia	Europe	Latin America
SETAR	35.29%	23.81%	36.36%
STAR	8.00%	12.50%	7.14%
STECM	68.97%	78.95%	78.95%

Notes: The entries represent the percentage of MSPE ratios smaller than one for each region and ADR level.
The out-of-sample forecast evaluation period is 1/1/2009 – 10/29/2010.

Summary of Forecasting Performance

The results indicate that the ADR cross-market premium should be modeled in a nonlinear, smooth transition, error correction framework. The STECM allows for these three dynamic properties of the cross-market premium time series to be modeled concurrently. Previous studies have looked at these properties independently, however the forecast evaluation of the STECM against the linear AR model and the SETAR and STAR nonlinear models shows that it is possible to produce a more accurate forecast, as determined by the MSPE, when the nonlinear, smooth transition, and cointegration properties present in the time series are incorporated into the same econometrics model.

CHAPTER VII

CONCLUSIONS

According to the LOOP, if markets are efficient, the prices of DRs and their underlying share should be the same, as any deviation in their prices will be arbitraged away. If there is a discrepancy in the prices of the DRs and their underlying shares, arbitrageurs will purchase the security where the price is cheaper and sell it where the price is higher to earn an arbitrage profit. Arbitrage profits will persist until the prices converge in the two markets. In prior studies, the LOOP has been tested using the cross-market premium of dually listed equity shares. If the premium is short-lived, i.e. a mispricing between an ADR and its underlying shares quickly dissipates due the actions of arbitrageurs, then the LOOP holds and the ADR market is efficiently priced. However, if the premium does not quickly dissipate, it is a violation of the LOOP indicating that the ADR market and the home market are not fully integrated.

Prior studies have arrived at diametrical conclusions. Early studies, using linear econometric models, found that the LOOP holds in the ADR market while more recent studies, using nonlinear models, found violations of the LOOP in the ADR market making it possible to exploit arbitrage opportunities for a profit. This study extends the literature by considering the possibility of cointegration between ADRs and their underlying shares. Additionally, it is the first study to use a STECM to concurrently model the following three dynamic properties about ADRs:

1. The adjustment to long-run equilibrium is not linear due to the presence of transaction costs. The reversion to the long-run equilibrium, due to the transaction costs, is a reversion to a band of no arbitrage rather than a reversion to the mean.
2. The reversion to the band of no action is not abrupt or instantaneous. The universe of equity investors does not represent a homogeneous group with identical transaction costs and access to information. They are rather a heterogeneous group with asymmetrical information and different transaction costs.
3. The ADR prices and their underlying shares prices are cointegrated. Failing to account for the cointegration between the two time series may produced a biased estimation (Jung and Doroodian, 1994; Nanang, 2000)

It is found that when these three properties are modeled simultaneously with a STECM, the ADR market is more integrated than a STAR[14] model suggests and deviations from the LOOP are short-lived. The average half-life of a deviation from the LOOP during the period of study is 2.6 days and the STECM results indicate that while the reversion to the band of no arbitrage is smooth, it is twice as fast as the STAR model indicates. While recent studies have found there are consistent deviations from the LOOP (Dabora, 1999; Hong and Susmel, 2003; Gagnon and Karolyi, 2004; De Jong et al., 2005; Yeyati et al., 2008), in this study it is found that deviations are short-lived. It is possible that the recent deregulation of financial markets, liberalization of foreign capital flows, lower transaction costs, and the more frequent use of ADRs by companies seeking access to foreign capital markets, have contributed to a reduction of arbitrage opportunities and deviations from the LOOP.

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[14] The STAR models only incorporate two of these characteristics: the nonlinearity in the data and the smooth reversion to the band of no action.

On average, the cross-market premium deviates from the band of no arbitrage only in 30 percent of all the observations in the period of study, indicating that arbitrage opportunities are few and difficult to take advantage of them. The implication of this result for a small retail investor is that while there are arbitrage opportunities in the ADR market, they are not accessible to them because they do not have access to instantaneous information and their transaction costs are high. For large institutional investors with the platform to conduct low cost and rapid trades, the results indicate that the ADR market can be profitable. The average annual cross-market premium during the 20 year period analyzed in the study is 16 percent with some cross-market premiums as high as 40 percent.

The STECM results also indicate that the degree of integration, based on the speed of transition back to the band of no arbitrage, is greater in the Latin American ADR market. The STAR model results yielded the opposite result. In the STAR model Latin America has the slowest reversion to the band of no arbitrage. This results suggests that the cointegration between and ADR and its underlying shares is important in the econometric modeling of these time series and failing to take into account the possibility of cointegration may result in the opposite results.

The study also showed that the cointegration between and ADR and its underlying shares is important to produce more accurate forecasts. The results show that the out-of-sample forecasting performance of the STECM is superior to that of the AR, SETAR, and STAR models. On average, in 76.76 percent of all the ADR cross-market premiums in the study, the STECM forecast was superior to the benchmark linear AR model. For the Level II Asian ADRs the percentage is 100. These results give support to the observation of Nanang (2000) in regards to the importance of modeling two assets simultaneously when they are cointegrated to avoid the possibility of a biased estimation.

The financial crisis of 2007 – 2009 had a considerable impact on the volatility of the ADR cross-market premium. The cross-market premium exhibits a considerable rise in volatility around its 200-day moving average. The 200-day moving standard deviation rises in all cases during the financial crisis and recedes soon after. The cross-market premium exhibits higher volatility during other periods but only during the 2007-2009 crisis, the volatility of the premium is higher for all the indices in the study. When the cross-market premium index is divided into pre-, during-, and post-crisis periods, the descriptive statistics show that the standard deviation is higher during the crisis. It is not apparent however that the financial crisis represents a structural change in the ADR cross-market premium. In all the indices the 200-day moving standard deviation returns to pre-crisis levels in the post-crisis period.

For investors seeking to diversify their portfolios with international securities, the results of this study indicate that the ADR market is efficiently priced with rare and short-lived arbitrage opportunities. Contrary to prior studies which have found deviations from the LOOP, in this study it is found these deviations are short-lived and difficult to exploit.

Future research

Linear models assume the mean of the ADR cross-market premium has the same dynamic time series properties inside and outside the band of no arbitrage. The regime-switching models for returns used in this study allow the mean to have different properties inside and outside the band of no arbitrage. These models however assume the volatility of the time series is equal inside and outside the band. Future research will look at regime-switching models for volatility to consider the possibility that the volatility is different inside and outside the band of no arbitrage.

Another venue for future research involves analyzing the direction of the flow of information. Alaganar and Bhar (2001) found for a sample of Australian ADRs that the information flow is from the underlying stocks to their corresponding ADRs but at the aggregate level the flow of information is reversed. Future research will look at the flow of information under a nonlinear framework.

Lastly, the STECM methodology could be applied to other markets where the transaction costs produce bands of no arbitrage, and these markets exhibit cointegration with other markets.

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APPENDICES

APPENDIX A

APPENDIX A

LISTING AND DESCRIPTIVE STATISTICS OF AMERICAN DEPOSITARY RECEIPTS

Descriptive Statistics Level II Asian ADRs

ADR	Country	Ratio ORD:DR	Exchange	Industry	Cross-market Premium Avg.	Std. Dev.	Skew.	Kurt.
ADVANTEST CORPORATION	Japan	1:1	NYSE	Misc Manufacturing/	-0.0021	0.02	0.05	6.07
CANON INC	Japan	1:1	NYSE	Electronics/Semiconductor	-0.0013	0.01	0.10	6.85
HONDA MOTOR	Japan	1:1	NYSE	Transportation Services	-0.0008	0.01	-0.03	5.86
INTERNET INITIATIVE JAPAN INC	Japan	1:400	NASDAQ	Software/Services	0.0065	0.02	-0.06	4.09
KB FINANCIAL GROUP INC	S.K.	1:1	NYSE	Financial Services	-0.0031	0.02	0.71	13.35
KONAMI CORPORATION	Japan	1:1	NYSE	Software/Services	-0.0043	0.01	0.10	4.72
KT CORPORATION	S.K.	1:2	NYSE	Telecommunications	-0.0356	0.05	-1.12	1.66
KUBOTA CORPORATION	Japan	5:1	NYSE	Capital Goods/Machinery	-0.0054	0.02	-1.24	6.83
MAHANAGAR TELEPHONE NIGAM LTD.	India	2:1	NYSE	Telecommunications	-0.0343	0.07	-1.73	2.15
MAKITA CORPORATION	Japan	1:1	NASDAQ	Capital Goods/Machinery	0.1814	0.20	0.16	-1.95
MITSUBISHI UFJ FINANCIAL GROUP, INC.	Japan	1:1	NYSE	Investment/Holding	0.0438	0.68	-0.30	-1.08
MITSUI & CO. LTD	Japan	20:1	NASDAQ	Misc Manufacturing/	-0.0007	0.02	0.47	12.88
MIZUHO FINANCIAL GROUP, INC.	Japan	2:1	NYSE	Financial Services	0.0000	0.02	0.01	4.39
NIDEC CORPORATION	Japan	1:4	NYSE	Electronics/Semiconductor	-0.0024	0.02	0.47	4.93
NIPPON TELEGRAPH & TELEPHONE CORP.	Japan	1:2	NYSE	Telecommunications	-0.0031	0.02	-0.13	3.72
NOMURA HOLDINGS	Japan	1:1	NYSE	Financial Services	0.0011	0.02	6.60	68.15
NTT DOCOMO INC	Japan	1:100	NYSE	Telecommunications	0.0030	0.05	9.76	113.49
ORIX CORPORATION	Japan	1:2	NYSE	Financial Services	-0.0023	0.02	0.04	7.20
PANASONIC CORP	Japan	1:1	NYSE	Electronics/Semiconductor	-0.0019	0.01	0.18	4.32
PARTNER COMMUNICATIONS CO.	Israel	1:1	NASDAQ	Telecommunications	0.0028	0.02	1.30	23.46
SHINHAN FINANCIAL GROUP CO. LTD.	S.K.	2:1	NYSE	Financial Services	-0.0422	0.03	0.33	0.84

SONY CORPORATION.	Japan	1:1	NYSE	Electronics/Semiconductor	-0.0012	0.02	0.26	8.59
SUMITOMO MITSUI FINANCIAL GROUP INC	Japan	1:5	NYSE	Financial Services	0.0013	0.04	-1.22	17.84
TATA COMMUNICATIONS LTD.	India	2:1	NYSE	Telecommunications	-0.0043	0.05	-4.46	37.08
TATA MOTORS LTD.	India	1:1	NYSE	Automotive	-0.0827	0.13	-2.43	5.24
WACOAL HOLDINGS CORP.	Japan	5:1	NASDAQ	Apparel/Textile	0.0033	0.02	-0.14	6.69
WOORI FINANCE	S.K.	3:1	NYSE	Financial Services	-0.0019	0.02	0.44	10.21

Descriptive Statistics Level III Asian ADRs

ADR	Country	Ratio ORD:DR	Exchange	Industry	Cross-market Premium			
					Avg.	Std. Dev.	Skew.	Kurt.
ADVANCED SEMICONDUCTOR ENGINEERING	Taiwan	5:1	NYSE	Electronics/Semiconductor	-0.0230	0.04	-0.86	1.48
ALON HOLDINGS BLUE SQUARE ISRAEL LTD	Israel	1:1	NYSE	Retail	0.0024	0.02	1.89	21.10
AU OPTRONICS CORP	Taiwan	10:1	NYSE	Electronics/Semiconductor	-0.0035	0.04	-0.69	8.47
CHINA EASTERN AIRLINES CORPORATION LT	H.K.	50:1	NYSE	Publishing/Information	0.6889	0.12	-0.53	-0.82
CHINA LIFE INSURANCE CO	China	15:1	NYSE	Financial Services	0.0682	0.21	0.23	-1.23
CHINA MOBILE LIMITED	H.K.	5:1	NYSE	Telecommunications	-0.0007	0.02	-0.47	11.91
CHINA PETROLEUM & CHEMICAL CORP	China	100:1	NYSE	Oil/Gas	0.4032	0.17	-0.27	-0.86
CHINA SOUTHERN AIRLINES COMPANY LTD.	China	50:1	NYSE	Transportation Services	0.4300	0.20	-0.22	-1.23
CHINA UNICOM (HONG KONG) LTD	H.K.	10:1	NYSE	Telecommunications	0.0001	0.02	-0.60	6.66
CHUNGHWA TELECOM	Taiwan	10:1	NYSE	Telecommunications	-0.0592	0.07	0.09	-1.00
CITY TELECOM (HK) LTD.	H.K.	20:1	NASDAQ	Telecommunications	0.0125	0.05	-2.48	30.09
CNOOC LTD.	H.K.	100:1	NYSE	Utilities	-0.0007	0.02	-0.05	6.77
DR. REDDY`S LABORATORIES LTD.	India	1:1	NYSE	Pharmaceuticals/Biotech	-0.0126	0.04	-2.73	12.81
HDFC BANK LTD.	India	3:1	NYSE	Financial Services	-0.0943	0.08	-0.64	0.30
HITACHI	Japan	10:1	NYSE	Capital Goods/Machinery	-0.0019	0.01	-0.59	5.69
ICICI BANK LTD.	India	2:1	NYSE	Financial Services	-0.0875	0.12	-2.00	5.62
INDOSAT TBK	Indonesia	50:1	NYSE	Telecommunications	0.0022	0.03	-2.67	25.76
INFOSYS TECHNOLOGIES LTD.	India	1:1	NASDAQ	Software/Services	-0.3535	0.32	-1.04	1.55
KOREA ELECTRIC POWER	S.K.	1:2	NYSE	Utilities	-0.1219	0.15	-2.71	14.05
KYOCERA CORPORATION	Japan	1:1	NYSE	Electronics/Semiconductor	-0.0012	0.01	-0.55	10.39
LG DISPLAY CO LTD.	S.K.	1:2	NYSE	Electronics/Semiconductor	0.0018	0.02	0.13	5.12
PATNI COMPUTER SYSTEMS	India	2:1	NYSE	Software/Services	-0.0498	0.07	-1.01	0.84
SATYAM COMPUTER SERVICES LTD.	India	2:1	NYSE	Software/Services	-0.2029	0.25	-18.8	542.43
SILICONWARE PRECISION INDUSTRIES CO	Taiwan	5:1	NASDAQ	Electronics/Semiconductor	-0.0434	0.04	-0.26	0.57
SINOPEC SHANGHAI PETROCHEMICAL CO	China	100:1	NYSE	Chemicals	0.5033	0.31	-1.50	1.81
SK TELECOM	S.K.	1:9	NYSE	Telecommunications	-0.2013	0.36	-1.75	1.70
STERLITE INDUSTRIES LTD	India	4:1	NYSE	Metals/Mining	-2.8772	1.41	0.00	-0.85
TAIWAN SEMICONDUCTOR M.	Taiwan	5:1	NYSE	Electronics/Semiconductor	-3.5785	1.69	-0.69	-0.70
TDK CORPORATION	Japan	1:1	NYSE	Telecommunications	-0.0016	0.01	0.54	9.41
TELEKOMUNIKASI	Indonesia	40:1	NYSE	Investment/Holding	0.0003	0.03	-1.57	13.47
TEVA- PHARMACEUTICAL INDUSTRIES LTD.	Israel	1:1	NASDAQ	Pharmaceuticals/Biotech	0.0054	0.05	6.41	46.35
TOYOTA MOTOR CORPORATION	Japan	2:1	NYSE	Automotive	-0.0002	0.01	0.18	13.06

UNITED MICRO ELECTRONICS	Taiwan	5:1	NYSE	Electronics/Semiconductor	-0.1243	0.21	-1.44	1.31
WEBZEN CO	S.K.	3:10	NASDAQ	Software/Services	0.0223	0.05	1.62	6.39
WIPRO LTD.	India	1:1	NYSE	Software/Services	-0.2300	0.17	-0.33	-0.89
YANZHOU COAL MINING COMPANY LIMITED	H.K.	10:1	NYSE	Utilities	0.4489	0.26	-0.22	-1.18

Descriptive Statistics Level II European ADRs

					Cross-market Premium			
ADR	Country	Ratio ORD:DR	Exchange	Industry	Avg.	Std. Dev.	Skew.	Kurt.
ABB LTD.	Switzerland	1:1	NYSE	Electronics/Semiconductor	-0.1451	0.14	-0.97	-0.76
ACERGY S.A.	Norway	1:1	NASDAQ	Oil/Gas	0.0811	0.10	0.86	-0.33
AIXTRON AG	Germany	1:1	NASDAQ	Electronics/Semiconductor	0.0074	0.02	-0.83	8.81
ALCATEL LUCENT	France	1:1	NYSE	Telecommunications	0.0000	0.01	-0.56	9.41
ALLIANZ SE	Germany	1:10	NYSE	Financial Services	-0.0323	0.06	-1.21	0.09
ALLIED IRISH BANKS PLC	Ireland	2:1	NYSE	Investment/Holding	-0.0095	0.04	-10.2	292.53
ASTRAZENECA PLC	UK	1:1	NYSE	Pharmaceuticals/Biotech	-0.0048	0.01	-0.78	7.12
AVIVA PLC	UK	1:2	NYSE	Financial Services	-0.0117	0.01	-1.63	7.96
BANK OF IRELAND	Ireland	4:1	NYSE	Financial Services	-0.5672	0.11	1.93	54.99
BHP BILLITON PLC	UK	2:1	NYSE	Oil/Gas	0.1307	0.23	1.23	-0.30
BP PLC	UK	6:1	NYSE	Oil/Gas	-0.0032	0.01	0.32	11.11
BRITISH AMERICAN TOBACCO	UK	2:1	AMEX	Tobacco	-0.0071	0.01	-1.09	5.84
CARNIVAL PLC	UK	1:1	NYSE	Transportation Services	-0.0053	0.02	-12.1	289.53
CREDIT SUISSE GROUP	Switzerland	1:1	NYSE	Financial Services	-0.0642	0.06	-1.48	24.53
CRH PLC	Ireland	1:1	NYSE	Building/Building Prods	-0.1685	0.08	0.49	-0.70
DELHAIZE FRERES & CIE	Belgium	1:1	NYSE	Retail	0.0021	0.01	-0.08	10.28
DIAGEO PLC	UK	4:1	NYSE	Beverages	-0.3381	0.54	-1.06	-0.68
FRESENIUS MEDICAL CARE AG & CO.KGAA	Germany	1:1	NYSE	Financial Services	0.0005	0.01	0.49	7.73
FRESENIUS MEDICAL CARE AG & CO.KGAA	Germany	1:1	NYSE	Financial Services	0.3487	0.11	-0.85	0.70
GLAXOSMITHKLINE PLC	UK	2:1	NYSE	Pharmaceuticals/Biotech	-0.0021	0.01	-0.32	3.16
HSBC HOLDINGS PLC	UK	5:1	NYSE	Investment/Holding	-0.1256	0.05	1.48	1.55
INTERCONTINENTAL HOTELS GROUP	UK	1:1	NYSE	Leisure/Lodging/Gaming	-0.1894	0.19	-0.30	-1.54
LLOYDS BANKING GROUP PLC	UK	4:1	NYSE	Financial Services	-0.8756	0.29	2.34	4.39
NATIONAL BANK OF GREECE	Greece	1:1	NYSE	Financial Services	-0.1701	0.36	-0.37	-0.60
NATIONAL GRID PLC	UK	5:1	NYSE	Utilities	-0.1424	0.07	-1.69	2.08
NOVARTIS AG	Switzerland	1:1	NYSE	Pharmaceuticals/Biotech	-0.0022	0.01	-1.44	7.04
PEARSON PLC	UK	1:1	NYSE	Publishing/Information	-0.0464	0.05	-0.60	-1.45
PRUDENTIAL PLC	UK	2:1	NYSE	Financial Services	-0.0299	0.02	0.06	1.64
RANDGOLD RESOURCES	UK	1:1	NASDAQ	Metals/Mining	-0.0018	0.02	-1.25	7.16
REED ELSEVIER NV	Netherlands	2:1	NYSE	Publishing/Information	0.0010	0.01	-0.21	5.62
REED ELSEVIER PLC	UK	4:1	NYSE	Publishing/Information	-0.0056	0.01	0.02	1.59
RIO TINTO PLC	UK	1:1	NYSE	Metals/Mining	-0.2076	0.06	2.92	7.90

ROYAL DUTCH SHELL PLC	Netherlands	2:1	NYSE	Oil/Gas	-0.0055	0.01	-0.72	4.22
ROYAL DUTCH SHELL PLC	Netherlands	2:1	NYSE	Oil/Gas	-0.0004	0.01	-0.13	11.69
SANOFI-AVENTIS	France	1:2	NYSE	Healthcare	-0.0007	0.01	-0.81	24.30
SAP AG	Germany	1:1	NYSE	Computer Software	-0.0403	0.08	-2.06	3.38
SHIRE PLC.	UK	3:1	NASDAQ	Pharmaceuticals/Biotech	-0.0048	0.02	-0.59	10.69
SIEMENS AG	Germany	1:1	NYSE	Consumer/Household	-0.0005	0.01	-1.43	20.03
SMITH & NEPHEW PLC	UK	5:1	NYSE	Healthcare	-0.0174	0.05	-3.36	9.97
TELEFONAKTIEBOLAGET LM ERICSSON	Sweden	1:1	NASDAQ	Telecommunications	-0.0049	0.02	-0.61	8.18
TORM A/S	Denmark	1:1	NASDAQ	Transportation Services	-0.0031	0.04	-1.16	12.41
UNILEVER PLC	UK	1:1	NYSE	Consumer/Household	-0.0086	0.01	-0.55	1.73
VEOLIA ENVIRONNEMENT	France	1:1	NYSE	Utilities	-0.0145	0.02	-0.01	3.73
VODAFONE GROUP PLC	UK	10:1	NASDAQ	Telecommunications	-0.1179	0.06	1.28	0.02

Descriptive Statistics Level III European ADRs

					Cross-market Premium			
ADR	Country	Ratio ORD:DR	Exchange	Industry	Avg.	Std. Dev.	Skew.	Kurt.
ARM HOLDINGS	UK	3:1	NASDAQ	Misc Manufacturing	-0.0051	0.02	-0.75	8.47
BANCO BILBAO VIZCAYA ARGENTARIA.	Spain	1:1	NYSE	Financial Services	-0.0403	0.01	-0.99	9.79
BARCLAYS PLC	UK	4:1	NYSE	Financial Services	-0.0323	0.02	-1.43	33.94
BE SEMICONDUCTOR INDUSTRIES NV	Netherlands	1:1	NASDAQ	Electronics/Semiconductor	0.0068	0.04	-1.59	24.26
BRITISH SKY BROADCASTING GROUP PLC	UK	4:1	NYSE	Media/Broadcasting	-0.0035	0.01	-0.33	7.77
BT GROUP	UK	10:1	NYSE	Business Services	-0.0412	0.04	0.14	-1.15
COMPAGNIE GENERALE DE GEOPHYSIGUE	France	1:1	NYSE	Oil/Gas	-0.0766	0.08	-0.81	0.09
CRUCELL NV	Netherlands	1:1	NASDAQ	Pharmaceuticals/Biotech	-0.0009	0.03	-0.37	15.62
DATALEX PLC	Ireland	2:1	NASDAQ	Business Services	0.0559	0.35	-3.20	17.18
ELAN CORPORATION PLC	Ireland	1:1	NYSE	Pharmaceuticals/Biotech	-0.0027	0.05	-1.61	15.31
FRANCE TELECOM SA	France	1:1	NYSE	Telecommunications	-0.0702	0.08	-0.35	-1.69
HELLENIC TELECOMMUNICATIONS	Greece	1:2	NYSE	Telecommunications	0.0001	0.02	-1.78	26.75
ICON PLC	Ireland	1:1	NASDAQ	Business Services	0.0006	0.07	-0.55	6.01
ING GROEP NV CVA	Netherlands	1:1	NYSE	Financial Services	-0.2859	0.07	3.45	10.97
KONINKLIJKE PHILIPS ELECTRONICS NV	Netherlands	1:1	NYSE	Electronics/Semiconductor	-0.0213	0.03	-0.40	1.35
LUXOTTICA GROUP.	Italy	1:1	NYSE	Luxury Goods	0.0010	0.01	-5.13	102.75
MAGYAR TELEKOM TELECOMMUNICATIONS	Hungary	5:1	NYSE	Telecommunications	0.0000	0.02	-0.79	12.09
MECHEL OAO	Russia	1:1	NYSE	Metals/Mining	-0.0675	0.10	-0.53	-0.40
MOBILE TELESYSTEMS	Russia	2:1	NYSE	Telecommunications	-0.1747	0.16	-0.44	-0.74
NATIONAL BANK OF GREECE	Greece	1:5	NYSE	Financial Services	-0.3248	0.08	0.58	0.71
NOKIA CORP	Finland	1:1	NYSE	Telecommunications	-0.0001	0.02	0.18	11.01
NOVO NORDISK	Denmark	1:1	NYSE	Pharmaceuticals/Biotech	-0.0429	0.04	0.05	-1.74
PORTUGAL TELECOM, S.G.P.S., S.A.	Portugal	1:1	NYSE	Telecommunications	-0.0345	0.02	0.39	1.22
REPSOL YPF	Spain	1:1	NYSE	Oil/Gas	0.0005	0.01	-1.23	20.72
ROYAL BANK OF SCOTLAND GROUP PLC	UK	20:1	NYSE	Financial Services	-0.0496	0.11	-9.54	172.00
RYANAIR HOLDINGS PLC	Ireland	5:1	NASDAQ	Transportation Services	-0.1223	0.10	-0.25	-0.08
STATOIL ASA	Norway	1:1	NYSE	Oil/Gas	0.0003	0.01	0.23	9.54
SYNGENTA AG	Switzerland	1:5	NYSE	Food/Agriculture	-0.0409	0.04	0.01	-1.46
TECHNICOLOR	France	1:1	NYSE	Telecommunications	-0.2337	0.05	2.69	14.68
TELECOM ITALIA	Italy	10:1	NYSE	Telecommunications	0.2179	0.06	-0.04	-0.54
TELEFONICA	Spain	3:1	NYSE	Telecommunications	-0.0153	0.02	-0.41	2.32

TOTAL S.A.	France	1:1	NYSE	Oil/Gas	0.0027	0.01	-0.34	7.01
TURKCELL ILETISIM HIZMETLERI A.S.	Turkey	5:2	NYSE	Telecommunications	-0.0971	0.26	-2.63	5.38
WIMM BILL DANN FOODS OJSC	Russia	1:4	NYSE	Food/Agriculture	-0.4933	0.34	-0.40	-0.90

Descriptive Statistics Level II Latin American ADRs

					Cross-market Premium			
ADR	Country	Ratio ORD:DR	Exchange	Industry	Avg.	Std. Dev.	Skew.	Kurt.
ALTO PALERMO S.A.	Argentina	40:1	NASDAQ	Property/Real Estate	-0.0409	0.18	-2.17	8.31
BANCO BRADESCO S.A.	Brazil	1:1	NYSE	Financial Services	-0.0535	0.07	-1.46	1.50
BRASIL TELECOM S.A.	Brazil	3:1	NYSE	Investment/Holding	0.0001	0.01	-0.20	6.37
BRASKEM S.A.	Brazil	2:1	NYSE	Oil/Gas	-0.0018	0.02	-1.65	21.00
BRF - BRASIL FOODS S.A.	Brazil	1:1	NYSE	Food/Agriculture	-0.0872	0.29	-2.12	4.62
CEMEX S.A.B. DE C.V.	Mexico	10:1	NYSE	Building/Building Prods	-4.0295	2.55	-0.96	-0.46
CRESUD	Argentina	10:1	NASDAQ	Food/Agriculture	0.2447	0.31	0.47	-1.75
ECOPETROL SA	Colombia	20:1	NYSE	Oil/Gas	-0.0058	0.02	-1.89	13.86
EMBOTELLADORA ANDINA S.A. "B"	Chile	6:1	NYSE	Food/Agriculture	-0.0021	0.02	0.27	4.46
EMBOTELLADORA ANDINA S.A. "A"	Chile	6:1	NYSE	Food/Agriculture	-2.3996	1.66	0.67	-0.78
GERDAU S.A.	Brazil	1:1	NYSE	Investment/Holding	-0.0018	0.02	-0.73	21.37
GRUMA S.A.B.DE C.V.	Mexico	4:1	NYSE	Food/Agriculture	-0.0065	0.08	-45.5	2386.17
GRUPO FINANCIERO GALICIA	Argentina	10:1	NASDAQ	Financial Services	-0.0110	0.05	2.76	19.57
IRSA	Argentina	10:1	NYSE	Property/Real Estate	0.0236	0.03	1.55	9.09
TELE NORTE LESTE PARTICIPACOES S.A.	Brazil	1:1	NYSE	Utilities	-0.0054	0.02	-1.46	23.62
VALE S.A.	Brazil	1:1	NYSE	Utilities	0.0224	0.11	4.17	15.85

Descriptive Statistics Level II Latin American ADRs

					Cross-market Premium			
ADR	Country	Ratio ORD:DR	Exchange	Industry	Avg.	Std. Dev.	Skew.	Kurt.
BANCO MACRO S.A.	Argentina	10:1	NYSE	Financial Services	0.0082	0.03	1.53	6.61
BBVA BANCO FRANCES ORDINARIAS SA	Argentina	3:1	NYSE	Financial Services	0.0614	0.06	0.80	4.76
CIA BRASILEIRA DE DISTR-PAO DE ACUCAR	Brazil	1:1	NYSE	Retail	-0.0007	0.02	-0.85	16.86
COCA-COLA FEMSA S.A.B. DE C.V.	Mexico	10:1	NYSE	Beverages	0.0022	0.02	0.13	8.40
CPFL ENERGIA S.A	Brazil	3:1	NYSE	Utilities	-0.0045	0.01	-0.03	5.27
EMBRAER-EMPRESA BRAS DE AERONAUTICA	Brazil	4:1	NYSE	Aerospace/Defense	-0.1382	0.15	-0.59	-0.97
ENERSIS S.A.	Chile	50:1	NYSE	Utilities	-0.1160	0.10	0.25	-1.69
FIBRIA CELULOSE S.A.	Brazil	1:1	NYSE	Paper/Forest Prods	-0.0072	0.01	-0.20	3.94
GAFISA S.A.	Brazil	2:1	NYSE	Investment/Holding	-0.0038	0.02	0.06	6.02
GRUPO SIMEC S.A.B. DE C.V.	Mexico	3:1	AMEX	Metals/Mining	-0.0393	0.10	-2.53	31.45
INDUSTRIAS BACHOCO, S.A.B. DE C.V.	Mexico	12:1	NYSE	Capital Goods/Machinery	0.0047	0.03	1.13	8.24
MAXCOM TELECOMUNICACIONES SA DE CV	Mexico	7:1	NYSE	Telecommunications	0.0122	0.02	0.57	4.50
PROVIDA A.F.P.	Chile	15:1	NYSE	Financial Services	-0.0007	0.02	0.58	6.89
RENESOLA	B.V.I.	2:1	NYSE	Electronics/Semiconductor	0.0011	0.04	-0.07	4.40
SOCIEDAD QUIMICA Y MINERA DE CHILE S.A.	Chile	1:1	NYSE	Chemicals	-0.0032	0.02	-1.39	12.29
TAM S.A.	Brazil	1:1	NYSE	Transportation Services	0.0393	0.24	0.21	-0.83
TELECOM ARGENTINA S.A.	Argentina	5:1	NYSE	Telecommunications	0.0081	0.03	4.07	26.93
ULTRAPAR PARTICIPACOES S.A.	Brazil	1:1	NYSE	Chemicals	0.0016	0.02	-1.51	32.83
VALE S.A.	Brazil	1:1	NYSE	Utilities	-0.0021	0.01	0.07	22.48
YPF	Argentina	1:1	NYSE	Oil/Gas	0.0070	0.04	3.25	19.14

APPENDIX B

APPENDIX B

LM TEST FOR STAR NONLINEARITY

LM test for STAR nonlinearity for daily ADR cross-market premiums.
The LM test allows for heteroskedastic errors and is based on an AR(2) model. Panel A shows the results of the test for Level II ADR cross-market premiums from Asia, Europe, and Latin America. Panel B shows the results of the test for Level III ADR cross-market premiums from Asia, Europe, and Latin America.

Panel A: Level II ADRs

ADR	LM test	p-value	ADR	LM test	p-value	ADR	LM test	p-value
A2_1	13.61	0.16	E2_1	43.70	0.08	LA2_1	29.92	0.00
A2_2	14.73	1.16	E2_2	88.91	0.00	LA2_2	41.10	0.00
A2_3	11.32	0.53	E2_3	12.20	0.16	LA2_3	23.34	0.00
A2_4	14.02	0.02	E2_4	9.65	0.78	LA2_4	22.00	0.00
A2_5	26.42	0.00	E2_5	60.39	0.00	LA2_5	68.75	0.00
A2_6	12.1	0.09	E2_6	125.30	0.00	LA2_6	9.11	0.26
A2_7	14.28	0.08	E2_7	28.17	0.00	LA2_7	133.34	0.00
A2_8	23.75	0.00	E2_9	43.70	0.00	LA2_9	6.10	0.17
A2_9	29.62	0.00	E2_10	65.79	0.00	LA2_10	31.42	0.00
A2_10	173.04	0.00	E2_11	88.91	0.00	LA2_11	20.36	0.03
A2_11	6.37	0.75	E2_12	12.20	0.14	LA2_12	12.36	0.15
A2_12	16.63	0.04	E2_13	9.65	0.75	LA2_13	55.63	0.00
A2_13	35.61	0.00	E2_14	25.13	0.00	LA2_14	27.05	0.00
A2_14	33.2	0.00	E2_15	109.60	0.00	LA2_15	182.34	0.00
A2_15	14.66	0.24	E2_16	28.46	0.00	LA2_16	16.28	0.00
A2_16	62.52	0.00	E2_17	44.01	0.00	Average	45.27	0.04
A2_17	72.71	0.00	E2_18	88.91	0.00			
A2_18	17.38	0.05	E2_19	12.37	0.07			
A2_19	15.74	0.05	E2_20	9.65	0.75			
A2_20	7.73	0.69	E2_21	58.19	0.00			
A2_21	31.2	0.00	E2_22	109.60	0.00			
A2_22	8.66	0.51	E2_23	28.17	0.00			
A2_23	69.98	0.00	E2_25	23.36	0.00			
A2_24	45.79	0.00	E2_26	88.91	0.00			
A2_25	25.72	0.01	E2_27	12.20	0.07			
A2_26	50.4	0.00	E2_28	9.65	0.75			
A2_27	21.4	0.00	E2_29	25.13	0.00			
A2_28	31.34	0.00	E2_30	109.60	0.00			
Average	32.14	0.16	E2_31	28.17	0.00			

E2_32	50.37	0.00
E2_33	88.91	0.00
E2_34	12.20	0.15
E2_35	9.65	0.74
E2_36	60.39	0.00
E2_37	109.60	0.00
E2_38	28.17	0.00
E2_39	36.41	0.00
E2_40	88.91	0.00
E2_41	12.20	0.15
E2_42	7.82	0.69
E2_43	30.54	0.00
E2_44	109.60	0.00
Average	48.68	0.13

Panel B: Level III ADRs

ADR	LM test	p-value	ADR	LM test	p-value	ADR	LM test	p-value
A3_1	89.34	0.00	E3_1	32.61	0.00	LA3_1	43.41	0.00
A3_2	9.67	0.25	E3_2	9.02	0.53	LA3_2	55.24	0.00
A3_3	62.68	0.00	E3_3	11.34	0.24	LA3_3	21.12	0.00
A3_4	15.57	0.14	E3_4	14.79	0.03	LA3_4	47.64	0.00
A3_5	16.53	0.00	E3_5	43.47	0.00	LA3_5	6.30	0.64
A3_6	13.66	0.13	E3_6	94.59	0.00	LA3_6	49.42	0.00
A3_7	9.64	0.19	E3_7	20.04	0.01	LA3_7	95.09	0.00
A3_8	11.67	0.27	E3_8	18.16	0.00	LA3_8	19.06	0.00
A3_9	17.23	0.00	E3_9	26.60	0.00	LA3_9	26.77	0.00
A3_10	22.51	0.01	E3_10	57.38	0.00	LA3_10	20.43	0.00
A3_11	25.57	0.00	E3_11	99.74	0.00	LA3_11	37.86	0.00
A3_12	28.01	0.00	E3_12	15.31	0.07	LA3_12	18.22	0.00
A3_13	46.41	0.00	E3_13	54.69	0.00	LA3_13	7.60	0.72
A3_14	35.99	0.00	E3_14	12.99	0.20	LA3_14	61.14	0.00
A3_15	40.86	0.00	E3_15	111.56	0.00	LA3_15	4.12	0.67
A3_16	46.59	0.00	E3_16	14.26	0.39	LA3_16	62.13	0.00
A3_17	18.70	0.00	E3_17	13.28	0.33	LA3_17	11.75	0.01
A3_18	42.00	0.00	E3_19	46.08	0.00	LA3_18	62.07	0.00
A3_19	33.68	0.00	E3_20	13.49	0.07	LA3_19	27.62	0.00
A3_20	12.80	0.10	E3_21	17.53	0.01	LA3_20	14.87	0.07
A3_21	20.60	0.01	E3_22	10.43	0.23	LA3_21	58.78	0.00
A3_22	26.43	0.00	E3_23	32.61	0.00	Average	35.74	0.10
A3_23	21.68	0.00	Average	35.00	0.10			
A3_24	53.82	0.00						
A3_25	13.00	0.05						
A3_26	69.91	0.00						
A3_27	7.10	0.45						
A3_28	8.41	0.21						
A3_29	22.13	0.01						
A3_30	25.73	0.00						
A3_31	283.71	0.00						
A3_32	14.04	0.29						
A3_33	30.17	0.00						
A3_34	37.52	0.00						
A3_35	27.15	0.00						
A3_36	14.10	0.15						
Average	35.41	0.06						

APPENDIX C

APPENDIX C

ADR CROSS-MARKET PREMIUM AR ESTIMATES AND HALF-LIVES

Panel A: Level II Asian ADRs

c	β1	β2	Half-life	c	β1	β2	Half-life
A2_1	0.219846	0.209996	3.5	A2_11	0.982112	0.007938	1.0
	(0.0225)	(0.0224)			(0.0142)	(0.0142)	
A2_2	0.206091	0.215869	3.7	A2_12	0.380426	0.215825	2.2
	(0.0139)	(0.0139)			(0.0139)	(0.0139)	
A2_3	0.197285	0.178982	3.8	A2_13	0.18968	0.334606	4.0
	(0.0140)	(0.0140)			(0.0400)	(0.0400)	
A2_4	0.219693	0.17389	3.5	A2_14	0.247315	0.155381	3.1
	(0.0348)	(0.0348)			(0.0227)	(0.0228)	
A2_5	0.299939	0.165324	2.6	A2_15	0.283057	0.198324	2.8
	(0.0224)	(0.0222)			(0.0161)	(0.0161)	
A2_6	0.123024	0.142341	6.0	A2_16	0.546369	0.347942	1.6
	(0.0246)	(0.0242)			(0.0155)	(0.0155)	
A2_7	0.64708	0.273745	1.4	A2_17	0.793228	0.117333	1.2
	(0.0192)	(0.0192)			(0.0197)	(0.0197)	
A2_8	0.449552	0.19696	1.9	A2_18	0.287814	0.200413	2.7
	(0.0139)	(0.0139)			(0.0189)	(0.0190)	
A2_9	0.666891	0.299442	1.4	A2_19	0.201842	0.145867	3.8
	(0.0179)	(0.0179)			(0.0141)	(0.0141)	
A2_10	0.633123	0.364782	1.4	A2_20	0.134319	0.099429	5.5
	(0.0137)	(0.0137)			(0.0225)	(0.0225)	
				Average half-life			2.9

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = $\ln(0.5)/\ln(1+\beta_1)$

Panel B: Level III Asian ADRs

C	β1	β2	Half-life	C	β1	β2	Half-life
A3_1	0.5253793	0.2344736	1.6	A3_19	0.8319822	0.1472346	1.1
	(0.0210)	(0.0210)			(0.0163)	(0.0163)	
A3_2	0.3342891	0.1044748	2.4	A3_20	0.2217431	0.1749188	3.5
	(0.0216)	(0.0219)			(0.0140)	(0.0140)	
A3_3	0.5390361	0.2986895	1.6	A3_21	0.2373865	0.1186896	3.3
	(0.0230)	(0.0230)			(0.0293)	(0.0293)	
A3_4	0.9304430	0.0638829	1.1	A3_22	0.7196283	0.2084130	1.3
	(0.0185)	(0.0185)			(0.0347)	(0.0347)	
A3_5	0.6788033	0.2986266	1.3	A3_23	0.7542962	0.2176508	1.2
	(0.0421)	(0.0421)			(0.0219)	(0.0219)	
A3_6	0.2333283	0.1945188	3.3	A3_24	0.4815113	0.2608378	1.8
	(0.0181)	(0.0174)			(0.0208)	(0.0207)	
A3_7	0.8503404	0.1431294	1.1	A3_25	0.9368366	0.0564728	1.0
	(0.0226)	(0.0225)			(0.0159)	(0.0159)	
A3_8	0.8459625	0.1481404	1.1	A3_26	0.8190873	0.1734905	1.2
	(0.0263)	(0.0263)			(0.0172)	(0.0172)	
A3_9	0.2075443	0.1997843	3.7	A3_27	0.8205346	0.1265489	1.2
	(0.0208)	(0.0208)			(0.0497)	(0.0496)	
A3_10	0.6755790	0.2576343	1.3	A3_28	0.8842936	0.1128885	1.1
	(0.0256)	(0.0256)			(0.0334)	(0.0335)	
A3_11	0.2776138	0.1596461	2.8	A3_29	0.2760428	0.1500509	2.8
	(0.0202)	(0.0202)			(0.0141)	(0.0141)	
A3_12	0.2238252	0.2438049	3.4	A3_30	0.3621709	0.2183561	2.2
	(0.0215)	(0.0215)			(0.0167)	(0.0167)	
A3_13	0.6474103	0.2477031	1.4	A3_31	0.5967826	0.3510957	1.5
	(0.0216)	(0.0216)			(0.0145)	(0.0144)	
A3_14	0.7039663	0.2478475	1.3	A3_32	0.2330734	0.1994018	3.3
	(0.0220)	(0.0220)			(0.0139)	(0.0139)	
A3_15	0.3200173	0.2329874	2.5	A3_33	0.6309071	0.3317571	1.4
	(0.0138)	(0.0138)			(0.0204)	(0.0206)	
A3_16	0.8155849	0.1451901	1.2	A3_34	0.5037822	0.3041009	1.7
	(0.0207)	(0.0207)			(0.0263)	(0.0265)	
A3_17	0.4018820	0.1512833	2.1	A3_35	0.6838712	0.2908874	1.3
	(0.0162)	(0.0162)			(0.0207)	(0.0208)	
A3_18	0.8218596	0.1621730	1.2	A3_36	0.9134413	0.0831542	1.1
	(0.0195)	(0.0195)			(0.0191)	(0.0191)	1.1
				Average half-life			1.8

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = ln(0.5)/ ln(1 + β_1)

Panel C: Level II European ADRs

ADR	β_1	β_2	Half-life	ADR	β_1	β_2	Half-life
E2_1	0.5527151	0.4327492	1.6	E2_23	0.3935531	0.3811325	2.1
	(0.0201)	(0.0201)			(0.0198)	(0.0198)	
E2_2	0.5962912	0.3702324	1.5	E2_24	0.7528890	0.0375074	1.2
	(0.0177)	(0.0177)			(0.0823)	(0.0821)	
E2_3	0.1941942	0.2314746	3.9	E2_25	0.5680958	0.4209686	1.5
	(0.0309)	(0.0309)			(0.0156)	(0.0156)	
E2_4	0.2191970	0.2146382	3.5	E2_26	0.4349760	0.3847735	1.9
	(0.0148)	(0.0148)			(0.0194)	(0.0194)	
E2_5	0.5540722	0.4272449	1.6	E2_27	0.5471147	0.4362687	1.6
	(0.0196)	(0.0196)			(0.0152)	(0.0152)	
E2_6	0.6017538	0.3331782	1.5	E2_28	0.4278473	0.4339365	1.9
	(0.0137)	(0.0137)			(0.0149)	(0.0149)	
E2_7	0.2966568	0.2574339	2.7	E2_29	0.3106774	0.2195761	2.6
	(0.0152)	(0.0152)			(0.0238)	(0.0237)	
E2_9	0.2829978	0.1835189	2.8	E2_30	0.1570532	0.1717034	4.8
	(0.0174)	(0.0174)			(0.0162)	(0.0162)	
E2_10	0.6794864	0.2378011	1.3	E2_31	0.3118026	0.2101236	2.6
	(0.0179)	(0.0179)			(0.0161)	(0.0161)	
E2_11	0.2888070	0.2564460	2.7	E2_32	0.3849758	0.3332540	2.1
	(0.0137)	(0.0137)			(0.0134)	(0.0133)	
E2_12	0.4093234	0.2405767	2.0	E2_33	0.3535242	0.2604077	2.3
	(0.0187)	(0.0187)			(0.0137)	(0.0137)	
E2_13	0.5644220	0.0768545	1.5	E2_34	0.2119829	0.1764603	3.6
	(0.0216)	(0.0216)			(0.0140)	(0.0140)	
E2_14	0.4646622	0.4678817	1.8	E2_35	0.1788578	0.1911202	4.2
	(0.0140)	(0.0140)			(0.0238)	(0.0238)	
E2_15	0.5858602	0.3728658	1.5	E2_36	0.5913538	0.3895349	1.5
	(0.0132)	(0.0132)			(0.0157)	(0.0157)	
E2_16	0.2702775	0.2019207	2.9	E2_37	0.3193416	0.1470693	2.5
	(0.0219)	(0.0219)			(0.0187)	(0.0186)	
E2_17	0.5552986	0.4411243	1.6	E2_38	0.2586515	0.2808863	3.0
	(0.0132)	(0.0132)			(0.0159)	(0.0159)	
E2_18	0.2703759	0.1852269	2.9	E2_39	0.5674468	0.4166422	1.5
	(0.0174)	(0.0174)			(0.0186)	(0.0186)	
E2_19	0.9018510	0.0796935	1.1	E2_40	0.1936356	0.1929150	3.9
	(0.0177)	(0.0177)			(0.0139)	(0.0139)	
E2_20	0.2574080	0.2099054	3.0	E2_41	0.7036409	0.1970410	1.3
	(0.0139)	(0.0139)			(0.0236)	(0.0235)	
E2_21	0.5565969	0.3385197	1.6	E2_42	0.4048030	0.2936051	2.0
	(0.0156)	(0.0156)			(0.0136)	(0.0136)	

E2_22	0.6464553	0.3514988	1.4	E2_43	0.3629177	0.3138106	2.2
	(0.0242)	(0.0243)			(0.0219)	(0.0219)	
				E2_44	0.4943273	0.4694371	1.7
					(0.0125)	(0.0126)	
				Average half-life			2.2

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = $\ln(0.5)/ \ln(1 + \beta_1)$

Panel D: Level III European ADRs

ADR	β_1	β_2	Half-life	ADR	β_1	β_2	Half-life
E3_1	0.2772949	0.1849492	2.8	E3_12	0.2395182	0.1585046	3.2
	(0.0186)	(0.0186)			(0.0192)	(0.0192)	
E3_2	0.2537150	0.1396806	3.1	E3_13	0.6893491	0.1654147	1.3
	(0.0141)	(0.0141)			(0.0197)	(0.0197)	
E3_3	0.3475040	0.1373055	2.3	E3_14	0.0981533	0.0910951	7.4
	(0.0141)	(0.0141)			(0.0165)	(0.0166)	
E3_4	0.4587843	0.1910026	1.8	E3_15	0.4658164	0.4081327	1.8
	(0.0169)	(0.0169)			(0.0130)	(0.0130)	
E3_5	0.2818298	0.1821707	2.8	E3_16	0.3763700	0.1464920	2.2
	(0.0162)	(0.0162)			(0.0216)	(0.0216)	
E3_6	0.5544809	0.4058295	1.6	E3_17	0.2736480	0.1125822	2.9
	(0.0130)	(0.0130)			(0.0184)	(0.0184)	
E3_7	0.6458074	0.2979525	1.4	E3_19	0.2369273	0.1619654	3.3
	(0.0173)	(0.0173)			(0.0160)	(0.0160)	
E3_8	0.3590627	0.2616073	2.3	E3_20	0.1991088	0.1237580	3.8
	(0.0209)	(0.0209)			(0.0141)	(0.0141)	
E3_9	0.8813143	0.0794016	1.1	E3_21	0.2153512	0.1957614	3.6
	(0.0216)	(0.0216)			(0.0221)	(0.0221)	
E3_10	0.5249515	0.3049181	1.6	E3_22	0.6494475	0.3354713	1.4
	(0.0135)	(0.0135)			(0.0251)	(0.0251)	
E3_11	0.5046044	0.4781879	1.7	E3_23	0.7053334	0.2825953	1.3
	(0.0163)	(0.0163)			(0.0204)	(0.0204)	
				Average half-life			2.5

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = $\ln(0.5)/ \ln(1 + \beta_1)$

Panel E: Level II Latin America ADRs

ADR	β_1	β_2	Half-life	ADR	β_1	β_2	Half-life
LA2_1	0.8852772	0.0644341	1.1	LA2_9	0.4215072	0.1493248	2.0
	(0.0217)	(0.0217)			(0.0179)	(0.0179)	
LA2_2	0.5341026	0.3974703	1.6	LA2_10	0.9427321	0.0529669	1.0
	(0.0167)	(0.0167)			(0.0181)	(0.0180)	
LA2_3	0.2692066	0.1175346	2.9	LA2_11	0.3084782	0.1406639	2.6
	(0.0231)	(0.0231)			(0.0194)	(0.0194)	
LA2_4	0.4484003	0.1324400	1.9	LA2_12	0.0518773	0.0464765	13.7
	(0.0164)	(0.0164)			(0.0194)	(0.0194)	
LA2_5	0.9135051	0.0779851	1.1	LA2_13	0.4717041	0.2522312	1.8
	(0.0216)	(0.0215)			(0.0206)	(0.0206)	
LA2_6	0.9890267	0.0095607	1.0	LA2_14	0.6197789	0.2508694	1.4
	(0.0203)	(0.0203)			(0.0160)	(0.0160)	
LA2_7	0.7662117	0.2320793	1.2	LA2_15	0.3556835	0.1130256	2.3
	(0.0180)	(0.0180)			(0.0193)	(0.0193)	
LA2_8	0.0303899	0.0587393	23.2	LA2_16	0.7049725	0.2849374	1.3
	(0.1174)	(0.1171)			(0.0155)	(0.0155)	
				Average half-life			3.8

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = $\ln(0.5)/\ln(1+\beta_1)$

Panel F: Level III Latin American ADRs

ADR	β_1	β_2	Half-life	ADR	β_1	β_2	Half-life
LA3_1	0.4941989	0.3574767	1.7	LA3_12	0.3452598	0.2143698	2.3
	(0.0348)	(0.0349)			(0.0555)	(0.0555)	
LA3_2	0.6074079	0.3227996	1.5	LA3_13	0.9780505	0.0206047	1.0
	(0.0151)	(0.0151)			(0.0189)	(0.0189)	
LA3_3	0.2600277	0.0965993	3.0	LA3_14	0.5898846	0.1860366	1.5
	(0.0174)	(0.0174)			(0.0162)	(0.0162)	
LA3_4	0.3657166	0.0946193	2.2	LA3_15	0.0484095	0.0777253	14.7
	(0.0158)	(0.0158)			(0.0646)	(0.0646)	
LA3_5	0.2100302	0.1285420	3.6	LA3_16	0.3414355	0.2873341	2.4
	(0.0298)	(0.0298)			(0.0153)	(0.0153)	
LA3_6	0.8856337	0.0993886	1.1	LA3_17	0.7954798	0.1705183	1.2
	(0.0212)	(0.0212)			(0.0365)	(0.0365)	
LA3_7	0.5727785	0.4026955	1.5	LA3_18	0.6469191	0.2246523	1.4
	(0.0145)	(0.0145)			(0.0162)	(0.0162)	
LA3_9	0.2505026	0.1329038	3.1	LA3_19	0.3817747	0.0827196	2.1
	(0.0459)	(0.0460)			(0.0203)	(0.0203)	
LA3_10	0.5742934	0.2732298	1.5	LA3_20	0.2467185	0.1355532	3.1
	(0.0152)	(0.0152)			(0.0236)	(0.0236)	
LA3_11	0.5882913	0.1502362	1.5	LA3_21	0.6801326	0.2156272	1.3
	(0.0182)	(0.0182)			(0.0154)	(0.0154)	
				Average half-life			2.6

Notes. This table reports the cross-market premium half-life based on an AR model.
Half-lives are estimated as following: Half-life = $\ln(0.5)/\ln(1 + \beta_1)$

APPENDIX D

APPENDIX D

ADR CROSS-MARKET PREMIUM SETAR ESTIMATES

SETAR estimates for Level II ADR Asia cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Panel A: Regime 1

	Threshold		Regime 1					
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
A2_1	υ_{t-4}	0.018172	0.004843	0.147348	0.128376	0.081917	0.230900	-
			(0.000529)	(0.034368)	(0.031532)	(0.032823)	(0.033390)	-
A2_2	υ_{t-4}	0.007659	0.004203	0.219876	0.122931	0.096705	0.045642	-
			(0.000362)	(0.035454)	(0.039184)	(0.032914)	(0.030416)	-
A2_3	υ_{t-2}	0.015604	0.005516	0.132737	0.068064	0.083792	0.043251	0.077460
			(0.000340)	(0.023485)	(0.023759)	(0.019354)	(0.018093)	(0.020260)
A2_4	υ_{t-4}	0.026887	0.011623	0.159027	0.132518	-	-	-
			(0.001006)	(0.063228)	(0.054677)	-	-	-
A2_5	υ_{t-4}	0.018180	0.010375	0.068993	0.072328	-	-	-
			(0.000562)	(0.036353)	(0.038089)	-	-	-

A2_6	υ_{t-4}	0.013189	0.008597	0.053341	0.117668	-	-	-
			(0.000549)	(0.041682)	(0.045702)	-	-	-
A2_7	PR_{t-3}	0.013577	0.007963	0.358258	0.185613	-0.325428	-	-
			(0.001078)	(0.082502)	(0.062243)	(0.110291)	-	-
A2_8	υ_{t-4}	0.026689	0.006656	0.330526	0.142660	0.124601	-	-
			(0.000399)	(0.024660)	(0.025262)	(0.022610)	-	-
A2_9	PR_{t-2}	0.017787	0.001305	0.301462	0.720079	0.304879	-	-
			(0.000333)	(0.070983)	(0.126532)	(0.042755)	-	-
A2_10	PR_{t-1}	0.127877	0.006192	0.383665	0.098973	0.131533	-	-
			(0.000581)	(0.036580)	(0.037906)	(0.023959)	-	-
A2_11	PR_{t-4}	0.777627	0.004677	0.937056	0.062737	-0.007098	-	-
			(0.001313)	(0.031454)	(0.039505)	(0.025343)	-	-
A2_12	υ_{t-3}	0.016561	0.004308	0.284514	0.157968	0.145839	-	-
			(0.000262)	(0.025292)	(0.023633)	(0.022428)	-	-
A2_13	υ_{t-4}	0.022362	0.011164	-0.002570	-	-	-	-
			(0.000687)	(0.047326)	-	-	-	-
A2_14	PR_{t-1}	0.018670	0.008341	0.160186	0.057702	-	-	-
			(0.000435)	(0.046316)	(0.025165)	-	-	-
A2_15	υ_{t-4}	0.016153	0.004950	0.179212	0.089226	0.114130	0.069075	0.109378
			(0.000400)	(0.027018)	(0.027524)	(0.026756)	(0.024506)	(0.020040)
A2_16	υ_{t-4}	0.013996	0.001126	0.209510	0.208046	0.238224	0.276025	-
			(0.000139)	(0.026303)	(0.025082)	(0.027328)	(0.030447)	-
A2_17	υ_{t-4}	0.015396	0.004271	0.203355	0.143003	0.167444	-	-
			(0.000804)	(0.043214)	(0.033859)	(0.032713)	-	-
A2_18	υ_{t-3}	0.017071	0.005772	0.136088	0.120114	0.047321	0.096241	-
			(0.000393)	(0.034064)	(0.026662)	(0.026113)	(0.025356)	-
A2_19	υ_{t-4}	0.009613	0.006982	0.072245	0.033118	0.025874	-	-
			(0.000319)	(0.024928)	(0.027498)	(0.025927)	-	-
A2_20	υ_{t-4}	0.006908	0.005236	0.106796	0.557232	0.525838	-	-
			(0.003203)	(0.127095)	(0.378843)	(0.385246)	-	-

A2_22	υ_{t-4}	0.044350	0.074816	-0.065757	-0.324888	-0.255478	-	-
			(0.013171)	(0.140663)	(0.143510)	(0.145995)	-	-
A2_23	υ_{t-4}	0.011945	0.007262	0.172931	-	-	-	-
			(0.000223)	(0.027616)	-	-	-	-
A2_24	PR_{t-1}	0.033181	0.008901	0.306944	0.098883	0.102969	-	-
			(0.000655)	(0.035210)	(0.033525)	(0.035994)	-	-
A2_25	υ_{t-2}	0.043037	0.012011	0.374854	0.158822	-	-	-
			(0.000843)	(0.036505)	(0.033762)	-	-	-
A2_26	υ_{t-4}	0.051304	0.019059	0.377247	0.076733	-	-	-
			(0.001721)	(0.048024)	(0.043628)	-	-	-
A2_27	υ_{t-4}	0.015520	0.006847	0.141953	0.127000	-	-	-
			(0.000491)	(0.040211)	(0.039131)	-	-	-
A2_28	υ_{t-4}	0.021474	0.009183	0.205489	0.061191	-	-	-
			(0.000596)	(0.041585)	(0.040803)	-	-	-

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
A2_1	υ_{t-4}	0.018172	0.010406	0.150473	0.137077	0.063735	0.061968	-
			(0.004582)	(0.065121)	(0.088682)	(0.056124)	(0.071751)	-
A2_2	υ_{t-4}	0.007659	0.004073	0.148960	0.165492	0.104631	0.134052	-
			(0.000825)	(0.028054)	(0.037873)	(0.025255)	(0.030368)	-
A2_3	υ_{t-2}	0.015604	0.002304	0.174024	0.174057	-0.010060	0.082741	0.265053
			(0.002241)	(0.057658)	(0.062973)	(0.048643)	(0.053435)	(0.057041)
A2_4	υ_{t-4}	0.026887	0.023358	0.133466	0.062068	-	-	-
			(0.004780)	(0.087712)	(0.073109)	-	-	-
A2_5	υ_{t-4}	0.018180	0.010371	0.321163	0.130924	-	-	-
			(0.003445)	(0.087616)	(0.068169)	-	-	-
A2_6	υ_{t-4}	0.013189	0.011856	0.074583	0.078786	-	-	-
			(0.001286)	(0.041079)	(0.048964)	-	-	-
A2_7	PR_{t-3}	0.013577	0.004108	0.626668	0.115240	0.187204	-	-
			(0.000966)	(0.036079)	(0.037241)	(0.032649)	-	-
A2_8	υ_{t-4}	0.026689	0.002904	0.500643	0.146599	0.093268	-	-
			(0.002616)	(0.045678)	(0.039287)	(0.036949)	-	-
A2_9	PR_{t-2}	0.017787	-0.000313	0.683148	0.162952	0.136629	-	-
			(0.001010)	(0.034835)	(0.041710)	(0.039227)	-	-
A2_10	PR_{t-1}	0.127877	0.219489	0.238418	0.074428	0.129905	-	-
			(0.025426)	(0.051732)	(0.040898)	(0.038467)	-	-
A2_11	PR_{t-4}	0.777627	0.018864	1.048799	-0.038185	-0.033376	-	-
			(0.014940)	(0.051140)	(0.074167)	(0.055717)	-	-
A2_12	υ_{t-3}	0.016561	-0.000454	0.401203	0.175727	0.184367	-	-
			(0.002267)	(0.052494)	(0.047870)	(0.045970)	-	-
A2_13	υ_{t-4}	0.022362	0.041200	-0.130594	-	-	-	-
			(0.005003)	(0.105763)	-	-	-	-

A2_14	PR_{t-1}	0.018670	0.005971	0.194944	0.322866	-	-	-
			(0.002435)	(0.091204)	(0.103644)	-	-	-
A2_15	υ_{t-4}	0.016153	0.005238	0.253837	0.152937	0.023087	0.075771	0.111969
			(0.001900)	(0.043337)	(0.041723)	(0.034035)	(0.038266)	(0.035480)
A2_16	υ_{t-4}	0.013996	-0.002682	0.568665	0.252225	0.066051	0.062020	-
			(0.001961)	(0.076215)	(0.073156)	(0.053606)	(0.048788)	-
A2_17	υ_{t-4}	0.015396	-0.001348	0.847632	0.079160	-0.002245	-	-
			(0.002748)	(0.067386)	(0.063087)	(0.038716)	-	-
A2_18	υ_{t-3}	0.017071	0.005729	0.233805	0.083589	0.130545	0.174034	-
			(0.002701)	(0.057842)	(0.062832)	(0.059694)	(0.062137)	-
A2_19	υ_{t-4}	0.009613	0.006153	0.196959	0.126479	0.063751	-	-
			(0.000957)	(0.035961)	(0.039047)	(0.034171)	-	-
A2_20	υ_{t-4}	0.006908	0.009394	0.136769	0.089457	0.060341	-	-
			(0.000692)	(0.023361)	(0.031534)	(0.027456)	-	-
A2_22	υ_{t-4}	0.044350	0.036670	0.156414	0.088212	0.088747	-	-
			(0.003480)	(0.045889)	(0.037649)	(0.034227)	-	-
A2_23	υ_{t-4}	0.011945	0.009616	0.295805	-	-	-	-
			(0.000723)	(0.040689)	-	-	-	-
A2_24	PR_{t-1}	0.033181	-0.002560	0.735497	0.090265	0.062611	-	-
			(0.003794)	(0.104743)	(0.073732)	(0.060624)	-	-
A2_25	υ_{t-2}	0.043037	-0.002861	0.707275	0.118049	-	-	-
			(0.008496)	(0.097464)	(0.088513)	-	-	-
A2_26	υ_{t-4}	0.051304	-0.002517	0.591242	0.385864	-	-	-
			(0.005094)	(0.166254)	(0.160958)	-	-	-
A2_27	υ_{t-4}	0.015520	0.014625	0.240783	0.071202	-	-	-
			(0.002594)	(0.079106)	(0.083089)	-	-	-
A2_28	υ_{t-4}	0.021474	0.015399	0.325622	0.145595	-	-	-
			(0.004254)	(0.099908)	(0.084944)	-	-	-

SETAR estimates for Level III ADR Asia cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Panel A:Regime 1

	Threshold		Regime 1					
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
A3_1	υ_{t-4}	0.024822	0.011249	0.159111	0.076554	0.000640	-	-
			(0.001047)	(0.045344)	(0.044770)	(0.045029)	-	-
A3_2	υ_{t-3}	0.020520	0.009797	0.202866	0.062063	-	-	-
			(0.000491)	(0.035190)	(0.031024)	-	-	-
A3_3	υ_{t-2}	0.029208	0.009449	0.149288	0.041945	0.054152	0.119128	0.047601
			(0.000876)	(0.039272)	(0.041702)	(0.030281)	(0.028522)	(0.031697)
A3_4	υ_{t-3}	0.746847	0.004691	0.894566	-0.000252	0.044092	0.054342	-
			(0.003064)	(0.040076)	(0.048675)	(0.045809)	(0.040215)	-
A3_5	υ_{t-3}	0.224996	0.018575	0.524748	0.197325	-	-	-
			(0.004413)	(0.078981)	(0.084725)	-	-	-
A3_6	υ_{t-3}	0.020659	0.006500	0.178848	0.131892	0.051341	0.109757	-
			(0.000478)	(0.033865)	(0.029552)	(0.027163)	(0.024830)	-
A3_7	PR_{t-3}	0.527391	0.004528	0.984586	-	-	-	-
			(0.001503)	(0.004818)	-	-	-	-
A3_8	PR_{t-4}	0.186170	0.014607	0.686852	0.134916	0.050644	-	-
			(0.004530)	(0.068998)	(0.080193)	(0.070379)	-	-

A3_9	υ_{t-4}	0.019748	0.009429	0.150064	0.111445	-	-	-
			(0.000527)	(0.035276)	(0.038011)	-	-	-
A3_10	PR_{t-2}	0.059969	0.012171	0.323844	0.197645	0.244999	-	-
			(0.002826)	(0.066075)	(0.083008)	(0.059174)	-	-
A3_11	υ_{t-4}	0.052529	0.020803	0.310305	0.118604	-	-	-
			(0.001985)	(0.037750)	(0.037169)	-	-	-
A3_12	υ_{t-4}	0.016940	0.008516	0.106229	0.051930	-	-	-
			(0.000406)	(0.028767)	(0.029637)	-	-	-
A3_13	PR_{t-1}	0.032530	0.006363	0.256928	0.106345	0.081764	0.123033	0.051758
			(0.000821)	(0.047805)	(0.038221)	(0.034288)	(0.036818)	(0.030733)
A3_14	PR_{t-1}	0.079109	0.010071	0.462219	0.072861	0.109384	0.111269	-
			(0.001266)	(0.048648)	(0.037800)	(0.044032)	(0.031871)	-
A3_15	υ_{t-2}	0.016383	0.004789	0.140237	0.069360	0.078767	0.112713	0.086109
			(0.000303)	(0.024452)	(0.023196)	(0.021896)	(0.016895)	(0.019355)
A3_16	PR_{t-1}	0.083815	0.011588	0.447108	0.088190	0.105572	0.100258	-
			(0.001353)	(0.043368)	(0.038294)	(0.036408)	(0.032237)	-
A3_17	υ_{t-3}	0.019220	0.008376	0.278813	0.149019	0.151717	-	-
			(0.000662)	(0.033993)	(0.042225)	(0.034814)	-	-
A3_18	PR_{t-2}	0.629404	0.001979	0.705046	0.185934	0.109131	-	-
			(0.001101)	(0.032162)	(0.045375)	(0.036525)	-	-
A3_19	PR_{t-3}	0.241068	0.001450	0.594812	0.208297	0.041261	0.055044	0.091262
			(0.000577)	(0.029830)	(0.040956)	(0.032099)	(0.029243)	(0.027787)
A3_20	υ_{t-4}	0.013385	0.006290	0.151994	0.082813	0.083281	-	-
			(0.000291)	(0.023394)	(0.022402)	(0.021408)	-	-
A3_21	υ_{t-3}	0.021214	0.008668	0.120233	0.120316	0.121287	0.031743	0.046152
			(0.001059)	(0.048670)	(0.045960)	(0.048976)	(0.030657)	(0.025877)
A3_22	PR_{t-1}	0.044131	0.010891	0.465316	0.010301	0.126193	-	-
			(0.001519)	(0.095445)	(0.064924)	(0.042963)	-	-
A3_23	PR_{t-2}	0.248810	0.011600	0.598279	0.160530	0.165874	-	-
			(0.002295)	(0.032715)	(0.037233)	(0.027924)	-	-

A3_24	υ_{t-4}	0.029142	0.012648	0.273039	0.154009	-	-	-
			(0.001365)	(0.061810)	(0.062690)	-	-	-
A3_25	PR_{t-2}	0.553571	0.007387	0.912856	0.065163	-	-	-
			(0.002040)	(0.033884)	(0.032826)	-	-	-
A3_26	υ_{t-4}	0.368767	0.002804	0.507822	0.141414	0.134536	0.012315	0.131711
			(0.000517)	(0.034168)	(0.038761)	(0.037918)	(0.037878)	(0.032843)
A3_27	υ_{t-2}	4.420090	0.156422	1.085058	-0.129237	-	-	-
			(0.054913)	(0.132802)	(0.131455)	-	-	-
A3_28	υ_{t-2}	4.368327	0.013278	0.996507	-	-	-	-
			(0.014094)	(0.006226)	-	-	-	-
A3_29	υ_{t-4}	0.014647	0.006519	0.149021	0.095915	0.079216	-	-
			(0.000305)	(0.022473)	(0.021829)	(0.024171)	-	-
A3_30	υ_{t-3}	0.019336	0.012465	0.127574	0.115497	-	-	-
			(0.000651)	(0.033525)	(0.038454)	-	-	-
A3_31	PR_{t-1}	0.027049	0.008254	0.189942	0.093475	0.102886	-	-
			(0.000424)	(0.033152)	(0.021086)	(0.021315)	-	-
A3_32	υ_{t-4}	0.011687	0.003791	0.140405	0.123601	0.075825	0.080970	0.070999
			(0.000244)	(0.021165)	(0.022750)	(0.023285)	(0.021266)	(0.017243)
A3_33	υ_{t-4}	0.144577	0.003819	0.548729	0.124950	0.123830	0.143197	-
			(0.000835)	(0.032954)	(0.033789)	(0.036881)	(0.034670)	-
A3_34	υ_{t-2}	0.034210	0.011675	0.209292	0.044598	0.101017	0.032969	0.036028
			(0.001215)	(0.053954)	(0.045116)	(0.033365)	(0.031116)	(0.030189)
A3_35	PR_{t-1}	0.067077	0.009312	0.454677	0.169912	0.113329	-	-
			(0.001699)	(0.068028)	(0.066149)	(0.043964)	-	-
A3_36	PR_{t-4}	0.394743	0.002189	0.860199	0.018846	0.116806	-	-
			(0.001331)	(0.032465)	(0.039935)	(0.030559)	-	-

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
A3_1	υ_{t-4}	0.024822	0.021829	0.436445	0.076606	0.092761	-	-
			(0.002796)	(0.040548)	(0.040339)	(0.035372)	-	-
A3_2	υ_{t-3}	0.020520	0.006468	0.400115	0.100929	-	-	-
			(0.004297)	(0.096341)	(0.082039)	-	-	-
A3_3	υ_{t-2}	0.029208	-0.004244	0.544685	0.209807	-0.113195	0.123946	0.220957
			(0.002762)	(0.060851)	(0.065775)	(0.065244)	(0.074057)	(0.061026)
A3_4	υ_{t-3}	0.746847	0.016974	1.021103	-0.043589	0.113132	-0.112347	-
			(0.006869)	(0.057545)	(0.056585)	(0.055588)	(0.042048)	-
A3_5	υ_{t-3}	0.224996	0.039129	0.661151	0.222828	-	-	-
			(0.012610)	(0.072792)	(0.059669)	-	-	-
A3_6	υ_{t-3}	0.020659	0.014350	0.151612	0.121126	0.021078	0.008813	-
			(0.003043)	(0.058464)	(0.047656)	(0.044354)	(0.045830)	-
A3_7	PR_{t-3}	0.527391	0.019425	0.966945	-	-	-	-
			(0.007217)	(0.011547)	-	-	-	-
A3_8	PR_{t-4}	0.186170	0.002988	0.856536	0.010166	0.126800	-	-
			(0.001933)	(0.031628)	(0.042627)	(0.030985)	-	-
A3_9	υ_{t-4}	0.019748	0.013848	0.152309	0.161007	-	-	-
			(0.003021)	(0.078575)	(0.060856)	-	-	-
A3_10	PR_{t-2}	0.059969	0.005856	0.759281	-0.008573	0.191161	-	-
			(0.001727)	(0.045611)	(0.051106)	(0.045079)	-	-
A3_11	υ_{t-4}	0.052529	0.043889	0.173147	0.072972	-	-	-
			(0.006252)	(0.072892)	(0.051109)	-	-	-
A3_12	υ_{t-4}	0.016940	0.013551	0.146414	0.209575	-	-	-
			(0.002669)	(0.066235)	(0.091315)	-	-	-
A3_13	PR_{t-1}	0.032530	-0.004618	0.730349	0.130411	0.066716	-0.051524	0.100556
			(0.002358)	(0.062015)	(0.065391)	(0.072878)	(0.078530)	(0.062968)

A3_14	PR_{t-1}	0.079109	0.002539	0.655776	0.104195	0.074225	0.139590	-
			(0.002751)	(0.057720)	(0.064651)	(0.050404)	(0.035972)	-
A3_15	υ_{t-2}	0.016383	-0.000420	0.272718	0.169308	0.011446	0.146889	0.274131
			(0.001410)	(0.049547)	(0.046934)	(0.056056)	(0.060302)	(0.044884)
A3_16	PR_{t-1}	0.083815	-0.000081	0.843286	-0.019456	0.008098	0.152454	-
			(0.002560)	(0.067696)	(0.082367)	(0.051186)	(0.042899)	-
A3_17	υ_{t-3}	0.019220	0.007271	0.413722	0.111776	0.081052	-	-
			(0.002584)	(0.067124)	(0.043933)	(0.039965)	-	-
A3_18	PR_{t-2}	0.629404	0.025008	0.857542	-0.042756	0.149346	-	-
			(0.020076)	(0.089131)	(0.080025)	(0.081688)	-	-
A3_19	PR_{t-3}	0.241068	0.011152	0.918235	-0.024777	-0.089956	0.104295	0.059444
			(0.011600)	(0.081355)	(0.089661)	(0.095541)	(0.079821)	(0.055558)
A3_20	υ_{t-4}	0.013385	0.007461	0.178910	0.133164	0.102941	-	-
			(0.001881)	(0.051431)	(0.053466)	(0.042373)	-	-
A3_21	υ_{t-3}	0.021214	0.002591	0.232975	0.040335	0.010823	0.069336	0.418870
			(0.003275)	(0.059265)	(0.065774)	(0.071475)	(0.089562)	(0.085171)
A3_22	PR_{t-1}	0.044131	0.000787	0.675001	0.109399	0.180961	-	-
			(0.003567)	(0.076471)	(0.101107)	(0.070870)	-	-
A3_23	PR_{t-2}	0.248810	0.008228	0.862437	-0.075739	0.187487	-	-
			(0.007340)	(0.057730)	(0.062302)	(0.052490)	-	-
A3_24	υ_{t-4}	0.029142	0.027970	0.399425	0.160841	-	-	-
			(0.002638)	(0.037424)	(0.030494)	-	-	-
A3_25	PR_{t-2}	0.553571	0.008360	0.991857	-0.004319	-	-	-
			(0.004671)	(0.085169)	(0.083297)	-	-	-
A3_26	υ_{t-4}	0.368767	0.036094	0.807548	-0.015116	0.103039	-0.081353	0.143772
			(0.014250)	(0.053574)	(0.064648)	(0.064701)	(0.065386)	(0.057295)
A3_27	υ_{t-2}	4.420090	1.420509	0.470705	0.223117	-	-	-
			(0.865287)	(0.169646)	(0.220102)	-	-	-
A3_28	υ_{t-2}	4.368327	0.404851	0.925403	-	-	-	-
			(0.173484)	(0.034247)	-	-	-	-

A3_29	υ_{t-4}	0.014647	0.007064	0.295862	0.099646	0.050109	-	-
			(0.001750)	(0.059801)	(0.048049)	(0.038869)	-	-
A3_30	υ_{t-3}	0.019336	0.009091	0.380695	0.208586	-	-	-
			(0.002277)	(0.046758)	(0.052111)	-	-	-
A3_31	PR_{t-1}	0.027049	-0.014110	0.746829	0.157986	0.105593	-	-
			(0.002376)	(0.098369)	(0.075211)	(0.058305)	-	-
A3_32	υ_{t-4}	0.011687	0.002615	0.201005	0.150737	0.019888	0.088446	0.199901
			(0.001934)	(0.062779)	(0.058622)	(0.041303)	(0.052591)	(0.059333)
A3_33	υ_{t-4}	0.144577	0.001052	0.481803	0.134346	0.293862	0.080704	-
			(0.007844)	(0.087993)	(0.085122)	(0.085517)	(0.093804)	-
A3_34	υ_{t-2}	0.034210	-0.002863	0.471538	0.221726	-0.020661	0.116729	0.171334
			(0.004483)	(0.081640)	(0.084531)	(0.089639)	(0.101917)	(0.077102)
A3_35	PR_{t-1}	0.067077	0.005385	0.612686	0.138039	0.226073	-	-
			(0.002471)	(0.041386)	(0.049031)	(0.039567)	-	-
A3_36	PR_{t-4}	0.394743	-0.009341	0.990101	-0.027663	0.049598	-	-
			(0.003702)	(0.045413)	(0.057478)	(0.041098)	-	-

SETAR estimates for Level II ADR Europe cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Panel A: Regime 1

	Threshold		Regime 1					
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
E2_1	υ_{t-2}	0.136527	0.041016	0.189043	0.247335	-	-	-
			(0.004843)	(0.048221)	(0.047015)	-	-	-
E2_2	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_3	PR_{t-4}	0.006473	0.007877	-0.003615	0.328999	0.005689	-	-
			(0.001466)	(0.053035)	(0.050010)	(0.038751)	-	-
E2_4	υ_{t-4}	0.015305	0.003905	0.155625	0.122222	0.091641	0.105820	0.104042
			(0.000313)	(0.027417)	(0.024190)	(0.027030)	(0.026363)	(0.023217)
E2_5	υ_{t-2}	0.081204	0.003533	0.246153	0.187369	-	-	-
			(0.000342)	(0.063289)	(0.047277)	-	-	-
E2_6	υ_{t-4}	0.023688	0.004504	0.310725	0.176833	0.138596	-	-
			(0.000273)	(0.026356)	(0.021316)	(0.022673)	-	-
E2_7	υ_{t-2}	0.013649	0.002249	0.252367	0.122572	0.122094	0.120458	0.096300
			(0.000205)	(0.027288)	(0.027456)	(0.023747)	(0.021677)	(0.019161)
E2_8	υ_{t-2}	0.136527	0.041016	0.189043	0.247335	-	-	-
			(0.004843)	(0.048221)	(0.047015)	-	-	-

E2_9	υ_{t-2}	0.136527	0.041016	0.189043	0.247335	-	-	-
			(0.004843)	(0.048221)	(0.047015)	-	-	-
E2_10	υ_{t-4}	0.222401	0.037032	0.163046	0.222762	0.105000	-	-
			(0.005373)	(0.047557)	(0.047671)	(0.046505)	-	-
E2_11	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_12	PR_{t-4}	0.006473	0.007877	-0.003615	0.328999	0.005689	-	-
			(0.001466)	(0.053035)	(0.050010)	(0.038751)	-	-
E2_13	υ_{t-4}	0.015305	0.003905	0.155625	0.122222	0.091641	0.105820	0.104042
			(0.000313)	(0.027417)	(0.024190)	(0.027030)	(0.026363)	(0.023217)
E2_14	PR_{t-4}	0.077023	0.003218	0.222122	0.181528	0.075183	-	-
			(0.000367)	(0.060835)	(0.052675)	(0.044693)	-	-
E2_15	υ_{t-4}	0.024735	0.003930	0.304541	0.162384	0.110164	0.103185	-
			(0.000279)	(0.026097)	(0.021159)	(0.022528)	(0.021238)	-
E2_16	υ_{t-2}	0.013672	0.002446	0.270855	0.134685	0.143543	0.143338	-
			(0.000204)	(0.027409)	(0.027304)	(0.023876)	(0.021697)	-
E2_17	PR_{t-4}	0.361842	0.000528	0.557739	0.154310	0.286270	-	-
			(0.000775)	(0.104971)	(0.129085)	(0.055445)	-	-
E2_18	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_19	PR_{t-2}	0.003906	0.012951	0.006634	-0.987842	-	-	-
			(0.002422)	(0.074066)	(0.628972)	-	-	-
E2_20	υ_{t-4}	0.015305	0.003905	0.155625	0.122222	0.091641	0.105820	0.104042
			(0.000313)	(0.027417)	(0.024190)	(0.027030)	(0.026363)	(0.023217)
E2_21	υ_{t-3}	0.059318	0.002842	0.213560	0.181187	0.017195	0.130350	-
			(0.000390)	(0.060199)	(0.052741)	(0.043698)	(0.042336)	-
E2_22	υ_{t-4}	0.024735	0.003930	0.304541	0.162384	0.110164	0.103185	-
			(0.000279)	(0.026097)	(0.021159)	(0.022528)	(0.021238)	-
E2_23	υ_{t-2}	0.013649	0.002249	0.252367	0.122572	0.122094	0.120458	0.096300
			(0.000205)	(0.027288)	(0.027456)	(0.023747)	(0.021677)	(0.019161)

E2_25	PR_{t-4}	0.177524	0.027791	0.277876	0.341246	-	-	-
			(0.004910)	(0.061900)	(0.033725)	-	-	-
E2_26	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_27	PR_{t-4}	0.006473	0.007877	-0.003615	0.328999	0.005689	-	-
			(0.001466)	(0.053035)	(0.050010)	(0.038751)	-	-
E2_28	υ_{t-4}	0.015305	0.003905	0.155625	0.122222	0.091641	0.105820	0.104042
			(0.000313)	(0.027417)	(0.024190)	(0.027030)	(0.026363)	(0.023217)
E2_29	PR_{t-4}	0.077023	0.003218	0.222122	0.181528	0.075183	-	-
			(0.000367)	(0.060835)	(0.052675)	(0.044693)	-	-
E2_30	υ_{t-4}	0.024735	0.003930	0.304541	0.162384	0.110164	0.103185	-
			(0.000279)	(0.026097)	(0.021159)	(0.022528)	(0.021238)	-
E2_31	υ_{t-2}	0.013649	0.002249	0.252367	0.122572	0.122094	0.120458	0.096300
			(0.000205)	(0.027288)	(0.027456)	(0.023747)	(0.021677)	(0.019161)
E2_32	υ_{t-4}	0.222401	0.036661	0.161476	0.219443	0.099232	0.015680	-
			(0.005696)	(0.047731)	(0.047280)	(0.047751)	(0.040648)	-
E2_33	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_34	PR_{t-4}	0.006473	0.007877	-0.003615	0.328999	0.005689	-	-
			(0.001466)	(0.053035)	(0.050010)	(0.038751)	-	-
E2_35	υ_{t-4}	0.015305	0.003905	0.155625	0.122222	0.091641	0.105820	0.104042
			(0.000313)	(0.027417)	(0.024190)	(0.027030)	(0.026363)	(0.023217)
E2_36	υ_{t-2}	0.081204	0.003533	0.246153	0.187369	-	-	-
			(0.000342)	(0.063289)	(0.047277)	-	-	-
E2_37	υ_{t-4}	0.024735	0.003930	0.304541	0.162384	0.110164	0.103185	-
			(0.000279)	(0.026097)	(0.021159)	(0.022528)	(0.021238)	-
E2_38	υ_{t-2}	0.013649	0.002249	0.252367	0.122572	0.122094	0.120458	0.096300
			(0.000205)	(0.027288)	(0.027456)	(0.023747)	(0.021677)	(0.019161)
E2_39	υ_{t-2}	0.136527	0.035647	0.161555	0.214492	0.081940	-0.009056	0.060480
			(0.005935)	(0.048405)	(0.047081)	(0.047013)	(0.046503)	(0.038987)

E2_40	υ_{t-4}	0.048241	0.007822	0.195270	0.123172	0.148794	-	-
			(0.000915)	(0.048416)	(0.045550)	(0.048369)	-	-
E2_41	PR_{t-4}	0.006473	0.007877	-0.003615	0.328999	0.005689	-	-
			(0.001466)	(0.053035)	(0.050010)	(0.038751)	-	-
E2_42	υ_{t-4}	0.015305	0.005107	0.173711	0.142116	0.115121	-	-
			(0.000278)	(0.027602)	(0.023691)	(0.026941)	-	-
E2_43	PR_{t-4}	0.077023	0.003476	0.238664	0.198442	-	-	-
			(0.000337)	(0.063417)	(0.049167)	-	-	-
E2_44	υ_{t-4}	0.027819	0.003337	0.345274	0.201073	0.100987	0.103841	-
			(0.000403)	(0.036558)	(0.029074)	(0.025168)	(0.028561)	-

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
E2_1	υ_{t-2}	0.136527	0.244368	0.257930	0.065486	-	-	-
			(0.038629)	(0.116818)	(0.113161)	-	-	-
E2_2	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_3	PR_{t-4}	0.006473	0.007243	0.239841	0.091938	0.215830	-	-
			(0.000980)	(0.059121)	(0.047479)	(0.051240)	-	-
E2_4	υ_{t-4}	0.015305	0.009104	0.133318	0.134411	0.050206	0.026821	0.065062
			(0.002758)	(0.049273)	(0.054983)	(0.057118)	(0.041423)	(0.040651)
E2_5	υ_{t-2}	0.081204	0.056448	0.341632	0.217098	-	-	-
			(0.019198)	(0.113179)	(0.093455)	-	-	-
E2_6	υ_{t-4}	0.023688	-0.002885	0.652327	0.223962	0.109540	-	-
			(0.001471)	(0.046914)	(0.055558)	(0.041313)	-	-
E2_7	υ_{t-2}	0.013649	0.009177	0.069065	0.072852	0.009900	0.126873	0.126170
			(0.001505)	(0.041128)	(0.038523)	(0.037851)	(0.040000)	(0.045721)
E2_8	υ_{t-2}	0.136527	0.244368	0.257930	0.065486	-	-	-
			(0.038629)	(0.116818)	(0.113161)	-	-	-
E2_9	υ_{t-2}	0.136527	0.244368	0.257930	0.065486	-	-	-
			(0.038629)	(0.116818)	(0.113161)	-	-	-
E2_10	υ_{t-4}	0.222401	0.219784	0.251096	0.046864	0.093322	-	-
			(0.041056)	(0.115540)	(0.113123)	(0.047210)	-	-
E2_11	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_12	PR_{t-4}	0.006473	0.007243	0.239841	0.091938	0.215830	-	-
			(0.000980)	(0.059121)	(0.047479)	(0.051240)	-	-
E2_13	υ_{t-4}	0.015305	0.009104	0.133318	0.134411	0.050206	0.026821	0.065062
			(0.002758)	(0.049273)	(0.054983)	(0.057118)	(0.041423)	(0.040651)

E2_14	PR_{t-4}	0.077023	0.038920	0.439354	0.224450	0.028741	-	-
			(0.015732)	(0.097252)	(0.075493)	(0.066837)	-	-
E2_15	υ_{t-4}	0.024735	-0.003373	0.639669	0.190674	0.001459	0.163582	-
			(0.001560)	(0.046976)	(0.055624)	(0.049394)	(0.039900)	-
E2_16	υ_{t-2}	0.013672	0.010222	0.078472	0.077554	0.020940	0.150808	-
			(0.001472)	(0.040674)	(0.039534)	(0.038903)	(0.041965)	-
E2_17	PR_{t-4}	0.361842	0.254224	-0.010026	0.198848	0.109427	-	-
			(0.050558)	(0.104418)	(0.067422)	(0.069553)	-	-
E2_18	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_19	PR_{t-2}	0.003906	0.007871	0.255663	0.218295	-	-	-
			(0.001001)	(0.059345)	(0.047255)	-	-	-
E2_20	υ_{t-4}	0.015305	0.009104	0.133318	0.134411	0.050206	0.026821	0.065062
			(0.002758)	(0.049273)	(0.054983)	(0.057118)	(0.041423)	(0.040651)
E2_21	υ_{t-3}	0.059318	0.060417	0.393239	0.209093	0.062875	-0.138341	-
			(0.020244)	(0.104778)	(0.079216)	(0.080416)	(0.097923)	-
E2_22	υ_{t-4}	0.024735	-0.003373	0.639669	0.190674	0.001459	0.163582	-
			(0.001560)	(0.046976)	(0.055624)	(0.049394)	(0.039900)	-
E2_23	υ_{t-2}	0.013649	0.009177	0.069065	0.072852	0.009900	0.126873	0.126170
			(0.001505)	(0.041128)	(0.038523)	(0.037851)	(0.040000)	(0.045721)
E2_25	PR_{t-4}	0.177524	0.188954	0.327079	0.148511	-	-	-
			(0.044430)	(0.124653)	(0.129584)	-	-	-
E2_26	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_27	PR_{t-4}	0.006473	0.007243	0.239841	0.091938	0.215830	-	-
			(0.000980)	(0.059121)	(0.047479)	(0.051240)	-	-
E2_28	υ_{t-4}	0.015305	0.009104	0.133318	0.134411	0.050206	0.026821	0.065062
			(0.002758)	(0.049273)	(0.054983)	(0.057118)	(0.041423)	(0.040651)
E2_29	PR_{t-4}	0.077023	0.038920	0.439354	0.224450	0.028741	-	-
			(0.015732)	(0.097252)	(0.075493)	(0.066837)	-	-

E2_30	υ_{t-4}	0.024735	-0.003373	0.639669	0.190674	0.001459	0.163582	-
			(0.001560)	(0.046976)	(0.055624)	(0.049394)	(0.039900)	-
E2_31	υ_{t-2}	0.013649	0.009177	0.069065	0.072852	0.009900	0.126873	0.126170
			(0.001505)	(0.041128)	(0.038523)	(0.037851)	(0.040000)	(0.045721)
E2_33	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_34	PR_{t-4}	0.006473	0.007243	0.239841	0.091938	0.215830	-	-
			(0.000980)	(0.059121)	(0.047479)	(0.051240)	-	-
E2_35	υ_{t-4}	0.015305	0.009104	0.133318	0.134411	0.050206	0.026821	0.065062
			(0.002758)	(0.049273)	(0.054983)	(0.057118)	(0.041423)	(0.040651)
E2_36	υ_{t-2}	0.081204	0.056448	0.341632	0.217098	-	-	-
			(0.019198)	(0.113179)	(0.093455)	-	-	-
E2_37	υ_{t-4}	0.024735	-0.003373	0.639669	0.190674	0.001459	0.163582	-
			(0.001560)	(0.046976)	(0.055624)	(0.049394)	(0.039900)	-
E2_38	υ_{t-2}	0.013649	0.009177	0.069065	0.072852	0.009900	0.126873	0.126170
			(0.001505)	(0.041128)	(0.038523)	(0.037851)	(0.040000)	(0.045721)
E2_39	υ_{t-2}	0.136527	0.192210	0.243857	0.039106	0.080514	0.035594	0.068313
			(0.039683)	(0.115488)	(0.112715)	(0.046684)	(0.037556)	(0.046639)
E2_40	υ_{t-4}	0.048241	0.012985	0.520763	0.226818	0.177728	-	-
			(0.002557)	(0.043510)	(0.046848)	(0.037460)	-	-
E2_41	PR_{t-4}	0.006473	0.007243	0.239841	0.091938	0.215830	-	-
			(0.000980)	(0.059121)	(0.047479)	(0.051240)	-	-
E2_42	υ_{t-4}	0.015305	0.010660	0.132503	0.137391	0.058203	-	-
			(0.002491)	(0.048126)	(0.053199)	(0.055385)	-	-
E2_43	PR_{t-4}	0.077023	0.040266	0.446466	0.235552	-	-	-
			(0.014135)	(0.095735)	(0.083408)	-	-	-
E2_44	υ_{t-4}	0.027819	-0.001913	0.724601	0.122324	-0.005252	0.145969	-
			(0.001296)	(0.048511)	(0.063339)	(0.054779)	(0.041551)	-

SETAR estimates for Level III ADR Europe cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \ if \ \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \ if \ \Delta PR_{t-d} \geq c \end{cases}$

Panel A: Regime 1

	Threshold				Regime 1			
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
E3_1	υ_{t-3}	0.010750	0.007513	0.159337	0.170336	-	-	-
			(0.000646)	(0.065218)	(0.057988)	-	-	-
E3_2	υ_{t-3}	0.047903	0.018632	0.217841	0.128324	0.124835	0.072820	-
			(0.001203)	(0.023801)	(0.024231)	(0.024205)	(0.020019)	-
E3_3	υ_{t-3}	0.041140	0.012389	0.356983	0.081880	0.122179	0.094662	-
			(0.001066)	(0.023915)	(0.024083)	(0.023951)	(0.020957)	-
E3_4	υ_{t-3}	0.027490	0.012589	0.214198	0.091919	-	-	-
			(0.000578)	(0.028378)	(0.026234)	-	-	-
E3_5	υ_{t-4}	0.011434	0.005014	0.229528	0.126158	-	-	-
			(0.000247)	(0.030118)	(0.026625)	-	-	-
E3_6	υ_{t-3}	0.038152	0.003157	0.179745	0.280829	0.228591	-	-
			(0.000333)	(0.031748)	(0.032287)	(0.031092)	-	-
E3_7	υ_{t-1}	0.134752	0.005068	0.671199	0.149356	-0.007388	0.108678	-
			(0.000719)	(0.036880)	(0.038156)	(0.034211)	(0.023746)	-
E3_8	υ_{t-4}	0.026546	0.004237	0.277403	0.244949	0.204023	-	-
			(0.000480)	(0.042767)	(0.040062)	(0.035403)	-	-

E3_9	υ_{t-2}	0.231084	0.022435	0.551357	0.269926	-	-	-
			(0.003444)	(0.053708)	(0.048093)	-	-	-
E3_10	υ_{t-4}	0.043093	0.005935	0.280388	0.180713	0.156765	0.146191	-
			(0.000505)	(0.026521)	(0.022746)	(0.024749)	(0.022019)	-
E3_11	υ_{t-4}	0.109687	0.001104	0.458230	0.237101	0.063158	0.108146	-
			(0.000308)	(0.076211)	(0.061185)	(0.044466)	(0.039051)	-
E3_12	υ_{t-2}	0.020161	0.008379	0.222497	0.050832	0.085331	-	-
			(0.000714)	(0.044125)	(0.033013)	(0.025500)	-	-
E3_13	PR_{t-1}	0.077708	0.011765	0.579641	0.065646	-	-	-
			(0.000809)	(0.032305)	(0.025246)	-	-	-
E3_14	PR_{t-2}	0.296311	0.322171	-0.038152	-0.024170	-	-	-
			(0.041426)	(0.083463)	(0.100663)	-	-	-
E3_15	υ_{t-4}	0.033924	0.002049	0.228379	0.192344	0.168002	0.235015	-
			(0.000349)	(0.042425)	(0.031053)	(0.029238)	(0.031129)	-
E3_16	υ_{t-3}	0.012706	0.002597	0.225288	0.141091	0.080764	0.105498	0.111213
			(0.000297)	(0.043243)	(0.037045)	(0.035124)	(0.029883)	(0.026945)
E3_17	υ_{t-4}	0.016071	0.008376	0.143941	0.081761	-	-	-
			(0.000386)	(0.030487)	(0.027142)	-	-	-
E3_19	υ_{t-4}	0.011418	0.006139	0.244027	0.177798	-	-	-
			(0.000369)	(0.044189)	(0.040984)	-	-	-
E3_20	υ_{t-4}	0.007484	0.004792	0.193022	0.082401	-	-	-
			(0.000209)	(0.030698)	(0.028015)	-	-	-
E3_21	υ_{t-3}	0.012896	0.006902	0.128389	0.056266	-	-	-
			(0.000383)	(0.041622)	(0.032017)	-	-	-
E3_22	PR_{t-1}	0.281107	0.001380	0.596058	0.240898	0.032747	0.124066	-
			(0.001342)	(0.036256)	(0.040424)	(0.038591)	(0.030665)	-
E3_23	υ_{t-3}	0.010750	0.007513	0.159337	0.170336	0.122094	0.120458	0.096300
			(0.000646)	(0.065218)	(0.057988)	(0.023747)	(0.021677)	(0.019161)

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
E3_1	υ_{t-3}	0.010750	0.013856	0.217652	0.119762	-	-	-
			(0.001498)	(0.058161)	(0.033911)	-	-	-
E3_2	υ_{t-3}	0.047903	0.025170	0.254808	0.071498	0.084721	-0.017739	-
			(0.006145)	(0.061833)	(0.048378)	(0.066816)	(0.054755)	-
E3_3	υ_{t-3}	0.041140	0.028612	0.229863	0.046276	0.000377	0.028192	-
			(0.004417)	(0.056109)	(0.043658)	(0.048176)	(0.043428)	-
E3_4	υ_{t-3}	0.027490	0.002014	0.557420	0.188752	-	-	-
			(0.006779)	(0.097563)	(0.087630)	-	-	-
E3_5	υ_{t-4}	0.011434	0.010099	0.192949	0.084800	-	-	-
			(0.000974)	(0.043226)	(0.038389)	-	-	-
E3_6	υ_{t-3}	0.038152	0.022891	0.406624	0.125755	0.153391	-	-
			(0.002665)	(0.041325)	(0.038381)	(0.032072)	-	-
E3_7	υ_{t-1}	0.134752	0.045637	0.281613	0.188996	0.100526	0.200958	-
			(0.020022)	(0.090778)	(0.070286)	(0.059727)	(0.062717)	-
E3_8	υ_{t-4}	0.026546	0.017441	0.248770	0.102274	0.140609	-	-
			(0.004408)	(0.057251)	(0.061941)	(0.059999)	-	-
E3_9	υ_{t-2}	0.231084	-0.001560	0.968360	0.005596	-	-	-
			(0.011778)	(0.049548)	(0.044044)	-	-	-
E3_10	υ_{t-4}	0.043093	-0.000973	0.576030	0.235733	0.086634	0.000757	-
			(0.004641)	(0.061276)	(0.051054)	(0.041497)	(0.036280)	-
E3_11	υ_{t-4}	0.109687	0.120229	0.054032	0.056227	0.081809	0.056137	-
			(0.011541)	(0.037034)	(0.030083)	(0.031686)	(0.033309)	-
E3_12	υ_{t-2}	0.020161	0.012148	0.166097	0.111276	0.071712	-	-
			(0.003228)	(0.082244)	(0.045374)	(0.041763)	-	-
E3_13	PR_{t-1}	0.077708	0.008629	0.529352	0.349244	-	-	-
			(0.012803)	(0.163139)	(0.101518)	-	-	-

E3_14	PR_{t-2}	0.296311	0.212862	0.160284	0.137292	-	-	-
			(0.024466)	(0.061471)	(0.055522)	-	-	-
E3_15	υ_{t-4}	0.033924	0.035949	0.147033	0.070966	0.059224	-0.033931	-
			(0.005124)	(0.075480)	(0.044207)	(0.045543)	(0.039980)	-
E3_16	υ_{t-3}	0.012706	0.006285	0.375293	0.081380	-0.053533	0.133642	-0.033247
			(0.005696)	(0.241657)	(0.078170)	(0.052882)	(0.049281)	(0.053633)
E3_17	υ_{t-4}	0.016071	0.009745	0.293293	0.062500	-	-	-
			(0.001708)	(0.074514)	(0.044621)	-	-	-
E3_19	υ_{t-4}	0.011418	0.012052	0.169305	0.092060	-	-	-
			(0.001093)	(0.036059)	(0.039786)	-	-	-
E3_20	υ_{t-4}	0.007484	0.006380	0.161832	0.092568	-	-	-
			(0.000514)	(0.038837)	(0.025839)	-	-	-
E3_21	υ_{t-3}	0.012896	0.009922	0.147413	0.150294	-	-	-
			(0.001751)	(0.061222)	(0.064326)	-	-	-
E3_22	PR_{t-1}	0.281107	0.050020	0.521603	0.225938	0.138676	-0.052018	-
			(0.021375)	(0.114198)	(0.131944)	(0.146140)	(0.108870)	-
E3_23	υ_{t-3}	0.010750	0.013856	0.217652	0.119762	0.009900	0.126873	0.126170
			(0.001498)	(0.058161)	(0.033911)	(0.037851)	(0.040000)	(0.045721)

SETAR estimates for Level II ADR Latin America cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Panel A: Regime 1

	Threshold		Regime 1					
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
LA2_1	υ_{t-1}	0.102477	0.013895	0.653016	0.135060	-	-	-
			(0.001598)	(0.047022)	(0.037940)	-	-	-
LA2_2	υ_{t-4}	0.064050	0.003268	0.288219	0.199182	0.250188	0.128734	-
			(0.000492)	(0.034492)	(0.039984)	(0.046854)	(0.034945)	-
LA2_3	υ_{t-4}	0.014318	0.007613	0.147874	-	-	-	-
			(0.000348)	(0.041014)	-	-	-	-
LA2_4	υ_{t-3}	0.017122	0.006978	0.190821	0.175614	-	-	-
			(0.000362)	(0.032186)	(0.034200)	-	-	-
LA2_5	υ_{t-4}	0.035795	0.007052	0.382164	0.208387	-	-	-
			(0.000852)	(0.060384)	(0.044493)	-	-	-
LA2_6	υ_{t-2}	5.844515	0.009228	1.018578	-0.021670	-	-	-
			(0.006872)	(0.043452)	(0.043549)	-	-	-
LA2_7	PR_{t-4}	0.122971	0.006435	0.326544	0.162497	0.179504	-	-
			(0.000917)	(0.041898)	(0.039549)	(0.046160)	-	-
LA2_9	PR_{t-4}	0.017241	0.032829	-0.047823	-	-	-	-
			(0.007731)	(0.137794)	-	-	-	-

LA2_10	υ_{t-3}	0.017386	0.008265	0.242437	0.099008	-	-	-
			(0.000475)	(0.040153)	(0.034665)	-		
LA2_11	PR_{t-3}	0.813616	-0.002308	1.050007	0.005750	0.049475	-0.701755	0.609750
			(0.006482)	(0.015524)	(0.019502)	(0.120801)	(0.684749)	(0.595888)
LA2_12	υ_{t-4}	0.016854	0.006388	0.140629	0.116973	0.141243	-	-
			(0.000441)	(0.033587)	(0.029996)	(0.040074)	-	-
LA2_13	υ_{t-3}	0.033520	0.009180	0.416414	0.097637	-	-	-
			(0.000587)	(0.031695)	(0.028718)	-	-	-
LA2_14	υ_{t-1}	0.061905	0.008564	0.483319	0.241128	0.078115	-	-
			(0.000968)	(0.044466)	(0.048230)	(0.034340)	-	-
LA2_15	υ_{t-4}	0.026379	0.010022	0.234708	0.090587	-	-	-
			(0.000558)	(0.037391)	(0.029238)	-	-	-
LA2_16	υ_{t-2}	0.018673	0.006534	0.242327	0.174739	0.143543	0.143338	-
			(0.000411)	(0.038154)	(0.038102)	(0.023876)	(0.021697)	-

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
LA2_1	υ_{t-1}	0.102477	-0.015683	1.002012	-0.007174	-	-	-
			(0.005893)	(0.061702)	(0.064317)	-	-	-
LA2_2	υ_{t-4}	0.064050	0.042481	0.339495	0.155158	0.087024	0.157528	-
			(0.008763)	(0.059200)	(0.044974)	(0.047805)	(0.043492)	-
LA2_3	υ_{t-4}	0.014318	0.011572	0.255132	-	-	-	-
			(0.001371)	(0.064077)	-	-	-	-
LA2_4	υ_{t-3}	0.017122	0.006346	0.509906	0.073293	-	-	-
			(0.002677)	(0.065079)	(0.056049)	-	-	-
LA2_5	υ_{t-4}	0.035795	0.000539	0.956960	0.035593	-	-	-
			(0.001210)	(0.021632)	(0.021976)	-	-	-
LA2_6	υ_{t-2}	5.844515	0.114328	0.967242	0.018390	-	-	-
			(0.054910)	(0.040382)	(0.040460)	-	-	-
LA2_7	PR_{t-4}	0.122971	0.009841	0.980260	-0.001340	0.004627	-	-
			(0.009463)	(0.054004)	(0.061781)	(0.033555)	-	-
LA2_9	PR_{t-4}	0.017241	0.016240	0.098277	-	-	-	-
			(0.003107)	(0.096351)	-	-	-	-
LA2_10	υ_{t-3}	0.017386	0.010184	0.413746	0.088849	-	-	-
			(0.001791)	(0.050686)	(0.042327)	-	-	-
LA2_11	PR_{t-3}	0.813616	0.030867	0.928807	0.066615	-0.003130	-0.017769	0.015357
			(0.014314)	(0.023736)	(0.028172)	(0.022414)	(0.032171)	(0.030202)
LA2_12	υ_{t-4}	0.016854	0.008348	0.330845	0.080199	0.034275	-	-
			(0.003950)	(0.106536)	(0.062873)	(0.058017)	-	-
LA2_13	υ_{t-3}	0.033520	0.053827	0.019055	0.015490	-	-	-
			(0.011798)	(0.024622)	(0.026765)	-	-	-
LA2_14	υ_{t-1}	0.061905	0.013027	0.366320	0.066992	0.342832	-	-
			(0.008731)	(0.131099)	(0.087046)	(0.084379)	-	-

LA2_15	υ_{t-4}	0.026379	0.007582	0.655126	0.181177	-	-	-
			(0.002068)	(0.059054)	(0.053872)	-	-	-
LA2_16	υ_{t-2}	0.018673	0.009150	0.370961	0.035763	0.020940	0.150808	-
			(0.006577)	(0.146317)	(0.105920)	(0.038903)	(0.041965)	-

SETAR estimates for Level III ADR Latin America cross-market premiums. Panel A reports the coefficients for regime 1 or inside the band of no arbitrage and Panel B reports the coefficients for regime 2 or outside the band of no arbitrage. The threshold variable is chosen using the AIC criterion. In addition to lagged values of the cross-market premium, I also consider a measure of volatility as candidate threshold variable (Franses and van Dijk, 2000), which is defined as the average absolute cross-market premiums over the last j days, that is, $\upsilon_{t,j} = \frac{1}{j}\sum_{i=0}^{j-1}|PR_{t-i}|$.

The SETAR model is estimated as $\Delta PR_t = \begin{cases} \alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \varepsilon_{1,t} \; if \; \Delta PR_{t-d} < c \\ \alpha_{2,0} + \sum_{j=1}^{P_2} \alpha_{2,j}\Delta PR_{t-j} + \varepsilon_{2,t} \; if \; \Delta PR_{t-d} \geq c \end{cases}$

Panel A: Regime 1

	Threshold		Regime 1					
ADR	Variable	Estimate	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{1,3}$	$\alpha_{1,4}$	$\alpha_{1,5}$
LA3_1	u_{t-4}	0.026055	0.007788	0.379533	-	-	-	-
			(0.000697)	(0.053977)	-	-	-	-
LA3_2	u_{t-2}	0.061108	0.009715	0.388983	0.094804	0.119776	-0.007020	0.118739
			(0.001294)	(0.033053)	(0.047811)	(0.042369)	(0.029873)	(0.025093)
LA3_3	u_{t-4}	0.016845	0.007730	0.171772	0.065364	-	-	-
			(0.000327)	(0.028194)	(0.023999)	-	-	-
LA3_4	u_{t-4}	0.014333	0.006833	0.272808	-	-	-	-
			(0.000247)	(0.031931)	-	-	-	-
LA3_5	PR_{t-2}	0.014141	0.006348	0.151942	0.028279	-	-	-
			(0.000541)	(0.038580)	(0.064639)	-	-	-
LA3_6	u_{t-2}	0.342518	0.000757	0.780230	0.222008	-	-	-
			(0.000488)	(0.038153)	(0.037981)	-	-	-
LA3_7	u_{t-3}	0.095831	0.007467	0.266574	0.076583	0.066979	0.059867	-
			(0.000859)	(0.049293)	(0.043415)	(0.040868)	(0.041745)	-
LA3_8	PR_{t-1}	0.015862	0.008202	0.135583	-	-	-	-
			(0.001456)	(0.210873)	-	-	-	-

LA3_9	u_{t-4}	0.018947	0.008470	0.166556	-	-	-	-
			(0.000840)	(0.082305)	-	-	-	-
LA3_10	PR_{t-1}	0.122449	0.009667	0.643652	0.046385	0.073930	0.099698	-
			(0.000924)	(0.039394)	(0.049274)	(0.047231)	(0.029203)	-
LA3_11	PR_{t-1}	0.030398	0.008512	0.398966	0.055210	0.048693	-	-
			(0.000528)	(0.039728)	(0.024176)	(0.021746)	-	-
LA3_12	u_{t-3}	0.018800	0.007844	0.238445	-	-	-	-
			(0.000946)	(0.099584)	-	-	-	-
LA3_13	u_{t-4}	0.953292	0.006839	0.921945	0.123812	-0.053122	-	-
			(0.007004)	(0.057007)	(0.079853)	(0.060662)	-	-
LA3_14	u_{t-4}	0.019969	0.006093	0.410936	0.088992	-	-	-
			(0.000350)	(0.031414)	(0.029574)	-	-	-
LA3_15	u_{t-4}	0.043970	0.038361	-0.068240	-	-	-	-
			(0.004302)	(0.112878)	-	-	-	-
LA3_16	u_{t-4}	0.016034	0.005435	0.213105	0.141240	-	-	-
			(0.000267)	(0.035912)	(0.033552)	-	-	-
LA3_17	PR_{t-1}	0.379495	0.008998	0.905553	0.059904	-	-	-
			(0.003062)	(0.044647)	(0.044668)	-	-	-
LA3_18	u_{t-4}	0.020889	0.003943	0.293715	0.118569	0.200563	-	-
			(0.000303)	(0.036583)	(0.026384)	(0.026562)	-	-
LA3_19	u_{t-4}	0.020399	0.008763	0.204435	0.075848	-	-	-
			(0.000474)	(0.034234)	(0.031280)	-	-	-
LA3_20	u_{t-3}	0.011000	0.005976	0.031177	0.095270	0.061876	-	-
			(0.000459)	(0.042451)	(0.055368)	(0.045170)	-	-
LA3_21	u_{t-3}	0.024299	0.003940	0.310852	0.184705	0.149922	0.130350	-
			(0.000302)	(0.030793)	(0.028627)	(0.022771)	(0.042336)	-

Panel B: Regime 2

	Threshold		Regime 2					
ADR	Variable	Estimate	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	$\alpha_{2,3}$	$\alpha_{2,4}$	$\alpha_{2,5}$
LA3_1	u_{t-4}	0.026055	0.016580	0.662731	-	-	-	-
			(0.003667)	(0.077487)	-	-	-	-
LA3_2	u_{t-2}	0.061108	0.009663	0.414296	0.048159	0.178521	0.153708	0.123807
			(0.004923)	(0.092523)	(0.049140)	(0.059921)	(0.058852)	(0.052046)
LA3_3	u_{t-4}	0.016845	0.010065	0.262370	0.047932	-	-	-
			(0.003282)	(0.119627)	(0.055437)	-	-	-
LA3_4	u_{t-4}	0.014333	0.010251	0.351054	-	-	-	-
			(0.001021)	(0.049222)	-	-	-	-
LA3_5	PR_{t-2}	0.014141	0.010688	0.337768	-0.067398	-	-	-
			(0.002437)	(0.141946)	(0.079999)	-	-	-
LA3_6	u_{t-2}	0.342518	0.135306	0.842279	-0.210254	-	-	-
			(0.095108)	(0.124813)	(0.157005)	-	-	-
LA3_7	u_{t-3}	0.095831	0.053610	0.351331	0.150335	0.094841	0.127963	-
			(0.005519)	(0.035697)	(0.039770)	(0.035115)	(0.035707)	-
LA3_8	PR_{t-1}	0.015862	0.023840	-0.103591	-	-	-	-
			(0.003962)	(0.098303)	-	-	-	-
LA3_9	u_{t-4}	0.018947	0.020242	0.113959	-	-	-	-
			(0.003243)	(0.081749)	-	-	-	-
LA3_10	PR_{t-1}	0.122449	0.011186	0.338611	0.381122	0.096476	0.088319	-
			(0.016020)	(0.238953)	(0.155548)	(0.078914)	(0.064363)	-
LA3_11	PR_{t-1}	0.030398	0.004399	0.555039	0.132156	0.113656	-	-
			(0.003228)	(0.085928)	(0.057912)	(0.051299)	-	-
LA3_12	u_{t-3}	0.018800	0.031080	0.131767	-	-	-	-
			(0.004646)	(0.093570)	-	-	-	-
LA3_13	u_{t-4}	0.953292	0.001090	1.089185	-0.144776	0.054468	-	-
			(0.001373)	(0.057361)	(0.072558)	(0.038476)	-	-

LA3_14	u_{t-4}	0.019969	0.006211	0.617398	0.134679	-	-	-
			(0.002025)	(0.050894)	(0.051784)	-	-	-
LA3_15	u_{t-4}	0.043970	0.056144	-0.049179	-	-	-	-
			(0.007411)	(0.078994)	-	-	-	-
LA3_16	u_{t-4}	0.016034	0.012263	0.242043	0.190594	-	-	-
			(0.002253)	(0.068195)	(0.063234)	-	-	-
LA3_17	PR_{t-1}	0.379495	0.056414	0.306212	0.564341	-	-	-
			(0.052809)	(0.203262)	(0.188811)	-	-	-
LA3_18	u_{t-4}	0.020889	0.002754	0.656585	0.056907	0.181301	-	-
			(0.002277)	(0.057636)	(0.049998)	(0.045376)	-	-
LA3_19	u_{t-4}	0.020399	0.011755	0.420875	0.001284	-	-	-
			(0.006016)	(0.168078)	(0.066308)	-	-	-
LA3_20	u_{t-3}	0.011000	0.005029	0.265427	0.086253	0.100742	-	-
			(0.001996)	(0.077499)	(0.076862)	(0.057917)	-	-
LA3_21	u_{t-3}	0.024299	-0.000694	0.762259	0.055767	0.118468	-0.138341	-
			(0.002583)	(0.061891)	(0.061451)	(0.048973)	(0.097923)	-

APPENDIX E

APPENDIX E

ADR CROSS-MARKET PREMIUM STAR ESTIMATES

STAR estimates for Level II ADR Asia cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d};\gamma,c) + \varepsilon_t$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	C
A2_1	-0.00031090	-0.24773964	-0.24111587	0.021560789	0.12596562	0.10065347	0.8573704	0.00831154
	(0.0089)	(0.2547)	(0.2425)	(0.0035)	(0.0418)	(0.0422)	(0.3570)	(0.0088)
A2_2	0.001359543	0.10395512	0.031628716	0.02848362	-0.03486522	0.062428837	0.58671021	0.021491788
	(0.0022)	(0.0350)	(0.0418)	(0.0059)	(0.0564)	(0.0473)	(0.2693)	(0.0039)
A2_3	0.006160114	0.10188594	0.013739647	0.020483592	0.070197714	0.14516075	0.84367093	0.023413821
	(0.0007)	(0.0279)	(0.0353)	(0.0036)	(0.0428)	(0.0388)	(0.2283)	(0.0029)
A2_4	0.012312377	0.055772629	0.045518525	0.024093814	0.13970034	0.059854162	2.6673287	0.023764293
	(0.0019)	(0.1042)	(0.0993)	(0.0048)	(0.0547)	(0.0588)	(0.5825)	(0.0038)
A2_5	0.010216082	-0.01061483	0.007915285	0.027460588	0.32766931	0.004451994	1.5726163	0.029025268
	(0.0010)	(0.0657)	(0.0495)	(0.0041)	(0.0389)	(0.0433)	(0.2579)	(0.0027)
A2_6	0.00734196	0.11721531	0.062481952	0.03081129	-0.20197248	-0.00829657	0.8497839	0.028308278
	(0.0016)	(0.0412)	(0.0463)	(0.0148)	(0.2008)	(0.1138)	(0.5669)	(0.0092)
A2_7	-0.07459208	-0.22691161	0.097663956	0.087746768	0.64657452	-0.06812484	0.67575773	0.0047218
	(0.0471)	(0.4030)	(0.1415)	(0.0174)	(0.0472)	(0.0686)	(0.1903)	(0.0443)

A2_8	-0.02213817	-0.43611389	0.32283139	0.037744467	0.80333723	-0.12528498	0.24532079	0.003330914
	(0.0513)	(1.2512)	(0.3847)	(0.0124)	(0.1565)	(0.1245)	(0.6685)	(0.1081)
A2_9	-0.06886109	-0.18754746	0.16637387	0.07450638	0.72026698	0.011540943	0.89395958	0.00032553
	(0.0476)	(0.4551)	(0.1176)	(0.0158)	(0.0410)	(0.0592)	(0.1679)	(0.0601)
A2_10	0.006879838	0.4050056	0.16872607	0.2683751	0.23385381	0.086690352	23.103085	0.34701054
	(0.0004)	(0.0202)	(0.0194)	(0.0180)	(0.0305)	(0.0316)	(0.4953)	(0.0146)
A2_11	0.005121001	0.93269365	0.059001714	0.035515244	1.2056731	-0.23704004	5.2611687	1.1494523
	(0.0015)	(0.0168)	(0.0167)	(0.0164)	(0.0397)	(0.0402)	(0.9056)	(0.0479)
A2_12	-0.00435007	-0.07863896	0.09248326	0.040742115	0.51405313	-0.1067997	0.44540788	0.03089107
	(0.0043)	(0.1010)	(0.0418)	(0.0070)	(0.0477)	(0.0629)	(0.1923)	(0.0074)
A2_13	0.009782579	0.056184387	0.16302707	0.031730582	-0.05150389	0.15249446	499.99977	0.025529029
	(0.0014)	(0.0764)	(0.0732)	(0.0045)	(0.0646)	(0.0617)	(5.9918)	
A2_14	0.008143911	0.13847374	-0.03750315	0.027161358	0.087453159	0.14392317	1.0964673	0.029612665
	(0.0007)	(0.0372)	(0.0475)	(0.0067)	(0.0723)	(0.0717)	(0.2877)	(0.0033)
A2_15	-0.01709054	0.2238548	-0.29096649	0.029966418	0.1026906	0.23866034	0.25904972	0.002823016
	(0.0602)	(0.1903)	(0.7941)	(0.0168)	(0.1097)	(0.1711)	(1.2634)	(0.0693)
A2_16	-0.05838960	-1.035046	0.3449594	0.062569452	0.84338383	-0.14271373	0.43417792	7.51268E-05
	(0.0245)	(0.4876)	(0.1075)	(0.0082)	(0.0344)	(0.0442)	(0.1313)	(0.0215)
A2_17	-0.01825220	-0.88227965	0.35481561	0.030047088	0.92581352	-0.06757671	1.1241648	0.005145638
	(0.0248)	(1.0707)	(0.2098)	(0.0066)	(0.0272)	(0.0311)	(0.2539)	(0.0421)
A2_18	0.005009856	0.15946641	0.14484559	0.057866717	-0.01516040	-0.30433559	1.086147	0.036296623
	(0.0008)	(0.0317)	(0.0299)	(0.0086)	(0.0618)	(0.0791)	(0.1895)	(0.0031)
A2_19	0.004984393	0.10899495	-0.04329687	0.022751282	0.036824507	0.12054888	0.61650648	0.022662722
	(0.0012)	(0.0291)	(0.0426)	(0.0046)	(0.0557)	(0.0501)	(0.2545)	(0.0035)
A2_20	0.009829657	0.16237014	0.080990138	0.019776663	0.001211906	0.022034236	5.5948398	0.024555695
	(0.0006)	(0.0315)	(0.0341)	(0.0030)	(0.0442)	(0.0410)	(1.0230)	(0.0019)

STAR estimates for Level III ADR Asia cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	C
A3_1	-0.0031382	-0.4163835	-0.2902116	0.0374104	0.4283511	0.0405062	1.8367932	0.0139108
	(0.0113)	(0.3820)	(0.2442)	(0.0038)	(0.0287)	(0.0325)	(0.1867)	(0.0100)
A3_2	0.0103133	0.1314117	-0.0509953	0.0211543	0.3992529	0.0470425	1.0554868	0.0327113
	(0.0009)	(0.0605)	(0.0495)	(0.0051)	(0.0494)	(0.0542)	(0.3291)	(0.0047)
A3_3	0.0114538	0.0520066	0.0054004	0.0355214	0.5837186	0.0648020	2.1905208	0.0433619
	(0.0013)	(0.0750)	(0.0542)	(0.0057)	(0.0385)	(0.0459)	(0.1836)	(0.0037)
A3_4	0.1143765	0.9281162	-0.2448184	0.0692715	0.8721407	0.0524005	0.9490879	0.4585152
	(0.0659)	(0.0850)	(0.2289)	(0.0272)	(0.0375)	(0.0360)	(0.2229)	(0.1361)
A3_5	0.0183654	0.5273098	0.1987339	0.0404456	0.6597153	0.2207041	64.9177800	0.2409684
	(0.0039)	(0.0570)	(0.0563)	(0.0141)	(0.0679)	(0.0684)	(2.3449)	(0.0049)
A3_6	0.0074980	0.0886260	-0.0261713	0.0165674	0.1384409	0.1252555	2.0316541	0.0152724
	(0.0013)	(0.0682)	(0.0820)	(0.0020)	(0.0292)	(0.0263)	(0.3283)	(0.0025)
A3_7	-0.0805694	0.9939647	-0.1332201	0.3082847	0.4364308	0.3657069	0.3292906	0.6851616
	(0.1861)	(0.3118)	(0.4615)	(0.8050)	(1.1003)	(0.6828)	(1.0699)	(2.1212)
A3_8	-0.0550010	0.4813493	0.0656679	0.1027613	0.8793807	0.0021198	0.8416980	0.0644452
	(0.0954)	(0.4518)	(0.1699)	(0.0567)	(0.0580)	(0.0842)	(0.2843)	(0.3848)
A3_9	0.0076226	0.0700127	0.0148286	0.0304051	0.0607247	0.0902508	1.0033410	0.0276385
	(0.0020)	(0.0524)	(0.0591)	(0.0060)	(0.0515)	(0.0494)	(0.3133)	(0.0046)
A3_10	0.0022873	-0.7267154	0.0240324	0.0583403	0.7495515	-0.0930543	1.0467200	0.0232550
	(0.0179)	(0.6768)	(0.1738)	(0.0098)	(0.0488)	(0.0662)	(0.1689)	(0.0278)
A3_11	-0.0070788	0.5228142	0.1320753	0.0894738	-0.0723635	0.0224573	0.3277255	0.0974968
	(0.0675)	(0.4131)	(0.0914)	(0.0777)	(0.4538)	(0.1017)	(1.7854)	(0.0690)
A3_12	0.0077960	0.1103542	-0.0326859	0.0368693	-0.0797923	0.0898187	1.5940012	0.0257658
	(0.0007)	(0.0398)	(0.0460)	(0.0044)	(0.0475)	(0.0448)	(0.1831)	(0.0016)
A3_13	-0.0170420	-0.2412108	0.1835979	0.0387687	0.8514951	-0.0419070	0.6685715	0.0155449
	(0.0242)	(0.6479)	(0.1270)	(0.0116)	(0.0549)	(0.0697)	(0.2669)	(0.0572)

A3_14	-0.0594513	-0.1426571	-0.0300059	0.0882640	0.7507926	-0.0207787	0.8552688	0.0098661
	(0.0523)	(0.4891)	(0.1727)	(0.0214)	(0.0497)	(0.0687)	(0.1888)	(0.0732)
A3_15	0.0016520	-0.0164874	-0.0152554	0.0351966	0.3714394	0.0512133	0.4825513	0.0313641
	(0.0023)	(0.0670)	(0.0446)	(0.0066)	(0.0639)	(0.0680)	(0.2067)	(0.0051)
A3_16	-0.1415078	-0.0559234	0.2882459	0.1653898	1.0360595	-0.2672320	0.5302130	0.0109830
	(0.1268)	(0.6122)	(0.2313)	(0.0473)	(0.0704)	(0.0979)	(0.2496)	(0.2083)
A3_17	-0.0177357	-0.0943778	0.1422744	0.0377389	0.5431196	0.0104590	0.2382137	0.0041557
	(0.0595)	(0.8399)	(0.1573)	(0.0149)	(0.0821)	(0.0734)	(0.7504)	(0.1669)
A3_18	-0.2559324	0.5413096	0.2265740	1.1823415	0.9323375	-0.4909791	0.3897536	1.1995922
	(0.1146)	(0.1108)	(0.0783)	(0.7243)	(0.1473)	(0.3824)	(0.2706)	(0.7468)
A3_19	-0.2225809	0.1948106	0.5065712	0.5520596	1.2858091	-0.6447478	0.2693526	0.5018500
	(0.0795)	(0.1593)	(0.1186)	(0.1491)	(0.1270)	(0.1784)	(0.1898)	(0.2222)
A3_20	-0.0188379	-0.0444489	0.0072423	0.0568228	0.1393183	-0.0361928	0.2000670	0.0270282
	(0.0219)	(0.1019)	(0.0713)	(0.0239)	(0.0749)	(0.0853)	(0.5741)	(0.0186)
A3_21	0.0110634	0.1731682	0.0716048	0.0326749	0.1511695	-0.0684675	500.0000000	
	(0.0008)	(0.0364)	(0.0389)	(0.0045)	(0.0587)	(0.0584)	(6.1372)	(0.0002)
A3_22	-0.0506141	-0.1885450	0.1504321	0.0714647	0.8907375	-0.1236555	0.6987516	0.0060311
	(0.0987)	(1.2085)	(0.2656)	(0.0342)	(0.1140)	(0.1579)	(0.4348)	(0.1655)
A3_23	-0.1410706	0.1718338	0.3623359	0.6773308	1.3157663	-0.9075319	0.3964068	0.5082128
	(0.0610)	(0.1656)	(0.1082)	(0.2690)	(0.2360)	(0.3971)	(0.1940)	(0.2008)
A3_24	0.0134672	0.0436385	0.0739681	0.0331504	0.3888595	0.1165716	4.3422045	0.0294138
	(0.0025)	(0.1299)	(0.1099)	(0.0026)	(0.0249)	(0.0272)	(0.2539)	(0.0031)
A3_25	0.0035863	0.9659411	0.0273092	-0.0362439	0.6002313	0.4435389	500.0000000	0.7373683
	(0.0012)	(0.0164)	(0.0165)	(0.0253)	(0.0590)	(0.0614)	(6.1895)	(0.0035)
A3_26	-0.0768939	0.6137386	0.2219213	0.9858695	0.8544031	-0.4874912	0.8064033	1.1693458
	(0.0292)	(0.0516)	(0.0408)	(0.4071)	(0.0847)	(0.2741)	(0.1645)	(0.3102)
A3_27	0.1964703	1.2110189	-0.2711114	0.3743822	0.6855418	0.2198229	500.0000000	3.3862273
	(0.1557)	(0.1039)	(0.1055)	(0.1483)	(0.0568)	(0.0573)	(8.2516)	(0.0156)
A3_28	0.0094886	0.9658607	0.0324579	1.3832783	0.6622454	0.1048842	429.8398500	5.1374629
	(0.0170)	(0.0433)	(0.0435)	(0.2461)	(0.0536)	(0.0541)	(3642.7294)	(55.9576)

A3_29	0.0009320	-0.2224620	-0.0023494	0.0157173	0.3318612	0.0354738	0.5447260	0.0075959
	(0.0063)	(0.3125)	(0.0893)	(0.0027)	(0.0375)	(0.0362)	(0.3624)	(0.0122)
A3_30	0.0010171	0.0964074	0.1146585	0.0634103	0.4155401	-0.0240288	0.5049047	0.0648792
	(0.0060)	(0.0714)	(0.0409)	(0.0148)	(0.0512)	(0.0657)	(0.2595)	(0.0149)
A3_31	-0.0197417	-0.4694412	0.1773561	0.0548876	1.0452829	-0.1511879	0.4740939	0.0511869
	(0.0340)	(0.7568)	(0.1510)	(0.0183)	(0.0946)	(0.0667)	(0.5682)	(0.0983)
A3_32	0.0038320	0.0873933	0.0359083	0.0234366	0.1037007	0.0771384	0.7802205	0.0218299
	(0.0007)	(0.0300)	(0.0312)	(0.0033)	(0.0352)	(0.0349)	(0.1819)	(0.0022)
A3_33	-0.0774513	0.4736470	-0.1545017	0.6707165	0.1074906	0.0310625	0.6746459	0.3383348
	(0.0193)	(0.0434)	(0.0618)	(0.0792)	(0.0647)	(0.0516)	(0.0873)	(0.0327)
A3_34	0.0104870	0.2819870	-0.0047455	0.0815904	0.3216104	0.1334432	1.5407050	0.0776524
	(0.0023)	(0.0547)	(0.0619)	(0.0142)	(0.0515)	(0.0557)	(0.2061)	(0.0072)
A3_35	-0.4409792	0.5390410	-0.0306756	0.8649706	0.3735792	0.0372081	0.2151027	0.3957434
	(0.4864)	(0.1831)	(0.2538)	(0.9863)	(0.3259)	(0.2778)	(0.8029)	(0.9127)
A3_36	-0.1420080	0.6143918	0.1187089	0.1575408	1.0044486	-0.1034582	0.5182537	0.0211392
	(0.2937)	(0.5625)	(0.1937)	(0.1465)	(0.1080)	(0.1748)	(0.4610)	(1.4064)

STAR estimates for Level II ADR Europe cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i}\Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i}\Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i}\Delta w_{t-i}\right)G(s_{t-d};\gamma,c) + \varepsilon_t$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	C
E2_1	0.0410163	0.1890424	0.2473354	0.2443714	0.2579256	0.0654810	45.7167460	0.2492830
	(0.0045)	(0.0498)	(0.0498)	(0.0119)	(0.0254)	(0.0262)	(61.8209)	(1.5142)
E2_2	-0.1738803	-0.2605371	0.2896828	0.1847260	0.5642385	-0.0078731	0.6782555	0.0050369
	(0.1206)	(0.4387)	(0.1634)	(0.0427)	(0.0567)	(0.0882)	(0.2507)	(0.1056)
E2_3	0.0069827	0.2702919	-0.0245120	0.0255996	-0.1300236	0.0800142	1.6002723	0.0192442
	(0.0018)	(0.0735)	(0.0944)	(0.0045)	(0.0764)	(0.0600)	(0.4213)	(0.0027)
E2_4	0.0006959	0.0289119	-0.1230876	0.0175010	0.0908190	0.1278522	0.8651213	0.0097766
	(0.0039)	(0.0824)	(0.1196)	(0.0024)	(0.0294)	(0.0278)	(0.2916)	(0.0045)
E2_5	0.0034201	0.2359264	0.2177496	0.0540559	0.3920011	0.1845229	38.5235980	0.0926801
	(0.0004)	(0.0385)	(0.0387)	(0.0036)	(0.0258)	(0.0266)	(30.6969)	(0.2400)
E2_6	-0.0153960	-0.0484910	0.2575123	0.0572052	0.8788984	-0.1428855	0.6308890	0.0503572
	(0.0065)	(0.1364)	(0.0465)	(0.0100)	(0.0426)	(0.0615)	(0.1095)	(0.0159)
E2_7	0.0022189	0.1102246	0.0171104	0.0155571	0.0738835	0.0395600	1.5931091	0.0101001
	(0.0009)	(0.0535)	(0.0578)	(0.0013)	(0.0285)	(0.0287)	(0.1747)	(0.0010)
E2_8	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
E2_9	0.4336059	0.1948860	0.0326664	0.4928225	0.1375411	0.0485554	1.1419534	0.5850088
	(0.0362)	(0.0434)	(0.0506)	(0.0325)	(0.0334)	(0.0336)	(0.2547)	(0.0058)
E2_10	-0.1745202	0.9232112	0.1513686	0.9813962	-0.3598842	-0.3352345	0.6675963	0.5625486
	(0.2312)	(0.2570)	(0.1288)	(1.5023)	(1.6581)	(0.6680)	(1.0970)	(0.7053)
E2_11	0.0044701	0.0225371	-0.0127631	0.0137233	0.1116328	0.0721926	2.1551442	0.0105540
	(0.0004)	(0.0441)	(0.0445)	(0.0009)	(0.0230)	(0.0232)	(0.1361)	(0.0006)
E2_12	0.0012244	0.0885576	-0.1603568	0.0206193	0.2100803	0.0371450	1.5694666	0.0118798
	(0.0020)	(0.0926)	(0.1018)	(0.0020)	(0.0315)	(0.0317)	(0.1763)	(0.0020)
E2_13	-0.0082388	-0.1200230	0.0465081	0.0460766	0.6645357	-0.1274496	0.6259920	0.0297399
	(0.0089)	(0.2125)	(0.0710)	(0.0098)	(0.0307)	(0.0361)	(0.2527)	(0.0126)

E2_14	-0.0147505	0.3036827	0.2322995	0.2219993	-0.0793590	-0.0686203	1.0959561	0.1274302
	(0.0057)	(0.0438)	(0.0473)	(0.0135)	(0.0235)	(0.0235)	(0.1085)	(0.0075)
E2_15	0.0934071	0.0125880	0.0056359	0.1172225	0.4270396	0.0882690	2.5460523	0.1463104
	(0.0061)	(0.0492)	(0.0418)	(0.0073)	(0.0192)	(0.0226)	(0.0705)	(0.0039)
E2_16	0.0036456	0.0272983	0.0360670	0.0078795	0.2105640	0.1021185	2.1980929	0.0079395
	(0.0005)	(0.0939)	(0.0810)	(0.0012)	(0.0325)	(0.0344)	(0.3734)	(0.0013)
E2_17	-7.0268172	-3.9887793	4.3001854	7.0703124	4.0405022	-3.6358435	0.0980930	0.0326850
	(83.0981)	(47.7683)	(46.7619)	(66.5340)	(37.6622)	(37.5134)	(10.2807)	(30.3624)
E2_18	-0.0028652	-0.2815916	-0.1304121	0.0105495	0.1847238	0.0712314	1.4008166	0.0017607
	(0.0090)	(0.4324)	(0.2791)	(0.0012)	(0.0248)	(0.0268)	(0.3736)	(0.0057)
E2_19	-0.0691350	0.8155806	-0.0551000	0.1457474	0.8671264	-0.0283492	0.2776007	0.1767394
	(0.1844)	(0.2110)	(0.2663)	(0.1398)	(0.1004)	(0.1399)	(0.7581)	(0.8626)
E2_20	0.0031159	0.0074944	0.0176347	0.0108985	0.1439792	0.0681674	1.6452714	0.0074088
	(0.0011)	(0.0790)	(0.0704)	(0.0009)	(0.0229)	(0.0246)	(0.2245)	(0.0013)
E2_21	0.0346621	0.4280163	-0.0430136	0.1228459	0.2209384	0.0899158	0.9850994	
	(0.0040)	(0.0446)	(0.0583)	(0.0105)	(0.0375)	(0.0323)	(0.0959)	(0.0055)
E2_22	0.0000381	0.7010599	0.2976550	0.3111303	0.2207505	0.1068633	499.9995000	0.4311726
	(0.0007)	(0.0297)	(0.0296)	(0.0274)	(0.0479)	(0.0473)	(4938.3542)	(5.0205)
E2_23	0.0869919	0.4511833	0.4312848	1.4990598	-0.2386969	-0.2426163	0.4694780	1.0038479
	(0.0402)	(0.0515)	(0.0497)	(0.4739)	(0.2483)	(0.2199)	(0.3466)	(0.0549)
E2_24	0.0243033	1.4255894	-0.1830838	0.0485842	0.6455494	0.1869812	14.1931880	0.1972459
	(0.0329)	(0.2279)	(0.3055)	(0.0279)	(0.0885)	(0.0962)	(25.5749)	(0.2886)
E2_25	0.0561007	0.3364791	0.1914781	0.3189812	-0.0043354	-0.0109299	17.2698830	0.2970051
	(0.0025)	(0.0191)	(0.0183)	(0.0235)	(0.0489)	(0.0488)	(0.2877)	(0.0017)
E2_26	0.0034464	0.1358170	0.0970049	0.0362083	0.1977686	-0.1338996	1.9387948	0.0267561
	(0.0002)	(0.0270)	(0.0260)	(0.0067)	(0.0965)	(0.1082)	(0.1485)	(0.0013)
E2_27	0.0042955	0.3583996	0.3267391	0.1054611	0.1809975	-0.0683437	156.7670900	0.0773739
	(0.0004)	(0.0212)	(0.0212)	(0.0046)	(0.0266)	(0.0290)	(235.5869)	(0.5144)
E2_28	-0.0124704	-0.0728767	-0.0077951	0.0520812	0.1104410	0.0811393	0.9579839	0.0205247
	(0.0071)	(0.1104)	(0.1036)	(0.0047)	(0.0330)	(0.0343)	(0.1368)	(0.0050)

E2_29	0.0081975	0.0820319	0.0648515	0.0681923	0.2467115	-0.0784248	0.7987216	0.0571368
	(0.0024)	(0.0511)	(0.0426)	(0.0163)	(0.0763)	(0.0934)	(0.2226)	(0.0075)
E2_30	-0.0044325	-0.0752905	-0.0001365	0.0121020	0.0513915	0.0437704	0.4841251	0.0016301
	(0.0134)	(0.1829)	(0.1451)	(0.0030)	(0.0429)	(0.0462)	(0.6726)	(0.0114)
E2_31	-0.0064543	0.3598780	-0.0552026	0.0170472	0.0727563	0.0248946	0.9772013	0.0044902
	(0.0100)	(0.1658)	(0.1465)	(0.0025)	(0.0475)	(0.0351)	(0.4166)	(0.0054)
E2_32	-0.0200245	0.4893940	0.3188977	0.2682957	-0.0073271	0.0030586	0.2112605	0.1930757
	(0.0582)	(0.1351)	(0.1436)	(0.1523)	(0.2737)	(0.2184)	(0.6700)	(0.0681)
E2_33	0.0053620	-0.0409864	-0.0276779	0.0089263	0.3050525	0.1502776	2.4997613	0.0095722
	(0.0004)	(0.0664)	(0.0546)	(0.0007)	(0.0202)	(0.0216)	(0.1650)	(0.0008)
E2_34	0.0041609	0.0052548	-0.0001228	0.0089473	0.1238530	0.0706393	2.3870582	0.0078215
	(0.0003)	(0.0496)	(0.0477)	(0.0007)	(0.0206)	(0.0211)	(0.2116)	(0.0006)
E2_35	0.0036616	0.1362437	0.1688945	0.0203933	-0.0069429	-0.0296521	37.3812250	0.0174868
	(0.0003)	(0.0320)	(0.0322)	(0.0021)	(0.0447)	(0.0448)	(1.8435)	(0.0001)
E2_36	-0.0756232	0.1201798	0.2654298	0.2280946	0.4593114	-0.0705849	0.7190872	0.1234447
	(0.0209)	(0.0926)	(0.0612)	(0.0359)	(0.0401)	(0.0718)	(0.1108)	(0.0346)
E2_37	-0.0027073	0.0273345	0.0966357	0.0580443	0.2608578	-0.3158052	0.4924682	0.0358122
	(0.0051)	(0.0619)	(0.0498)	(0.0115)	(0.0633)	(0.0889)	(0.2689)	(0.0063)
E2_38	-0.0132179	0.0149999	0.1258648	0.0151300	0.0634641	0.0585203	0.5431707	0.0080500
	(0.0135)	(0.1418)	(0.1350)	(0.0033)	(0.0383)	(0.0423)	(0.4405)	(0.0139)
E2_39	0.0045543	0.2505639	0.1921430	0.0777226	0.3761088	0.2111658	47.8699720	0.1500448
	(0.0003)	(0.0272)	(0.0271)	(0.0075)	(0.0370)	(0.0371)	(302.3137)	(2.3835)
E2_40	-0.0018785	0.3411005	-0.0535746	0.0146367	0.0891679	0.1265690	1.2139386	0.0037704
	(0.0135)	(0.2203)	(0.2192)	(0.0017)	(0.0275)	(0.0212)	(0.5801)	(0.0108)
E2_41	-0.0175357	-0.3571638	0.4823953	0.0450018	0.9424248	-0.2332731	0.9766641	0.0270996
	(0.0155)	(0.4300)	(0.1868)	(0.0091)	(0.0531)	(0.0720)	(0.2144)	(0.0247)
E2_42	0.0019592	0.2951482	0.0303777	0.0152670	0.1783945	0.1016645	1.6344064	0.0120019
	(0.0008)	(0.0445)	(0.0545)	(0.0014)	(0.0295)	(0.0270)	(0.1630)	(0.0012)
E2_43	-0.1143002	-0.4475954	1.7095749	0.1234566	0.6450081	-1.1981249	0.0962447	0.0031687
	(2.0138)	(9.0059)	(24.7690)	(1.5644)	(6.8994)	(19.2663)	(14.8488)	(0.4952)

E2_44	-0.0393226	0.0287930	0.1381644	0.1608238	0.0866636	0.0178090	1.0124185	0.0650192
	(0.0164)	(0.1185)	(0.1152)	(0.0122)	(0.0314)	(0.0364)	(0.1209)	(0.0141)

STAR estimates for Level III ADR Europe cross-market premiums. C is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	c
E3_1	-0.0181836	-0.0880515	0.1847786	0.0304227	0.1544275	-0.0208768	0.7839247	0.0030599
	(0.0347)	(0.2539)	(0.2082)	(0.0055)	(0.0353)	(0.0458)	(0.5405)	(0.0205)
E3_2	-0.0421765	0.4403854	0.3301097	0.1233084	-0.1707632	-0.3109956	0.0947284	0.0584777
	(0.5552)	(2.0583)	(2.1638)	(0.7750)	(2.8771)	(3.0291)	(7.9295)	(0.2951)
E3_3	0.0191750	0.2001523	0.0511400	0.0330188	0.2556430	-0.0099061	1.6383446	0.0334736
	(0.0016)	(0.0472)	(0.0443)	(0.0023)	(0.0237)	(0.0266)	(0.2262)	(0.0022)
E3_4	-0.0064745	-0.2866507	0.2011703	0.0657476	0.9305294	-0.3129059	0.3963058	0.0551152
	(0.0081)	(0.1954)	(0.0692)	(0.0116)	(0.0470)	(0.0569)	(0.1686)	(0.0164)
E3_5	0.0024222	0.0854089	0.0143472	0.0157542	0.1514289	0.0226014	1.1519567	0.0110155
	(0.0018)	(0.0693)	(0.0663)	(0.0020)	(0.0308)	(0.0325)	(0.2701)	(0.0022)
E3_6	-0.0094615	-0.1914782	0.1431832	0.0655039	0.3391686	-0.0367598	1.4908189	0.0336414
	(0.0033)	(0.0812)	(0.0517)	(0.0040)	(0.0218)	(0.0287)	(0.0625)	(0.0037)
E3_7	-0.0212562	0.4333367	0.3333029	0.2575106	0.6052518	-0.4577042	0.7281245	0.2317990
	(0.0113)	(0.0454)	(0.0423)	(0.1090)	(0.0842)	(0.2951)	(0.2648)	(0.0675)
E3_8	-0.0121336	0.0133912	0.0094041	0.0507322	0.1586564	0.0056894	0.8505279	0.0216719
	(0.0114)	(0.1207)	(0.1056)	(0.0084)	(0.0441)	(0.0497)	(0.2742)	(0.0087)
E3_9	0.0490466	-0.2818025	0.6418585	0.0125166	0.9785920	-0.0152831	2.8349468	0.0167747
	(0.0668)	(2.4758)	(1.2769)	(0.0097)	(0.0313)	(0.0332)	(0.6695)	(0.3640)
E3_10	-0.0211889	-0.5234450	0.1052730	0.0416579	0.6526731	0.1013684	0.7042543	0.0035823
	(0.0225)	(0.5527)	(0.0931)	(0.0069)	(0.0287)	(0.0344)	(0.1748)	(0.0415)
E3_11	0.0000000	0.3736783	0.1895611	0.1842748	-0.0520065	-0.0476584	3.1312679	0.1058641
	(0.0013)	(0.0510)	(0.0559)	(0.0108)	(0.0349)	(0.0317)	(0.0931)	(0.0048)
E3_12	-0.0357465	0.5749858	-0.0695704	0.0665509	-0.2134876	0.2255046	0.0859739	0.0366252
	(0.7445)	(5.7375)	(2.1750)	(0.6979)	(5.3703)	(2.0056)	(14.3319)	(0.3652)
E3_13	0.0100751	0.2514799	0.0922511	0.0219487	0.7875420	0.0258667	1.5488976	0.0456905
	(0.0040)	(0.2491)	(0.0676)	(0.0060)	(0.0327)	(0.0398)	(0.3476)	(0.0293)

E3_14	0.5488802	-0.6451019	-0.1967839	0.1258609	0.4676896	0.1385827	0.2444698	0.2907125
	(0.1336)	(0.3454)	(0.1340)	(0.0259)	(0.0750)	(0.0466)	(0.3579)	(0.0215)
E3_15	0.0041917	-0.0124165	0.0211172	0.0429276	0.1186545	0.0263453	2.8057829	0.0249054
	(0.0007)	(0.0485)	(0.0461)	(0.0018)	(0.0201)	(0.0206)	(0.0740)	(0.0010)
E3_16	-0.0013293	0.0048560	0.0663549	0.0363274	0.4131828	-0.1047851	0.5861693	0.0265324
	(0.0033)	(0.0892)	(0.0508)	(0.0070)	(0.0376)	(0.0445)	(0.2295)	(0.0052)
E3_17	0.0087126	0.1016383	0.0205438	0.0196835	0.2701309	-0.0170629	1.8689627	0.0234162
	(0.0005)	(0.0410)	(0.0354)	(0.0028)	(0.0341)	(0.0377)	(0.2789)	(0.0018)
E3_18	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
E3_19	-0.0064726	-0.1456547	-0.1015264	0.0185470	0.1417620	0.0439695	0.9937496	0.0024272
	(0.0160)	(0.2757)	(0.2097)	(0.0024)	(0.0263)	(0.0280)	(0.4088)	(0.0108)
E3_20	0.0019993	0.2628575	0.0904135	0.0167427	-0.0163672	0.0070769	0.4604536	0.0200366
	(0.0032)	(0.0609)	(0.0353)	(0.0056)	(0.0904)	(0.0469)	(0.7604)	(0.0067)
E3_21	0.0063937	0.1070432	0.0424116	0.0178625	0.0596519	0.0613446	2.1693592	
	(0.0006)	(0.0487)	(0.0509)	(0.0023)	(0.0387)	(0.0398)	(0.2911)	(0.0013)
E3_22	-0.0028379	0.4118321	0.1063884	0.1005656	0.5609451	0.1807658	0.6991584	0.1327705
	(0.0195)	(0.1973)	(0.1982)	(0.0352)	(0.0574)	(0.0708)	(0.2101)	(0.0906)
E3_23	-0.0118860	0.6136958	0.1738632	1.2869968	0.1352361	-0.3688690	1.3933845	0.8822619
	(0.0087)	(0.0375)	(0.0398)	(0.2121)	(0.0913)	(0.1013)	(0.1380)	(0.0662)

STAR estimates for Level II ADR Latin America cross-market premiums. C is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as

$$\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i}\Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i}\Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i}\Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i}\Delta w_{t-i}\right)G(s_{t-d};\gamma,c) + \varepsilon_t$$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	c
LA2_1	0.0144329	0.5974027	0.0915664	0.0666943	1.0810115	-0.2099796	2.4204780	0.2339186
	(0.0026)	(0.0638)	(0.0364)	(0.0169)	(0.0366)	(0.0432)	(0.2699)	(0.0256)
LA2_2	-0.0475715	0.1616078	-0.0139910	0.1696218	0.2019299	0.0440899	1.1650536	0.0730315
	(0.0161)	(0.0947)	(0.0975)	(0.0172)	(0.0377)	(0.0387)	(0.1095)	(0.0161)
LA2_3	0.0073855	0.0274382	-0.0460008	0.0123775	0.2615446	0.0436830	1.6712785	0.0142531
	(0.0009)	(0.1057)	(0.0815)	(0.0021)	(0.0386)	(0.0410)	(0.4364)	(0.0032)
LA2_4	-0.0111312	-0.4980194	0.2544162	0.0315830	0.6895874	-0.2064269	0.5128414	0.0114960
	(0.0126)	(0.4412)	(0.1480)	(0.0050)	(0.0462)	(0.0507)	(0.2424)	(0.0175)
LA2_5	0.0072601	0.2784949	0.3008333	0.0007433	0.9613039	0.0309845	31.8416810	0.0336589
	(0.0025)	(0.2392)	(0.1415)	(0.0014)	(0.0234)	(0.0235)	(0.7191)	(0.0096)
LA2_6	-0.1598868	1.1185126	-0.2788884	0.4958617	0.9372722	0.0171186	1.0057200	1.5173871
	(0.4699)	(0.1928)	(0.4129)	(0.3597)	(0.0411)	(0.0332)	(0.3783)	(5.1880)
LA2_7	-0.0447376	-0.6907744	0.1553554	0.0725470	0.9617126	-0.0750403	3.2550033	0.0158239
	(0.0444)	(0.7196)	(0.0954)	(0.0133)	(0.0250)	(0.0314)	(0.2346)	(0.0748)
LA2_8	-0.0154258	1.8866216	1.4957717	0.0249705	-0.0325509	0.0401697	445.4489900	0.0182773
	(0.0127)	(0.5595)	(0.7309)	(0.0066)	(0.1160)	(0.1168)	(56.6530)	(0.0012)
LA2_9	0.0080462	0.2281644	0.0716448	0.0160394	0.3971518	0.0092177	3.4214049	0.0208814
	(0.0006)	(0.0502)	(0.0432)	(0.0017)	(0.0271)	(0.0309)	(0.3207)	(0.0015)
LA2_10	0.0060137	0.9890405	0.0111372	0.0377808	0.8349244	0.1531697	499.9894400	2.9089483
	(0.0056)	(0.0219)	(0.0221)	(0.0263)	(0.0327)	(0.0327)	(24.6732)	(0.2192)
LA2_11	-0.0043855	-0.2263255	0.3384544	0.0395531	0.7103537	-0.3901891	0.3262072	0.0346458
	(0.0095)	(0.2588)	(0.1721)	(0.0099)	(0.1116)	(0.1137)	(0.4087)	(0.0150)
LA2_12	-0.0791058	1.3383624	1.8675289	0.0887405	-0.5878782	-0.8302932	0.0363393	0.0595269
	(19.5207)	(224.1780)	(313.8652)	(10.3399)	(118.7906)	(166.2660)	(175.0105)	(144.0643)
LA2_13	-1.0510268	0.8618618	0.3943230	1.0683200	-0.2285404	-0.2875005	0.0335946	0.0050305
	(41.4889)	(21.4473)	(13.5146)	(34.7271)	(18.0065)	(11.3876)	(35.7968)	(8.2852)

LA2_14	-0.0308082	0.1985859	0.2175436	0.1462171	0.7085870	-0.3881006	0.4055150	0.0953463
	(0.0126)	(0.0796)	(0.0556)	(0.0328)	(0.0701)	(0.1298)	(0.1990)	(0.0223)
LA2_15	-0.0020721	-0.0522642	0.2383613	0.0382923	0.6318518	-0.3469182	0.3770409	0.0349029
	(0.0069)	(0.1584)	(0.1062)	(0.0086)	(0.0669)	(0.0786)	(0.3668)	(0.0108)
LA2_16	0.0054320	0.2260485	0.1818294	-0.0114689	0.9748121	0.0427401	66.7293650	0.0790845
	(0.0004)	(0.0236)	(0.0238)	(0.0083)	(0.0232)	(0.0240)	(7.4556)	(0.0183)

STAR estimates for Level III ADR Latin America cross-market premiums. C is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The STAR models are corrected for heteroskedasticity. The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	$\alpha_{1,0}$	$\alpha_{1,1}$	$\alpha_{1,2}$	$\alpha_{2,0}$	$\alpha_{2,1}$	$\alpha_{2,2}$	γ	c
LA3_1	-0.0333015	0.1498851	0.0857318	0.1605563	0.1626868	-0.1279576	0.4468913	0.0762237
	(0.0244)	(0.1272)	(0.1203)	(0.0730)	(0.1671)	(0.2160)	(0.3574)	(0.0353)
LA3_2	-0.0313123	0.3612161	0.0228505	0.3023884	0.1946982	-0.1385418	0.5884427	0.1725082
	(0.0099)	(0.0393)	(0.0430)	(0.0481)	(0.0734)	(0.0791)	(0.1075)	(0.0206)
LA3_3	0.0038674	-0.0141007	0.1489210	0.0300536	0.4574194	-0.2748345	0.5188394	0.0319373
	(0.0027)	(0.0846)	(0.0518)	(0.0062)	(0.0657)	(0.0713)	(0.3291)	(0.0061)
LA3_4	0.0027680	0.3443642	0.1053867	0.0279137	0.2297556	-0.1551895	0.5999746	0.0353451
	(0.0037)	(0.0332)	(0.0443)	(0.0184)	(0.0954)	(0.1873)	(0.8186)	(0.0199)
LA3_5	0.0036640	0.0817924	0.1686613	0.0318311	0.2680877	-0.3944166	0.6619299	0.0256967
	(0.0026)	(0.0989)	(0.0673)	(0.0127)	(0.1562)	(0.2395)	(0.5503)	(0.0076)
LA3_6	-0.0156890	0.6461538	0.2381141	0.3522567	0.8520311	-0.6081616	1.1145089	0.4085728
	(0.0078)	(0.0464)	(0.0383)	(0.0688)	(0.0544)	(0.1309)	(0.1615)	(0.0486)
LA3_7	-0.0438710	0.0742018	-0.2032731	0.1463313	0.2879396	0.0993080	1.5289906	0.0619209
	(0.0175)	(0.1114)	(0.1269)	(0.0107)	(0.0256)	(0.0267)	(0.0866)	(0.0166)
LA3_8	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LA3_9	0.0047649	0.1445898	-0.0121668	0.0594353	-0.1947039	-0.2649361	0.9539420	0.0327279
	(0.0043)	(0.0927)	(0.0941)	(0.0288)	(0.2643)	(0.2196)	(0.5465)	(0.0099)
LA3_10	-0.8465095	1.3455349	-0.8038036	1.0860579	-0.4983962	0.8216421	0.0735182	0.2414875
	(3.3933)	(3.2489)	(2.9139)	(3.2485)	(3.1143)	(2.6818)	(3.4138)	(1.4379)
LA3_11	0.0082205	-0.1511282	-0.0271335	0.0103062	0.6452704	0.0786055	1.3766683	0.0039102
	(0.0038)	(1.3585)	(0.2735)	(0.0021)	(0.0297)	(0.0321)	(0.5266)	(0.0429)
LA3_12	0.0020643	0.6796389	0.3474420	0.0268786	0.1254301	0.0411722	351.5674000	0.0256858
	(0.0019)	(0.1257)	(0.1449)	(0.0050)	(0.0706)	(0.0730)	(7067.7607)	(3.1899)
LA3_13	0.0799021	0.6850898	0.2267075	0.0011989	1.0422783	-0.0435063	2.6309249	0.9027599
	(0.0556)	(0.2597)	(0.2064)	(0.0025)	(0.0266)	(0.0274)	(0.7134)	(0.0166)

LA3_14	-0.0112749	-0.1751940	0.3637993	0.0215681	0.8210070	-0.0964334	0.4254468	0.0029383
	(0.0234)	(0.8533)	(0.3434)	(0.0064)	(0.0695)	(0.0788)	(0.4423)	(0.0580)
LA3_15	0.0366944	-0.0338029	0.0291803	0.0601532	-0.0657728	-0.0430308	500.0000000	0.0452931
	(0.0069)	(0.1413)	(0.1393)	(0.0095)	(0.0848)	(0.0856)	(41.3594)	(0.0076)
LA3_16	0.0041374	0.1904627	0.0374362	0.0243458	0.1126745	0.0961254	1.5130477	0.0206530
	(0.0008)	(0.0359)	(0.0409)	(0.0026)	(0.0314)	(0.0309)	(0.1755)	(0.0016)
LA3_17	0.0513181	0.6017076	-1.2636832	0.0098753	0.7832416	0.1798987	9.2595695	0.0296450
	(0.0645)	(0.4956)	(2.5016)	(0.0044)	(0.0379)	(0.0377)	(0.9906)	(0.0527)
LA3_18	-0.0882428	-0.1759192	0.0217635	0.0961308	0.7337073	-0.1020881	0.3303770	0.0021820
	(0.0541)	(0.3830)	(0.1104)	(0.0191)	(0.0478)	(0.0668)	(0.1894)	(0.0590)
LA3_19	0.0070880	0.1000367	0.0450534	0.0340090	0.4806860	-0.1672319	1.0044623	0.0355227
	(0.0015)	(0.0652)	(0.0392)	(0.0057)	(0.0396)	(0.0469)	(0.2392)	(0.0042)
LA3_20	0.0066876	0.0334246	0.0240552	0.0226285	0.1608688	-0.0499630	2.9502912	0.0188764
	(0.0005)	(0.0458)	(0.0433)	(0.0025)	(0.0382)	(0.0400)	(0.3004)	(0.0010)
LA3_21	-0.0198190	-0.4545658	0.1472723	0.0308689	0.8322275	-0.0515046	0.8090336	
	(0.0150)	(0.4909)	(0.0860)	(0.0048)	(0.0268)	(0.0334)	(0.1524)	(0.0231)

APPENDIX F

APPENDIX F

ADR CROSS-MARKET PREMIUM STECM ESTIMATES

STECM estimates for Level II ADR Asian cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.
The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d};\gamma,c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
A2_1	LSTAR	-0.048230	-0.544930	0.284550	0.033010	-0.012320	0.023710	10.000000	1.266330	-
		(0.0000)	(0.0000)	(0.1214)	(0.0000)	(0.0363)	(0.0000)	(0.9998)	(0.9745)	-
A2_2	LSTAR	0.142690	-1.623910	0.516940	-0.038500	-0.036120	-0.002440	0.929280	2.654240	-
		(0.9403)	(0.9403)	(0.9404)	(0.9403)	(0.9403)	(0.9406)	(0.0000)	(0.2843)	-
A2_3	ESTAR	-0.005210	-0.291360	-0.278110	-0.004370	-0.002340	-0.008350	0.500000	-0.957210	2.677360
		(0.5505)	(0.0035)	(0.0221)	(0.3980)	(0.4161)	(0.0058)	(0.9888)	(0.0000)	(0.0000)
A2_4	LSTAR	0.001930	-0.328820	0.073410	0.030280	-0.016990	0.010790	10.000000	0.148480	-
		(0.5755)	(0.0000)	(0.0175)	(0.0127)	(0.0415)	(0.0877)	(1.0000)	(0.9936)	-
A2_5	ESTAR	-0.003750	-0.704040	0.523420	-0.004430	-0.009510	0.003480	10.000000	-4.105020	4.784460
		(0.4113)	(0.0000)	(0.0019)	(0.1923)	(0.0059)	(0.0236)	(0.6855)	(0.0000)	(0.0000)
A2_6	LSTAR	0.009430	-0.405250	0.042690	-0.006730	-0.011930	0.008850	10.000000	0.933200	-
		(0.0002)	(0.0862)	(0.3191)	(0.0010)	(0.9283)	(0.0008)	(0.3935)	(0.0000)	-
A2_7	LSTAR	-0.065210	-1.930290	1.328950	0.059580	-0.078690	0.037190	1.266890	1.117560	-
		(0.9806)	(0.9704)	(0.9615)	(0.9827)	(0.9937)	(0.9862)	(0.9966)	(0.5054)	-
A2_8	ESTAR	0.022570	-0.534030	-0.560320	-0.007800	-0.007900	-0.023970	0.500000	-3.857490	1.275280
		(0.0109)	(0.0002)	(0.0021)	(0.0682)	(0.0487)	(0.0000)	(0.1716)	(0.0000)	(0.0000)

A2_9	ESTAR	-0.001180	-0.687270	0.695350	0.032920	-0.115290	-0.004220	10.000000	-0.196340	0.307250
		(0.4019)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.2542)	(0.0448)	(0.0000)	(0.0000)
A2_10	LSTAR	-0.006670	0.179250	-0.051890	-0.009820	0.000030	0.000180	10.000000	-0.196340	-
		(0.0000)	(0.0001)	(0.6219)	(0.1036)	(0.0033)	(0.2734)	(0.0023)	(0.0033)	-
A2_11	ESTAR	-0.036380	0.035240	0.011600	-0.001170	0.001240	0.003730	10.000000	-0.486130	-0.006170
		(0.0000)	(0.5187)	(0.7540)	(0.9359)	(0.5082)	(0.0265)	(1.0000)	(0.0000)	(0.0000)
A2_12	LSTAR	-0.008120	-0.007840	-0.168090	-0.000110	0.000390	-0.000130	10.000000	-0.486130	-
		(0.0000)	(0.6332)	(0.0040)	(0.8189)	(0.0962)	(0.3084)	(0.0002)	(0.2064)	-
A2_13	ESTAR	0.003480	-0.195690	0.112490	-0.009560	-0.012560	-0.000150	10.000000	-0.486130	-0.006170
		(0.0009)	(0.0640)	(0.3240)	(0.0146)	(0.2249)	(0.9851)	(0.3615)	(0.0000)	(0.0024)
A2_14	LSTAR	0.010590	0.545190	-0.564050	0.024600	0.044620	-0.000490	10.000000	-0.486130	-
		(0.0105)	(0.0001)	(0.5317)	(0.2590)	(0.0839)	(0.0001)	(0.0027)	(0.0000)	-
A2_15	ESTAR	0.016510	0.009890	-0.209200	-0.016030	-0.003010	-0.005840	3.559340	-1.735170	0.708060
		(0.0402)	(0.8470)	(0.0277)	(0.0564)	(0.7806)	(0.0158)	(0.9911)	(0.0000)	(0.8500)
A2_16	LSTAR	-18.522780	-111.1119	186.493410	-13.834980	-13.648920	2.054800	3.559340	-1.735170	-
		(0.8361)	(0.9837)	(0.8342)	(0.8361)	(0.8321)	(0.8346)	(0.0974)	(0.0000)	-
A2_17	ESTAR	0.016640	0.377940	-1.076870	-0.001430	0.045890	-0.012100	3.559340	-1.735170	0.708060
		(0.1522)	(0.9334)	(0.2122)	(0.3539)	(0.6459)	(0.3350)	(0.0088)	(0.0000)	(0.0000)
A2_18	ESTAR	0.003270	-0.806790	0.422170	-0.001830	-0.008000	-0.001410	3.559340	-1.735170	0.708060
		(0.2489)	(0.0245)	(0.2045)	(0.6868)	(0.4053)	(0.0156)	(0.0000)	(0.0000)	(1.0000)
A2_19	LSTAR	-46.966890	293.042200	74.165500	-49.147340	-8.649150	-19.037940	3.559340	-1.735170	-
		(0.7035)	(0.6979)	(0.5632)	(0.7035)	(0.6993)	(0.6930)	(0.1891)	(0.0024)	-
A2_20	LSTAR	-0.064620	-0.336830	0.525770	0.012080	-0.081780	0.003890	10.000000	-0.723410	-
		(0.0002)	(0.0987)	(0.0554)	(0.2888)	(0.0000)	(0.7462)	(1.0000)	(0.0000)	-
A2_22	ESTAR	-0.026570	-0.949030	0.378920	0.000840	-0.006610	0.000860	4.852420	-7.170580	3.943450
		(0.0000)	(0.0000)	(0.0005)	(0.2383)	(0.0000)	(0.2144)	(0.5092)	(0.0000)	(0.0000)
A2_23	LSTAR	-0.003680	-0.108140	0.075830	0.009100	-0.001870	-0.001150	10.000000	-0.760220	-
		(0.1318)	(0.1171)	(0.6508)	(0.0000)	(0.3897)	(0.2376)	(0.2644)	(0.0000)	-
A2_24	LSTAR	0.036220	-0.530120	-0.678720	0.027050	-0.002320	-0.038780	1.266890	0.274410	-
		(0.0888)	(0.0120)	(0.0042)	(0.0118)	(0.8347)	(0.0031)	(0.0160)	(0.0428)	-

A2_25	LSTAR	0.065380	1.160310	-1.600910	-0.028100	0.125090	-0.068530	1.404760	3.538580	-
		(0.0007)	(0.0002)	(0.0000)	(0.0003)	(0.0000)	(0.0000)	(0.9987)	(0.5610)	-
A2_26	LSTAR	0.043470	1.530170	0.260430	-0.029990	0.038160	0.027840	0.500000	0.214520	-
		(0.8007)	(0.0012)	(0.2967)	(0.5354)	(0.2331)	(0.2154)	(0.0061)	(0.1558)	-
A2_27	LSTAR	0.023160	-0.283760	-0.008830	0.006440	-0.003950	-0.004470	10.000000	-2.275080	-
		(0.0002)	(0.0819)	(0.6042)	(0.0001)	(0.2254)	(0.0000)	(0.2146)	(0.0000)	-
A2_28	LSTAR	0.510610	-0.639050	-1.831510	0.011340	0.007410	-0.024960	0.500000	-0.083600	-
		(0.4292)	(0.0817)	(0.0327)	(0.9366)	(0.3772)	(0.0367)	(0.0274)	(0.7536)	-

STECM estimates for Level III ADR Asian cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.
The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d};\gamma,c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
A3_1	ESTAR	0.019710	-2.633640	4.232070	-0.252940	-0.938890	0.876340	8.133430	-0.193300	0.208590
		(0.1029)	(0.0000)	(0.0000)	(0.0003)	(0.0001)	(0.0000)	(1.0000)	(0.0000)	(1.0000)
A3_2	LSTAR	-0.045490	2.278360	-3.183700	0.043690	0.402810	-0.121560	1.915100	0.808610	-
		(0.9651)	(0.0000)	(0.9651)	(0.9651)	(0.0000)	(0.9651)	(0.1164)	(0.0000)	-
A3_3	ESTAR	0.005480	-2.829330	1.265920	0.032930	-0.178150	-0.002750	0.500000	-0.076340	0.004640
		(0.3746)	(0.0001)	(0.0029)	(0.0125)	(0.0002)	(0.8714)	(0.0187)	(0.9748)	(0.9748)
A3_4	LSTAR	0.019590	0.100800	-0.166920	-0.004130	0.000460	0.000400	5.966020	-0.290100	-
		(0.0660)	(0.1448)	(0.0370)	(0.0033)	(0.5388)	(0.5268)	(0.0004)	(0.1733)	-
A3_5	LSTAR	-0.080440	-0.012070	0.239440	-0.001230	0.001150	0.002050	1.557630	-1.637040	-
		(0.0107)	(0.9640)	(0.2741)	(0.5969)	(0.6759)	(0.2815)	(0.0229)	(0.0395)	-
A3_6	ESTAR	-0.024000	-1.497920	0.137290	0.012530	0.001610	-0.010370	4.852420	-5.298160	4.994130
		(0.9471)	(0.8426)	(0.9860)	(0.8936)	(0.9982)	(0.9705)	(0.9929)	(0.8113)	(0.6553)
A3_7	LSTAR	-1.112820	1.279070	-0.260160	-0.019290	0.005480	0.002990	0.500000	-12.196400	-
		(0.0015)	(0.0768)	(0.8197)	(0.0173)	(0.0763)	(0.1329)	(0.0002)	(0.0010)	-
A3_8	ESTAR	-0.000260	-0.041830	0.085800	0.004340	-0.001340	-0.001320	0.929280	-0.239960	6.762330
		(0.9458)	(0.8319)	(0.5843)	(0.1587)	(0.6238)	(0.2675)	(0.0103)	(0.1593)	(0.0000)
A3_9	ESTAR	-0.001260	-0.635980	0.334690	-0.005600	-0.026330	0.000630	10.000000	-0.386120	0.773650
		(0.2675)	(0.0000)	(0.0001)	(0.0656)	(0.0000)	(0.8707)	(0.9871)	(0.0000)	(0.9253)
A3_10	LSTAR	0.008460	0.345000	-0.232380	-0.002200	0.010840	0.010640	1.557630	0.034950	-
		(0.3461)	(0.1441)	(0.3028)	(0.6693)	(0.3220)	(0.0254)	(0.1217)	(0.7991)	-
A3_11	LSTAR	-0.756980	3.921040	3.523680	0.392370	1.038090	1.331920	0.614750	2.428970	-
		(0.9597)	(0.9599)	(0.9597)	(0.9599)	(0.9598)	(0.9597)	(0.0589)	(0.5543)	-
A3_12	LSTAR	0.171950	-1.532080	-0.766370	-0.008770	-0.004040	-0.002760	9.018550	9.819290	-
		(0.2582)	(0.0555)	(0.4712)	(0.5678)	(0.5195)	(0.4632)	(0.0897)	(0.0000)	-

A3_13	LSTAR	0.107390	0.492300	-0.782760	-0.130560	0.043520	0.013770	5.966020	0.557350	-
		(0.0020)	(0.1899)	(0.0613)	(0.0144)	(0.1691)	(0.2237)	(0.2885)	(0.0000)	-
A3_15	ESTAR	0.000740	0.144690	-0.052060	-0.001500	-0.005090	0.001150	10.000000	-1.070540	4.419140
		(0.4927)	(0.2476)	(0.6051)	(0.0617)	(0.0000)	(0.5213)	(0.9999)	(0.8825)	(0.8830)
A3_16	ESTAR	0.010240	0.065340	0.159810	0.005690	0.000640	0.002770	10.000000	-1.070540	4.419140
		(0.0000)	(0.7987)	(0.0151)	(0.0001)	(0.9194)	(0.0044)	(0.9902)	(0.8089)	(0.0000)
A3_17	LSTAR	0.249910	0.621090	-1.824510	-0.084570	0.032120	0.011230	10.000000	1.910200	-
		(0.0000)	(0.0167)	(0.0000)	(0.0000)	(0.0003)	(0.4981)	(0.0541)	(0.0000)	-
A3_18	ESTAR	-0.005560	1.496030	-1.601880	0.035100	-0.009050	-0.006000	5.380480	-1.577440	1.409860
		(0.4635)	(0.0000)	(0.0000)	(0.0021)	(0.0568)	(0.0543)	(0.3517)	(0.0000)	(0.0000)
A3_19	ESTAR	-0.000660	0.540910	-0.961470	0.032680	0.004300	-0.007540	10.000000	-0.761570	0.581530
		(0.6210)	(0.0005)	(0.0000)	(0.0113)	(0.7552)	(0.1115)	(1.0000)	(0.0000)	(1.0000)
A3_20	ESTAR	0.003500	0.210840	-0.472190	-0.001210	-0.001650	0.006490	3.946680	-2.496340	3.611550
		(0.0029)	(0.1606)	(0.0000)	(0.1620)	(0.0581)	(0.0030)	(0.9999)	(0.9964)	(0.8507)
A3_21	LSTAR	0.093590	-3.020520	1.468620	-0.023530	-0.065220	0.040020	2.123510	1.314950	-
		(0.2022)	(0.0229)	(0.0602)	(0.5858)	(0.0122)	(0.2010)	(0.0044)	(0.0000)	-
A3_23	LSTAR	0.824850	-0.481340	1.786140	0.007740	-0.009450	0.036380	0.500000	-0.687050	-
		(0.0811)	(0.1670)	(0.1316)	(0.2135)	(0.5551)	(0.1178)	(0.0209)	(0.1940)	-
A3_25	LSTAR	0.027830	0.616100	-0.650800	0.000400	0.003130	0.002840	7.335180	2.658540	-
		(0.6112)	(0.0049)	(0.0051)	(0.3301)	(0.0000)	(0.0689)	(1.0000)	(1.0000)	-
A3_26	LSTAR	-0.005410	-0.087610	0.168460	-0.020870	0.008990	0.008820	10.000000	-0.056200	-
		(0.3140)	(0.7388)	(0.4935)	(0.1040)	(0.4239)	(0.2074)	(0.2042)	(0.0233)	-
A3_28	LSTAR	1.113160	0.275920	-0.047280	-0.099510	0.198110	0.092440	0.681650	-0.142700	-
		(0.4731)	(0.5603)	(0.8850)	(0.6816)	(0.5997)	(0.6811)	(0.5133)	(0.7912)	-
A3_29	LSTAR	0.087580	1.891580	-1.457350	-0.009420	0.003660	0.037290	1.030410	2.411190	-
		(0.2426)	(0.0085)	(0.0260)	(0.2534)	(0.5488)	(0.0306)	(0.0206)	(0.0128)	-
A3_30	LSTAR	0.160640	1.929390	-2.193840	-0.007820	0.035590	-0.013420	0.500000	3.440310	-
		(0.6271)	(0.3082)	(0.3123)	(0.6890)	(0.3621)	(0.1081)	(0.5338)	(0.1881)	-
A3_31	ESTAR	-0.021140	1.925750	1.323230	-0.006180	0.019450	0.045930	0.681650	-2.063260	2.449240
		(0.0165)	(0.0285)	(0.0018)	(0.0478)	(0.5173)	(0.0000)	(0.0024)	(0.0000)	(0.0000)

A3_32	LSTAR	-0.247370	1.156610	0.341140	-0.032290	0.017820	-0.001950	1.030410	-8.553740	-
		(0.4293)	(0.6635)	(0.7912)	(0.4146)	(0.3448)	(0.9409)	(0.0782)	(0.0290)	-
A3_33	LSTAR	0.327250	0.851980	-0.226180	-0.317300	0.324150	0.143190	0.929280	0.118830	-
		(0.0000)	(0.0006)	(0.4578)	(0.0000)	(0.0315)	(0.0045)	(0.0000)	(0.0001)	-
A3_34	LSTAR	-0.122910	-0.864940	-0.914840	0.038710	0.139460	-0.067550	0.755830	-0.066570	-
		(0.2757)	(0.0038)	(0.0092)	(0.8363)	(0.2229)	(0.3733)	(0.0001)	(0.0601)	-
A3_35	LSTAR	-0.180810	0.757900	-1.226980	0.265760	-0.158730	-0.201810	10.000000	0.410060	-
		(0.0004)	(0.1305)	(0.0444)	(0.1152)	(0.0006)	(0.0084)	(0.6086)	(0.0000)	-

STECM estimates for Level II ADR European cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.

The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
E2_1	LSTAR	-0.022020	-6.579140	5.305470	-0.084540	-0.336860	-0.022290	3.559340	1.151950	-
		(0.9103)	(0.2449)	(0.2509)	(0.3098)	(0.1998)	(0.7200)	(0.0236)	(0.0000)	-
E2_2	LSTAR	-0.959290	-3.733600	3.235560	1.152550	-0.014960	0.388060	1.727140	0.968950	-
		(0.9476)	(0.9477)	(0.9476)	(0.9476)	(0.9525)	(0.9476)	(0.0016)	(0.4030)	-
E2_3	ESTAR	-0.185850	3.189550	-0.635560	0.139270	-0.057460	0.372300	5.966020	0.376700	0.527910
		(0.8573)	(0.8764)	(0.9379)	(0.8812)	(0.8206)	(0.8464)	(0.7354)	(0.2656)	(0.2601)
E2_4	ESTAR	-0.015720	-1.472550	0.712570	-0.051420	-0.366060	0.002230	10.000000	-0.166610	0.166770
		(0.0011)	(0.0000)	(0.0244)	(0.1196)	(0.0000)	(0.9858)	(0.8636)	(0.0000)	(0.0000)
E2_7	ESTAR	-0.005630	-1.087460	0.519000	-0.003640	-0.026450	-0.001560	10.000000	-1.576430	1.427170
		(0.0000)	(0.0001)	(0.0167)	(0.0052)	(0.0001)	(0.5567)	(0.9999)	(0.9017)	(0.9973)
E2_10	ESTAR	0.007460	-0.766900	1.699670	-0.022690	-0.034390	0.019180	3.210010	-4.997740	2.738260
		(0.4952)	(0.0087)	(0.0002)	(0.0028)	(0.0000)	(0.0006)	(0.1960)	(0.0000)	(0.0000)
E2_11	LSTAR	-0.019420	0.834410	-0.816930	0.005880	0.024850	0.000390	10.000000	2.212710	-
		(0.3879)	(0.0079)	(0.0292)	(0.3503)	(0.0003)	(0.9857)	(0.8283)	(0.0000)	-
E2_12	ESTAR	-0.014590	2.380930	-1.801540	0.002970	0.042990	0.002700	9.018550	-4.498900	1.951960
		(0.0104)	(0.0045)	(0.0000)	(0.3437)	(0.0075)	(0.7590)	(0.7573)	(0.0000)	(0.0153)
E2_13	LSTAR	-0.015450	-1.922770	0.694180	-0.000070	-0.035100	-0.020190	3.210010	1.521640	-
		(0.7303)	(0.0008)	(0.1727)	(0.7421)	(0.0183)	(0.0025)	(0.0388)	(0.0000)	-
E2_14	ESTAR	1.875000	23.000000	-30.000000	-0.875000	-0.171880	-0.039060	9.018550	-5.939960	5.260770
		(0.4866)	(0.0000)	(0.6743)	(0.0674)	(0.9048)	(0.8925)	(1.0000)	(0.0000)	(1.0000)
E2_15	LSTAR	0.033490	-0.649570	0.513750	-0.027780	-0.034930	0.008110	1.404760	0.920630	-
		(0.6080)	(0.2245)	(0.2432)	(0.1058)	(0.1565)	(0.3993)	(0.2840)	(0.1373)	-
E2_16	ESTAR	-4.375000	-878.0000	983.750000	-0.208500	-14.812500	-2.432130	9.018550	-4.132280	4.023090
		(0.9850)	(0.9653)	(0.9848)	(0.9785)	(0.9867)	(0.9851)	(0.9990)	(0.9701)	(0.9813)

E2_17	LSTAR	-0.314240	3.189570	1.178260	0.073870	-0.010780	0.029520	5.966020	2.811390	-
		(0.0419)	(0.2724)	(0.4652)	(0.0598)	(0.6719)	(0.0602)	(0.0012)	(0.0000)	-
E2_21	ESTAR	-1.346390	-5.547890	-2.312000	0.173260	-0.129560	-0.153590	10.000000	0.925830	0.925830
		(0.0000)	(0.0002)	(0.0041)	(0.0260)	(0.0014)	(0.0029)	(0.0017)	(0.0000)	(0.0000)
E2_22	ESTAR	0.042360	0.591180	-1.175160	-0.002750	0.124450	-0.034350	10.000000	0.476810	1.013600
		(0.0014)	(0.9146)	(0.1055)	(0.1305)	(0.0961)	(0.0135)	(0.4650)	(0.0000)	(0.1730)
E2_23	LSTAR	-1.875030	-3.569930	1.678010	-0.067220	-0.434740	0.183940	3.559340	1.303510	-
		(0.6990)	(0.6638)	(0.6212)	(0.4339)	(0.6514)	(0.5894)	(0.1449)	(0.0910)	-
E2_24	LSTAR	-0.058560	0.626410	-0.492050	-0.016470	0.011970	-0.013130	10.000000	-0.125370	-
		(0.0000)	(0.0003)	(0.0043)	(0.2957)	(0.2329)	(0.2907)	(0.0491)	(0.1167)	-
E2_26	LSTAR	-0.001870	0.804860	-0.564420	-0.004850	-0.004710	0.018450	10.000000	1.097510	-
		(0.9059)	(0.0100)	(0.0280)	(0.1741)	(0.2027)	(0.0161)	(0.9866)	(0.0005)	-
E2_27	ESTAR	-0.002030	-2.142800	2.090660	-0.042350	-0.232830	-0.001440	1.142550	-0.011880	0.048820
		(0.0509)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.8697)	(0.0002)	(0.9332)	(0.9332)
E2_28	LSTAR	-0.002290	-0.183940	0.841840	-0.007680	-0.026340	-0.053180	5.380480	0.361460	-
		(0.4796)	(0.4281)	(0.0000)	(0.1010)	(0.0005)	(0.0008)	(0.2050)	(0.0000)	-
E2_29	LSTAR	-0.612920	15.214510	-11.460460	0.060780	0.386630	-0.089440	2.354600	4.589660	-
		(0.9709)	(0.9709)	(0.0000)	(0.9709)	(0.9709)	(0.9709)	(0.0000)	(0.5833)	-
E2_31	LSTAR	-0.046640	-0.746370	1.642540	0.009750	-0.026660	0.012650	10.000000	1.582580	-
		(0.0004)	(0.0049)	(0.0000)	(0.2342)	(0.0005)	(0.0051)	(0.9993)	(0.7992)	-
E2_32	LSTAR	-18.073350	-12.364590	-57.183500	0.455740	-0.312370	-0.725600	10.000000	4.777830	-
		(0.0000)	(0.9760)	(0.0000)	(0.9760)	(0.9760)	(0.9760)	(0.0008)	(0.4336)	-
E2_33	LSTAR	0.023470	0.767800	-0.241910	-0.003610	0.024540	0.009100	10.000000	2.632280	-
		(0.9651)	(0.4016)	(0.7943)	(0.9027)	(0.3054)	(0.2150)	(0.9998)	(0.9815)	-
E2_34	LSTAR	0.011080	-0.444400	1.133740	-0.003090	-0.003950	0.015670	10.000000	2.372730	-
		(0.2596)	(0.3387)	(0.0274)	(0.2049)	(0.7992)	(0.0072)	(0.9890)	(0.3474)	-
E2_35	LSTAR	-0.016550	0.181670	-0.707880	0.007380	0.010810	-0.001600	10.000000	1.229820	-
		(0.1021)	(0.5618)	(0.0258)	(0.1038)	(0.4822)	(0.5800)	(1.0000)	(0.9959)	-
E2_36	LSTAR	-0.101230	-1.434940	2.145030	0.031370	-0.058180	0.022100	8.133430	1.527060	-
		(0.1011)	(0.3656)	(0.3040)	(0.2466)	(0.1919)	(0.2732)	(0.3306)	(0.0000)	-

E2_38	LSTAR	0.006590	-0.464450	1.170540	-0.006570	-0.009360	0.008620	10.000000	2.236580	-
		(0.0830)	(0.1218)	(0.0057)	(0.0000)	(0.0478)	(0.0002)	(0.6192)	(0.0000)	-
E2_39	LSTAR	-0.003250	-0.148160	0.156580	0.003330	-0.001180	-0.000020	10.000000	-0.104370	-
		(0.0018)	(0.4409)	(0.3116)	(0.0458)	(0.9032)	(0.8631)	(0.9977)	(0.8886)	-
E2_40	LSTAR	0.012960	-0.199800	0.152300	-0.075570	-0.026100	0.026020	10.000000	0.226320	-
		(0.0340)	(0.2511)	(0.2619)	(0.0000)	(0.1757)	(0.0987)	(1.0000)	(1.0000)	-
E2_41	LSTAR	57.589280	982.944040	-1775.3907	-25.644940	87.075560	-39.604800	10.000000	1.400580	-
		(0.9094)	(0.9375)	(0.9303)	(0.9092)	(0.9318)	(0.9250)	(0.6507)	(0.4920)	-
E2_42	LSTAR	0.000410	1.266190	-0.258120	-0.012390	0.058750	0.021100	10.000000	0.767810	-
		(0.4663)	(0.0002)	(0.5034)	(0.0342)	(0.0007)	(0.2374)	(0.9999)	(0.9926)	-
E2_43	ESTAR	11.471750	114.456150	-79.430860	-5.651990	1.937710	-1.711180	10.000000	1.962070	3.077120
		(0.9438)	(0.9436)	(0.9428)	(0.9439)	(0.9431)	(0.9436)	(0.6649)	(0.0185)	(0.5544)
E2_44	LSTAR	-0.003850	-0.293840	0.040400	-0.009150	-0.021490	0.002520	10.000000	0.664030	-
		(0.5349)	(0.1302)	(0.8273)	(0.1975)	(0.0201)	(0.6047)	(0.9981)	(0.0115)	-

STECM estimates for Level III ADR European cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.

The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
E3_1	ESTAR	0.002480	-0.448410	-0.256480	0.066640	-0.005150	-0.022540	5.966020	-0.092150	0.263850
		(0.0207)	(0.0000)	(0.0046)	(0.0000)	(0.9377)	(0.0005)	(0.9999)	(0.9542)	(0.9837)
E3_2	LSTAR	-0.027330	0.073590	1.906300	0.155440	-0.064280	0.106140	3.559340	0.471900	-
		(0.4930)	(0.8665)	(0.0257)	(0.1177)	(0.1663)	(0.0228)	(0.0049)	(0.0000)	-
E3_3	LSTAR	-0.001230	0.558330	0.940560	-0.020310	-0.025130	0.018290	10.000000	0.371640	-
		(0.7811)	(0.0000)	(0.0000)	(0.0060)	(0.0071)	(0.0024)	(0.0001)	(0.0000)	-
E3_4	LSTAR	0.006030	-1.938240	0.214160	0.489090	-0.165970	0.224480	5.380480	0.289780	-
		(0.8880)	(0.0122)	(0.4323)	(0.0026)	(0.1431)	(0.1417)	(0.0361)	(0.0000)	-
E3_5	LSTAR	0.008920	3.356470	-2.759850	-0.018670	0.126880	-0.002610	5.966020	0.827350	-
		(0.1106)	(0.0000)	(0.0000)	(0.9073)	(0.0000)	(0.0404)	(1.0000)	(1.0000)	-
E3_6	LSTAR	-0.820240	1.324020	-0.000890	-0.052670	0.017300	5.966020	-0.334360	0.504390	-
		(0.0000)	(0.0000)	(0.8580)	(0.0000)	(0.0001)	(0.1563)	(0.0000)	(0.0000)	-
E3_7	LSTAR	-0.092950	1.947970	2.448850	0.001810	-0.001650	0.038050	0.614750	1.206110	-
		(0.6662)	(0.5181)	(0.5100)	(0.8703)	(0.9341)	(0.5107)	(0.4193)	(0.1713)	-
E3_8	LSTAR	-0.444510	-1.516400	4.981060	0.259550	-0.162440	0.085080	0.500000	1.823790	-
		(0.6909)	(0.6718)	(0.5987)	(0.6521)	(0.6249)	(0.5715)	(0.1112)	(0.2792)	-
E3_9	ESTAR	0.306860	-0.369370	-0.590420	5.499180	3.367880	0.215340	0.500000	0.004870	0.036940
		(0.0001)	(0.0063)	(0.0859)	(0.0000)	(0.1226)	(0.9369)	(0.0000)	(0.1247)	(0.0000)
E3_10	LSTAR	0.028740	0.582480	-0.186370	0.024090	0.086540	0.015320	10.000000	-0.274300	-
		(0.1075)	(0.0020)	(0.2549)	(0.8885)	(0.0008)	(0.3353)	(0.0310)	(0.0000)	-
E3_11	ESTAR	0.000080	-1.893390	1.897290	0.001120	-0.078500	0.004840	0.500000	-0.655580	0.747980
		(0.9858)	(0.0020)	(0.0024)	(0.5102)	(0.0022)	(0.0979)	(0.2347)	(0.0000)	(0.0000)
E3_12	LSTAR	-0.006420	0.217720	0.011720	-0.048990	0.003820	-0.011380	3.946680	-0.143030	-
		(0.1022)	(0.1119)	(0.9693)	(0.0003)	(0.8484)	(0.2666)	(0.1576)	(0.0166)	-

E3_14	LSTAR	0.022900	0.857680	-0.724080	-0.050960	0.064470	0.097800	3.946680	-0.577790	-
		(0.7346)	(0.0017)	(0.0319)	(0.0000)	(0.0241)	(0.0000)	(0.9987)	(0.0000)	-
E3_15	ESTAR	-0.002090	-0.648390	0.753360	0.005710	-0.022140	0.003850	10.000000	-0.706320	0.492050
		(0.0187)	(0.0000)	(0.0000)	(0.0168)	(0.0000)	(0.2047)	(0.6767)	(0.0000)	(0.0000)
E3_16	LSTAR	0.009110	-1.680370	2.395930	-0.027270	-0.111740	0.022160	4.852420	0.659980	-
		(0.0274)	(0.3260)	(0.0775)	(0.0198)	(0.3102)	(0.0011)	(0.1943)	(0.0000)	-
E3_18	ESTAR	0.002000	-1.549440	1.571130	0.107680	-0.072690	0.017160	2.123510	-0.027470	-0.027470
		(0.7731)	(0.0000)	(0.0000)	(0.0000)	(0.0005)	(0.2077)	(0.0019)	(0.9977)	(0.9977)
E3_19	ESTAR	-0.113580	1.090430	0.659450	-0.282900	0.018760	0.004000	0.500000	-0.732040	-0.680270
		(0.2673)	(0.1784)	(0.4540)	(0.1994)	(0.8632)	(0.7854)	(0.3493)	(0.8872)	(0.8872)
E3_20	ESTAR	0.000540	0.426830	0.008840	-0.000140	-0.012640	0.005630	2.894960	-0.447940	0.508190
		(0.7434)	(0.0021)	(0.6892)	(0.4066)	(0.0001)	(0.5847)	(0.4297)	(0.0000)	(0.0000)
E3_21	LSTAR	0.009780	-0.523560	0.499570	-0.004880	-0.003380	-0.024260	5.380480	-0.712810	-
		(0.6728)	(0.7537)	(0.9320)	(0.6745)	(0.6965)	(0.7782)	(0.1668)	(0.0000)	-
E3_22	LSTAR	-0.041700	-0.234440	0.336150	-0.042320	-0.017860	0.009890	9.018550	-0.313120	-
		(0.0000)	(0.4275)	(0.2110)	(0.0000)	(0.2864)	(0.5125)	(0.8210)	(0.0000)	-
E3_23	ESTAR	0.002320	0.484420	-0.286570	-0.023310	0.021440	0.004260	2.610840	-0.321140	0.778250
		(0.6423)	(0.0025)	(0.0347)	(0.0000)	(0.0552)	(0.5386)	(0.9976)	(0.9474)	(0.0000)

STECM estimates for Level II ADR Latin American cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.
The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d}; \gamma, c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d}; \gamma, c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
LA2_1	LSTAR	0.009730	-0.129370	0.175090	-0.030540	0.004280	0.008940	10.000000	-0.647110	-
		(0.3350)	(0.1216)	(0.0106)	(0.0000)	(0.7377)	(0.2763)	(0.3058)	(0.0000)	-
LA2_2	LSTAR	0.071970	-0.885440	0.384840	0.047800	-0.098280	-0.028810	0.929280	0.699150	-
		(0.1993)	(0.0000)	(0.5526)	(0.0918)	(0.1423)	(0.2486)	(0.5645)	(0.0000)	-
LA2_4	LSTAR	-0.045640	-0.376010	-1.251600	0.095240	0.018520	-0.085730	8.133430	0.215890	-
		(0.0036)	(0.3437)	(0.0560)	(0.0194)	(0.6975)	(0.0021)	(0.1391)	(0.0000)	-
LA2_5	LSTAR	-7.989330	-522.200300	586.970200	6.398090	-84.300920	8.761180	10.000000	0.813610	-
		(0.9587)	(0.0000)	(0.9587)	(0.9588)	(0.9587)	(0.9587)	(0.3556)	(0.1809)	-
LA2_6	LSTAR	3478.930450	2898.221760	-2365.4614	994.864220	-15.889420	1106.354020	10.000000	-1.822710	-
		(0.9010)	(0.9058)	(0.9063)	(0.8986)	(0.8180)	(0.9029)	(0.2945)	(0.0000)	-
LA2_7	LSTAR	0.026670	1.103780	-1.192970	-0.059690	0.014470	-0.156830	2.610840	-0.350070	-
		(0.3196)	(0.0978)	(0.0860)	(0.0175)	(0.9808)	(0.0042)	(0.1102)	(0.0004)	-
LA2_8	LSTAR	-0.031360	-1.291170	0.964140	-0.013170	-0.071590	-0.021740	10.000000	0.938450	-
		(0.0694)	(0.0169)	(0.2818)	(0.0344)	(0.0120)	(0.0354)	(0.5954)	(0.0000)	-
LA2_10	LSTAR	2.586130	0.990710	-0.188310	-0.393440	0.592530	-0.117250	10.000000	-0.745930	-
		(0.0229)	(0.1165)	(0.7464)	(0.0228)	(0.0527)	(0.1167)	(0.9997)	(0.8774)	-
LA2_11	LSTAR	2.215660	14.599010	-0.484890	4.239210	3.145750	1.719590	8.133430	-0.695970	-
		(0.8091)	(0.8364)	(0.9802)	(0.8100)	(0.8215)	(0.8314)	(0.1615)	(0.0044)	-
LA2_11	LSTAR	2.215660	14.599010	-0.484890	4.239210	3.145750	1.719590	8.133430	-0.695970	-
		(0.8091)	(0.8364)	(0.9802)	(0.8100)	(0.8215)	(0.8314)	(0.1615)	(0.0044)	-
LA2_14	LSTAR	-0.001760	0.281860	-0.569030	0.013340	0.087970	-0.031590	7.335180	-0.023870	-
		(0.8524)	(0.3458)	(0.0606)	(0.5356)	(0.0860)	(0.0400)	(0.2682)	(0.5137)	-
LA2_16	LSTAR	-2.764490	-33.995200	38.972840	1.743420	-2.425720	-0.570700	5.380480	1.507390	-
		(0.9804)	(0.0000)	(0.9804)	(0.9804)	(0.9804)	(0.9804)	(0.1215)	(0.6094)	-

STECM estimates for Level III ADR Latin American cross-market premiums. *C* is the size of the band of no arbitrage. The parameter γ determines the smoothness of the change in the value of the logistic function, and thus the transition from one regime to the other. The α coefficients represent the autoregressive parameters in the model and the β coefficients the error correction terms. $\beta_{1,1}$ and $\beta_{1,2}$ represent lagged values of the error correction term.
The STAR model is estimated as $\Delta PR_t = \left(\alpha_{1,0} + \alpha_{1,1} z_{t-1} + \sum_{i=1}^{P_1} \alpha_{1,i} \Delta PR_{t-i} + \sum_{j=1}^{P_2} \beta_{1i} \Delta w_{t-i}\right)\left(1 - G(s_{t-d};\gamma,c)\right) + \left(\alpha_{2,0} + \alpha_{2,1} z_{t-1} + \sum_{j=1}^{P_1} \alpha_{2,i} \Delta PR_{t-j} + \sum_{j=1}^{P_2} \beta_{2i} \Delta w_{t-i}\right) G(s_{t-d};\gamma,c) + \varepsilon_t$

ADR	Model	$a_{1,0}$	$a_{1,1}$	$a_{1,2}$	$\beta_{1,0}$	$\beta_{1,1}$	$\beta_{1,2}$	γ	c_1	c_2
LA3_1	LSTAR	0.024550	-0.125920	-0.507660	-0.005110	0.004930	-0.021230	1.404760	-0.058570	-
		(0.0134)	(0.5556)	(0.0078)	(0.3368)	(0.7081)	(0.0027)	(0.0144)	(0.4654)	-
LA3_2	LSTAR	0.642140	-6.030960	2.929080	-0.197390	-0.543310	-0.280660	1.557630	0.466730	-
		(0.0000)	(0.0148)	(0.1384)	(0.0050)	(0.0876)	(0.0040)	(0.0009)	(0.0000)	-
LA3_3	ESTAR	3.197270	644.328120	-645.828120	4.724850	46.010740	18.768070	10.000000	-1.388150	1.610520
		(0.9776)	(0.9776)	(0.9776)	(0.9776)	(0.9776)	(0.9776)	(0.9373)	(0.6248)	(0.5113)
LA3_4	ESTAR	221.898440	10718.5000	-13443.7500	-73.074220	158.468750	-53.550780	7.335180	-4.405410	2.627880
		(0.9987)	(0.9987)	(0.0000)	(0.9987)	(0.9987)	(0.9987)	(0.9997)	(0.9983)	(0.9980)
LA3_5	ESTAR	-0.002990	-1.007590	0.582910	-0.002260	-0.018150	-0.000660	3.559340	-1.684080	1.622410
		(0.0045)	(0.0000)	(0.0000)	(0.0208)	(0.0000)	(0.6671)	(0.9936)	(0.7359)	(0.0000)
LA3_6	ESTAR	-0.005470	-0.464320	-0.956320	0.003520	-0.017140	-0.031540	8.133430	-1.134570	1.022460
		(0.0361)	(0.0044)	(0.0010)	(0.1635)	(0.0040)	(0.0005)	(0.9999)	(0.9982)	(0.8427)
LA3_7	LSTAR	0.101580	-2.861320	2.090520	-0.097930	-0.108390	-0.010470	10.000000	0.886000	-
		(0.9241)	(0.9195)	(0.9207)	(0.9223)	(0.9193)	(0.9055)	(0.7056)	(0.0000)	-
LA3_9	ESTAR	0.000890	-1.767520	1.111200	0.056000	-0.154740	-0.037930	1.727140	0.048000	0.048000
		(0.8893)	(0.0001)	(0.0120)	(0.0379)	(0.0001)	(0.0706)	(0.0150)	(0.9507)	(0.9507)
LA3_10	LSTAR	0.041540	-0.005370	-1.490090	0.138040	0.109390	-0.094070	10.000000	-0.284620	-
		(0.0102)	(0.9679)	(0.0013)	(0.0007)	(0.0000)	(0.0000)	(0.3349)	(0.0000)	-
LA3_11	ESTAR	-2.652260	15.241340	-11.818260	1.500480	0.433780	0.028190	9.018550	1.503480	2.239950
		(0.6217)	(0.6518)	(0.6462)	(0.6204)	(0.6322)	(0.1191)	(0.0000)	(0.0011)	(0.0000)
LA3_12	LSTAR	0.023000	-0.507840	-0.633820	0.042250	0.017880	-0.030900	2.354600	-0.004710	-
		(0.0014)	(0.0020)	(0.0019)	(0.0025)	(0.4877)	(0.0478)	(0.0025)	(0.5873)	-
LA3_13	LSTAR	0.023970	-0.376330	0.348650	-0.000900	-0.000740	-0.001340	0.838080	-2.615100	-
		(0.7339)	(0.8529)	(0.8625)	(0.7528)	(0.9074)	(0.5929)	(0.6623)	(0.5240)	-

LA3_14	LSTAR	-0.322930	-3.974000	0.966480	-0.159400	-0.201560	-0.102740	0.500000	-2.544830	-
		(0.0000)	(0.0000)	(0.4261)	(0.0000)	(0.0000)	(0.0011)	(0.0000)	(0.0000)	-
LA3_15	ESTAR	0.005730	-1.105760	1.166470	0.098520	-0.055540	0.027260	1.557630	-0.100970	0.402040
		(0.7939)	(0.0011)	(0.0010)	(0.0000)	(0.0152)	(0.2295)	(0.0037)	(0.9551)	(0.9551)
LA3_16	LSTAR	0.001060	-0.845960	0.570180	0.007370	-0.017620	0.010060	10.000000	-1.507560	-
		(0.8641)	(0.0000)	(0.0000)	(0.0417)	(0.0672)	(0.0065)	(0.9985)	(0.3087)	-
LA3_17	ESTAR	-0.172020	11.346880	-8.056160	0.395510	1.110040	0.065270	10.000000	-1.642700	-1.458180
		(0.5750)	(0.5835)	(0.5851)	(0.5706)	(0.5495)	(0.5627)	(0.8587)	(0.4467)	(0.4511)
LA3_18	ESTAR	0.010320	-0.281930	-0.105150	-0.016770	0.017530	0.007840	3.210010	-0.169910	0.063980
		(0.1532)	(0.3358)	(0.7629)	(0.1887)	(0.5201)	(0.6149)	(0.2113)	(0.0090)	(0.1378)
LA3_19	LSTAR	-13.254170	-103.775340	-396.832720	5.932890	-0.584530	-5.157870	10.000000	2.203160	-
		(0.9999)	(0.9997)	(0.9997)	(0.9998)	(0.9996)	(0.9998)	(0.9999)	(0.9287)	-
LA3_20	LSTAR	-0.053380	-1.115050	-0.222900	0.030870	-0.055860	-0.037390	10.000000	0.728350	-
		(0.0002)	(0.0000)	(0.6609)	(0.0478)	(0.0000)	(0.0019)	(0.9998)	(0.9216)	-
LA3_21	ESTAR	0.018460	-1.222580	2.167000	-0.007550	-0.058840	-0.017730	1.915100	1.487430	3.546980
		(0.9930)	(0.2649)	(0.0673)	(0.8984)	(0.1599)	(0.0003)	(0.6437)	(0.0000)	(0.4393)

APPENDIX G

APPENDIX G

JOHANSEN COINTEGRATION TEST

Johansen Cointegration test.
The null hypothesis of no cointegration is tested against the alternative of at least one cointegrating vector.
Asia Level II ADRs

ADR	Eigenvalue	Probability	ADR	Eigenvalue	Probability
A2_1	0.1168	0.0001	A2_15	0.0947	0.0001
A2_2	0.1310	0.0001	A2_16	0.0318	0.0001
A2_3	0.1194	0.0001	A2_17	0.0412	0.0001
A2_4	0.0899	0.0001	A2_18	0.1020	0.0001
A2_5	0.1462	0.0001	A2_19	0.1211	0.0001
A2_6	0.1008	0.0001	A2_20	0.1395	0.0001
A2_7	0.0156	0.0000	A2_21	0.0019	0.4852
A2_8	0.0761	0.0001	A2_22	0.0274	0.0000
A2_9	0.0065	0.0001	A2_23	0.1537	0.0001
A2_10	0.0010	0.6706	A2_24	0.0623	0.0001
A2_11	0.0011	0.5963	A2_25	0.0833	0.0001
A2_12	0.1249	0.0001	A2_26	0.0127	0.0086
A2_13	0.1190	0.0001	A2_27	0.0728	0.0001
A2_14	0.1152	0.0001	A2_28	0.1099	0.0001
			Average	0.0792	0.0630

Johansen Cointegration test.

The null hypothesis of no cointegration is tested against the alternative of at least one cointegrating vector.

Asia Level III ADRs

ADR	Eigenvalue	Probability	ADR	Eigenvalue	Probability
A3_1	0.0354	0.0001	A3_19	0.0038	0.0074
A3_2	0.1302	0.0001	A3_21	0.1579	0.0001
A3_3	0.0189	0.0000	A3_22	0.1297	0.0001
A3_4	0.0071	0.0008	A3_23	0.0158	0.0036
A3_5	0.0051	0.4380	A3_24	0.0130	0.0000
A3_6	0.1764	0.0001	A3_25	0.0223	0.0000
A3_7	0.0075	0.0078	A3_26	0.0026	0.0557
A3_8	0.0110	0.0045	A3_27	0.0077	0.0000
A3_9	0.1449	0.0001	A3_28	0.0028	0.9746
A3_10	0.0087	0.0110	A3_29	0.0107	0.0231
A3_11	0.0826	0.0001	A3_30	0.1288	0.0001
A3_12	0.1604	0.0001	A3_31	0.0977	0.0001
A3_13	0.0301	0.0000	A3_32	0.0647	0.0001
A3_14	0.0094	0.0032	A3_33	0.1269	0.0001
A3_15	0.0685	0.0001	A3_34	0.0070	0.0004
A3_16	0.0152	0.0000	A3_35	0.0579	0.0001
A3_17	0.0855	0.0001	A3_36	0.0052	0.0892
A3_18	0.0041	0.1332	A3_37	0.0057	0.0180
			Average	0.0517	0.0492

Johansen Cointegration test.

The null hypothesis of no cointegration is tested against the alternative of at least one cointegrating vector.

Europe Level II ADRs

ADR	Eigenvalue	Probability	ADR	Eigenvalue	Probability
E2_1	0.0158	0.0012	E2_24	0.0391	0.5748
E2_2	0.0198	0.0014	E2_26	0.0068	0.2521
E2_4	0.1405	0.0001	E2_27	0.0629	0.0250
E2_5	0.1157	0.1110	E2_28	0.0054	0.2091
E2_6	0.0374	0.0001	E2_29	0.0800	0.0001
E2_7	0.0585	0.0001	E2_31	0.0840	0.0001
E2_9	0.0644	0.0000	E2_32	0.0680	0.0001
E2_10	0.0737	0.0000	E2_33	0.0431	0.0001
E2_11	0.0685	0.0001	E2_34	0.0531	0.0001
E2_12	0.0701	0.0000	E2_35	0.1444	0.0001
E2_13	0.0778	0.2119	E2_37	0.0101	0.0228
E2_14	0.1013	0.0001	E2_38	0.0555	0.0000
E2_15	0.0337	0.0001	E2_39	0.1173	0.0001
E2_17	0.0054	0.0379	E2_40	0.0341	0.1207
E2_18	0.1061	0.0001	E2_41	0.1676	0.0001
E2_19	0.0188	0.0008	E2_43	0.0561	0.0001
E2_21	0.0866	0.0001	E2_45	0.1119	0.0001
E2_22	0.0137	0.0015			
			Average	0.0642	0.0449

Johansen Cointegration test.

The null hypothesis of no cointegration is tested against the alternative of at least one cointegrating vector.

Europe Level III ADRs

ADR	Eigenvalue	Probability	ADR	Eigenvalue	Probability
E3_1	0.0983	0.0001	E3_18	0.0179	0.2307
E3_2	0.1181	0.0001	E3_19	0.0055	0.0981
E3_3	0.0480	0.0001	E3_21	0.0065	0.0089
E3_4	0.0913	0.0001	E3_22	0.1712	0.0001
E3_5	0.0991	0.0001	E3_23	0.0227	0.0001
E3_6	0.0100	0.0000	E3_24	0.0118	0.0000
E3_7	0.0036	0.0636	E3_25	0.1365	0.0001
E3_8	0.1044	0.0001	E3_26	0.0188	0.0018
E3_9	0.0322	0.0001	E3_27	0.0083	0.0001
E3_10	0.0766	0.0001	E3_28	0.1566	0.0001
E3_11	0.0086	0.0001	E3_29	0.0476	0.0001
E3_12	0.0793	0.0001	E3_30	0.1020	0.0001
E3_13	0.0930	0.0001	E3_31	0.0047	0.3041
E3_14	0.0050	0.0024	E3_32	0.0664	0.0001
E3_15	0.0377	0.0001	E3_33	0.1371	0.0001
E3_16	0.1301	0.0001	E3_34	0.0230	0.0000
E3_17	0.1020	0.0001	E3_35	0.0063	0.2398
			Average	0.0612	0.0280

Johansen Cointegration test.
The null hypothesis of no cointegration is tested against the alternative of at least one cointegrating vector.
Latin America Level II ADRs and Latin America III ADRs

ADR	Eigenvalue	Probability
LA2_1	0.0370	0.0001
LA2_2	0.0154	0.0000
LA2_3	0.1031	0.0001
LA2_4	0.0985	0.0001
LA2_5	0.0085	0.0038
LA2_6	0.0014	0.7030
LA2_7	0.0166	0.0000
LA2_8	0.0044	0.0202
LA2_9	0.1487	0.0000
LA2_10	0.0837	0.0001
LA2_11	0.1347	0.0001
LA2_12	0.0166	0.0000
LA2_13	0.0171	0.0000
LA2_14	0.0927	0.0001
LA2_15	0.0253	0.0001
Average	0.0536	0.0485

ADR	Eigenvalue	Probability
LA3_1	0.0396	0.0000
LA3_2	0.0155	0.0000
LA3_3	0.0975	0.0001
LA3_4	0.1425	0.0001
LA3_5	0.0648	0.0001
LA3_6	0.0031	0.1578
LA3_7	0.0012	0.4862
LA3_8	0.1420	0.0000
LA3_9	0.0879	0.0000
LA3_10	0.0339	0.0001
LA3_11	0.0768	0.0001
LA3_12	0.1078	0.0001
LA3_13	0.0037	0.0789
LA3_14	0.0465	0.0001
LA3_15	0.1493	0.0001
LA3_16	0.1156	0.0001
LA3_17	0.0079	0.1670
LA3_18	0.0374	0.0001
LA3_19	0.0767	0.0001
LA3_21	0.1006	0.0001
LA3_22	0.0454	0.0001
Average	0.0665	0.0424

APPENDIX H

APPENDIX H

MEAN SQUARED PREDICTION ERROR

Level II Asian ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
A2_1	0.000059	0.000047	0.803752	0.000151	2.554781	0.000000	0.001642
A2_2	0.000028	0.000018	0.645933	0.000227	8.256138	0.000006	0.213002
A2_3	0.000041	0.000025	0.601912	0.000188	4.562142	0.000001	0.013570
A2_4	0.000029	0.000056	1.947958	0.000101	3.485935	0.000004	0.131019
A2_5	0.000066	0.000122	1.842568	0.000379	5.713570	0.000000	0.002214
A2_6	0.000110	0.000144	1.301945	0.000475	4.303569	0.000000	0.000126
A2_7	0.000021	0.000045	2.161043	0.000145	6.915420	0.000000	0.003557
A2_8	0.000047	0.000048	1.023126	0.000086	1.819330	0.000000	0.000001
A2_9	0.000002	0.000000	0.038342	0.000003	1.451478	0.000000	0.020206
A2_10	0.000000	0.000046	824.304172	0.000058	1041.107401	0.000000	1.227223
A2_11	0.000006	0.000000	0.043178	0.000000	0.007518	0.000004	0.646216
A2_12	0.000028	0.000013	0.460193	0.000407	14.545405	0.000023	0.830409
A2_13	0.000049	0.000263	5.317691	0.000118	2.382227	0.000018	0.366449
A2_14	0.000069	0.000095	1.390002	0.000384	5.609044	0.000000	0.003123
A2_15	0.000041	0.000025	0.621734	0.000046	1.125250	0.000000	0.001859
A2_16	0.000001	0.000000	0.373933	0.000003	5.086558	0.000000	0.000035
A2_17	0.000002	0.000019	9.921364	0.000044	22.485926	0.000000	0.021159
A2_18	0.000043	0.000044	1.027768	0.001066	25.074621	0.000000	0.005100
A2_19	0.000039	0.000047	1.228176	0.000198	5.125382	0.000000	0.000479
A2_20	0.000080	0.000048	0.599555	0.000170	2.123161	0.000000	0.004103
A2_22	0.002334	0.006456	2.766644	0.005441	2.331804	0.001310	0.561557
A2_23	0.000036	0.000073	2.059530	0.000069	1.938186	0.000000	0.000002
A2_24	0.000008	0.000010	1.251770	0.000007	0.885187	0.000000	0.059076
A2_25	0.000052	0.000121	2.332106	0.000658	12.656543	0.000000	0.002655
A2_26	0.000080	0.000207	2.587220	0.010243	128.146766	0.006815	85.260043
A2_27	0.000026	0.000055	2.153757	0.001092	42.387480	0.000001	0.050136
A2_28	0.000056	0.000140	2.509270	0.000739	13.232186	0.000015	0.270298

Level III Asian ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
A3_1	0.000089	0.000221	2.494139	0.000400	4.514252	0.000000	0.004385
A3_2	0.000037	0.000041	1.101879	0.000178	4.741845	0.000003	0.077653
A3_3	0.000020	0.000088	4.419250	0.000628	31.715913	0.000002	0.082366
A3_4	0.000001	0.000001	1.002934	0.000778	1143.548248	0.000000	0.161513
A3_5	0.000048	0.001772	37.030430	0.001990	41.588130	0.000480	10.024159
A3_6	0.000065	0.000058	0.894636	0.000161	2.470917	0.000000	0.001673
A3_7	0.000000	0.000001	3.942619	0.000824	3917.109369	0.008543	40603.058985
A3_8	0.000002	0.000001	0.611381	0.012386	7823.654473	0.000006	3.480328
A3_9	0.000080	0.000116	1.457646	0.000383	4.813686	0.000000	0.000178
A3_10	0.000038	0.000121	3.188059	0.000861	22.684621	0.000001	0.020663
A3_11	0.000624	0.000748	1.197106	0.001862	2.981490	0.000127	0.202729
A3_12	0.000048	0.000115	2.409522	0.000527	11.002505	0.000001	0.016538
A3_13	0.000011	0.000005	0.451646	0.000159	14.930759	0.000000	0.043345
A3_14	0.000106	0.000091	0.853855	0.010075	94.690943	-	-
A3_15	0.000025	0.000017	0.702051	0.000360	14.453894	0.000001	0.034225
A3_16	0.000020	0.000142	7.094483	0.000163	8.155162	0.000009	0.471028
A3_17	0.000030	0.000026	0.875797	0.000023	0.755557	0.000011	0.380252
A3_18	0.000044	0.000003	0.073555	0.089960	2035.721346	0.000021	0.485033
A3_19	0.000009	0.000002	0.250370	0.019191	2126.918924	0.000009	1.016224
A3_20	0.000047	0.000054	1.144984	0.000400	8.538503	0.000000	0.000038
A3_21	0.000002	0.000071	33.436081	0.000013	6.219936	0.000000	0.149767
A3_22	0.000057	0.000105	1.836277	0.001469	25.677060	-	-
A3_23	0.000118	0.000234	1.972106	0.107719	909.045575	0.032003	270.076341
A3_24	0.000519	0.001381	2.660219	0.002441	4.702268	-	-
A3_25	0.000001	0.000000	0.139578	0.000001	0.998608	0.000002	1.866863
A3_26	0.000003	0.000021	6.159142	0.049922	14945.970966	0.000008	2.332126
A3_27	0.094645	0.461833	4.879637	0.122137	1.290479	-	-
A3_28	0.000361	0.224519	622.297659	1.170764	3244.994239	0.000316	0.874982
A3_29	0.000024	0.000029	1.196952	0.000044	1.799501	0.000202	8.345101
A3_30	0.000075	0.000127	1.696953	0.000981	13.088676	0.000563	7.508418
A3_31	0.000001	0.000045	63.597369	0.000259	362.990593	0.000002	2.592999
A3_32	0.000023	0.000014	0.604401	0.000197	8.771867	0.000012	0.511772
A3_33	0.000391	0.000013	0.032253	0.297116	758.972003	0.000001	0.003132
A3_34	0.000017	0.000019	1.102688	0.000158	9.281120	0.000456	26.802579
A3_35	0.000270	0.000248	0.918241	0.164121	606.886489	0.000028	0.101776
A3_36	0.000000	0.000000	4.904248	0.000002	20.877250	-	-

Level II European ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
E2_1	0.000006	0.002371	372.219507	0.003359	527.438127	0.000034	5.285452
E2_2	0.000011	0.000136	12.925190	0.000025	2.372904	0.000394	37.522361
E2_3	0.000066	0.019387	293.200261	0.000239	3.608336	0.000014	0.204181
E2_4	0.000013	0.005432	431.687206	0.000033	2.661768	0.000002	0.154297
E2_5	0.000000	0.000005	14.607544	0.000015	43.658530	0.000000	0.873457
E2_6	0.000010	0.000011	1.046241	0.001206	116.779024	-	-
E2_7	0.000020	0.000011	0.523230	0.000105	5.201623	0.000013	0.655112
E2_9	0.313218	0.265713	0.848331	0.661283	2.111255	-	-
E2_10	0.000188	0.001543	8.187223	0.088901	471.631318	0.000000	0.000021
E2_11	0.000026	0.000014	0.522168	0.000131	5.037607	0.000000	0.003687
E2_12	0.000022	0.000079	3.572144	0.000159	7.248400	0.000000	0.009295
E2_13	0.000018	0.000028	1.569321	0.000385	21.321824	0.000003	0.164004
E2_14	0.000023	0.000013	0.566987	0.009167	394.586922	0.000002	0.094477
E2_15	0.000064	0.000013	0.211065	0.013903	217.385429	0.000567	8.861657
E2_16	0.000012	0.000010	0.865260	0.000036	3.161645	0.000000	0.000883
E2_17	0.000002	0.000000	0.131026	0.000121	72.232022	0.000004	2.398453
E2_18	0.000019	0.000056	3.037211	0.000010	0.556143	0.000000	0.009191
E2_19	0.000005	0.011306	2231.285280	0.000023	4.482327	-	-
E2_20	0.000027	0.000021	0.783920	0.000065	2.418278	-	-
E2_21	0.000260	0.000297	1.143374	0.007604	29.259364	0.017390	66.917175
E2_22	0.000000	0.000018	679.045745	0.000000	0.034799	0.000000	5.988791
E2_23	0.093365	0.054246	0.581010	0.597972	6.404687	0.055194	0.591161
E2_24	0.014236	-	-	0.001634	0.114751	0.000080	0.005596
E2_25	0.000005	0.004086	831.910858	0.010298	2096.911289	0.000177	36.013489
E2_26	0.000001	0.000059	49.072607	0.000363	301.006361	0.000000	0.100987
E2_27	0.000001	0.000018	23.671563	0.000031	41.230980	0.000000	0.032927
E2_28	0.000024	0.000038	1.587227	0.000469	19.355042	0.000003	0.122305
E2_29	0.000074	0.000011	0.151267	0.001417	19.031407	-	-
E2_30	0.000011	0.000011	0.988481	0.000006	0.528569	0.000002	0.144709
E2_31	0.000041	0.000013	0.312892	0.000049	1.183259	0.000000	0.010859
E2_32	0.006288	0.005416	0.861393	0.024234	3.854220	0.010684	1.699172
E2_33	0.000034	0.000121	3.535023	0.000144	4.207826	0.000000	0.000142
E2_34	0.000020	0.000071	3.590357	0.000054	2.759806	0.000000	0.002471
E2_35	0.000010	0.000016	1.566152	0.000080	7.994978	0.000000	0.048033
E2_36	0.000001	0.000013	16.955065	0.004839	6349.719328	0.000000	0.621382
E2_37	0.000052	0.000016	0.301230	0.000794	15.136068	0.000001	0.011122
E2_38	0.000005	0.000008	1.868595	0.000001	0.250256	0.000000	0.003746
E2_39	0.000000	0.001323	29122.889307	0.000030	654.751012	0.000001	15.222798
E2_40	0.000061	0.000055	0.896281	0.000034	0.554040	0.000001	0.017428
E2_41	0.000007	0.000087	12.834696	0.000245	36.008055	0.000004	0.516429
E2_42	0.000019	0.000051	2.714233	0.000115	6.155731	0.000000	0.023774
E2_43	0.000040	0.000012	0.290325	0.000022	0.545789	0.000230	5.813293
E2_44	0.000023	0.000020	0.874495	0.003781	163.382294	0.000002	0.102338

Level III European ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
E3_1	0.000148	0.000197	1.326747	0.000125	0.839986	0.000000	0.000010
E3_2	0.002363	0.001545	0.653716	0.005479	2.318553	0.000000	0.000086
E3_3	0.000439	0.000267	0.606605	0.000891	2.026646	0.000003	0.007450
E3_4	0.000000	0.000000	12.416544	0.000213	5661.687288	0.000000	3.144843
E3_5	0.000019	0.000026	1.321322	0.000066	3.404142	0.000000	0.002195
E3_6	0.000003	0.000009	2.745533	0.000710	216.878111	0.011361	3471.075739
E3_7	0.000025	0.000025	1.015651	0.011334	452.079089	0.000091	3.620842
E3_8	0.000053	0.000026	0.495246	0.000438	8.313877	0.000294	5.585621
E3_9	0.000012	0.000032	2.585856	0.000016	1.266099	0.000045	3.605850
E3_10	0.000022	0.000028	1.301886	0.000094	4.314660	0.000000	0.000054
E3_11	0.000002	0.000003	1.410701	0.006305	3238.417385	0.000000	0.000219
E3_12	0.000096	0.000112	1.165931	0.000285	2.959943	0.000000	0.000616
E3_13	0.000052	0.000192	3.702241	0.000366	7.048706	-	-
E3_14	0.135082	0.170354	1.261118	0.274949	2.035421	0.000000	0.000000
E3_15	0.000012	0.000005	0.411597	0.000512	43.127729	0.000000	0.001456
E3_16	0.000013	0.000008	0.622051	0.000287	22.078788	0.000000	0.000218
E3_17	0.000043	0.000059	1.390843	0.000171	4.012552	-	-
E3_19	0.000043	0.000044	1.015769	0.000017	0.398434	0.000003	0.058340
E3_20	0.000022	0.000026	1.163968	0.000082	3.706809	0.000000	0.000022
E3_21	0.000044	0.000075	1.705833	0.000178	4.052808	0.000000	0.000576
E3_22	0.000000	0.000001	3.599640	0.001543	10899.967810	0.000000	0.016223
E3_23	0.000001	0.000090	91.739486	0.079480	81007.917032	0.000001	0.569386

Level II Latin American ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
LA2_1	0.000035	0.000020	0.575609	0.001217	34.957398	0.000011	0.312866
LA2_2	0.000023	0.000020	0.869151	0.003925	170.929819	0.000013	0.555514
LA2_3	0.000037	0.000066	1.797848	0.000091	2.485771	-	-
LA2_4	0.000069	0.000114	1.669185	0.000255	3.717292	0.000000	0.004688
LA2_5	0.000001	0.000097	88.328929	0.000078	71.213128	0.000002	2.196712
LA2_6	0.000094	0.000289	3.062442	0.077940	825.450011	-	-
LA2_7	0.000000	0.000009	138.788028	0.000030	437.152890	0.000003	50.022151
LA2_8	0.000753	-	-	0.000714	0.947697	0.000003	0.003838
LA2_9	0.000043	0.000917	21.156072	0.000139	3.197742	-	-
LA2_10	0.000978	3.006912	3074.745562	0.000181	0.185184	0.003460	3.537854
LA2_11	0.000084	0.000006	0.069300	0.000460	5.464472	0.000003	0.038579
LA2_12	0.000158	0.000002	0.011958	0.000015	0.092484	0.000018	0.112754
LA2_13	0.000069	0.000080	1.148979	0.000001	0.012876	-	-
LA2_14	0.000010	0.000051	5.107515	0.002647	265.072353	0.000022	2.248498
LA2_15	0.000051	0.000122	2.374317	0.000371	7.233423	-	-
LA2_16	0.000000	0.000068	583.769784	0.000144	1226.212913	0.000002	13.203717

Level III Latin American ADR cross-market premiums mean squared prediction errors (MSPE) and ratios

ADR	AR MSPE	SETAR MSPE	Ratio SETAR/AR	LSTAR MSPE	Ratio STAR/AR	STECM MSPE	Ratio STECM/AR
LA3_1	0.000006	0.002984	494.267986	0.003202	530.432158	0.000000	0.007043
LA3_2	0.000002	0.024458	12773.741406	0.007896	4123.645898	0.000020	10.357231
LA3_3	0.000108	0.001239	11.419703	0.000453	4.173856	0.000000	0.000342
LA3_4	0.000025	0.000207	8.286919	0.000194	7.794895	0.000001	0.022678
LA3_5	0.000152	0.000029	0.192900	0.000728	4.796015	0.000000	0.000575
LA3_6	0.000006	0.002998	473.220696	0.016660	2629.398278	0.000005	0.795003
LA3_7	0.000011	0.000020	1.868605	0.002222	207.252675	0.000000	0.025196
LA3_9	0.000127	0.000794	6.237313	0.001481	11.626824	0.000001	0.005846
LA3_10	0.000123	0.000530	4.312991	0.012586	102.482495	0.000014	0.111273
LA3_11	0.000016	0.004189	261.361968	0.000022	1.398577	0.000055	3.407436
LA3_12	0.000002	0.000311	155.975297	0.000001	0.741664	0.000005	2.419199
LA3_14	0.000010	0.000006	0.540419	0.000011	1.090977	0.001660	162.656512
LA3_15	0.001362	0.000027	0.019863	0.001425	1.045985	0.000000	0.000055
LA3_16	0.000017	0.000360	20.991438	0.000202	11.759255	0.000000	0.012716
LA3_17	0.000118	0.016141	136.884289	0.030122	255.444100	0.000000	0.000448
LA3_18	0.000001	0.016129	10862.047144	0.000011	7.502425	0.000003	1.984247
LA3_19	0.000094	0.000426	4.550253	0.000555	5.924452	0.000000	0.001821
LA3_20	0.000071	0.000047	0.664242	0.000369	5.224242	0.000004	0.051892
LA3_21	0.000003	0.000377	128.407503	0.000022	7.347285	0.000000	0.049120

APPENDIX I

APPENDIX I

JARQUE-BERA TEST OF NORMALITY

Jarque-Bera (JB) test of normality for Asian Level II and Level III ADR cross-market premium. The null hypothesis of normality is tested against the alternative of no normality.

ADR	Jarque-Bera	*p*-value	ADR	Jarque-Bera	*p*-value
A2_1	119.5	0.0000	A3_1	115.5	0.0000
A2_2	435.7	0.0000	A3_2	66.1	0.0000
A2_3	279.3	0.0000	A3_3	13.4	0.0012
A2_4	57.7	0.0000	A3_4	10427.6	0.0000
A2_5	214.5	0.0000	A3_5	57.4	0.0000
A2_6	191.2	0.0000	A3_6	622.9	0.0000
A2_7	8233.5	0.0000	A3_7	126.0	0.0000
A2_8	229.0	0.0000	A3_8	2421.6	0.0000
A2_9	402.0	0.0000	A3_9	373.2	0.0000
A2_10	1376.9	0.0000	A3_10	2.5	0.2836
A2_11	334.9	0.0000	A3_11	3176.5	0.0000
A2_12	3752.4	0.0000	A3_12	235.9	0.0000
A2_13	107.4	0.0000	A3_13	1562.0	0.0000
A2_14	46.6	0.0000	A3_14	265.5	0.0000
A2_15	2068.4	0.0000	A3_15	72.4	0.0000
A2_16	13.9	0.0010	A3_16	232.7	0.0000
A2_17	4808.0	0.0000	A3_17	196.4	0.0000
A2_18	660.8	0.0000	A3_18	113.6	0.0000
A2_19	556.6	0.0000	A3_19	263.7	0.0000
A2_20	230.6	0.0000	A3_21	9309.3	0.0000
A2_21	259.0	0.0000	A3_22	20.8	0.0000
A2_22	78.4	0.0000	A3_23	91.2	0.0000
A2_23	12714.7	0.0000	A3_24	251.9	0.0000
A2_24	281.0	0.0000	A3_25	266.4	0.0000
A2_25	84.4	0.0000	A3_26	433.4	0.0000
A2_26	24.6	0.0000	A3_27	341.2	0.0000
A2_27	290.7	0.0000	A3_28	13.2	0.0014
A2_28	120.3	0.0000	A3_29	148.7	0.0000
			A3_30	1380.0	0.0000
			A3_31	288.7	0.0000
			A3_32	451.7	0.0000
			A3_33	312.0	0.0000
			A3_34	811.1	0.0000
			A3_35	356.2	0.0000
			A3_36	236.6	0.0000

			A3_37	598.9	0.0000

Jarque-Bera (JB) test of normality for European Level II and Level III ADR cross-market premium. The null hypothesis of normality is tested against the alternative of no normality.

ADR	Jarque-Bera	*p*-value	ADR	Jarque-Bera	*p*-value
E2_1	51.4	0.0000	E3_1	5572.1	0.0000
E2_2	8.5	0.0142	E3_2	272.8	0.0000
E2_4	2405.4	0.0000	E3_3	307.4	0.0000
E2_5	26.9	0.0000	E3_4	1202.6	0.0000
E2_6	405.1	0.0000	E3_5	15919.4	0.0000
E2_7	184.5	0.0000	E3_6	6330.6	0.0000
E2_9	54.4	0.0000	E3_7	1008.6	0.0000
E2_10	425.1	0.0000	E3_8	182.2	0.0000
E2_11	320.0	0.0000	E3_9	24046.6	0.0000
E2_12	24.8	0.0000	E3_10	1747.2	0.0000
E2_13	10.4	0.0056	E3_11	4425.5	0.0000
E2_14	191.2	0.0000	E3_12	222.3	0.0000
E2_15	346.7	0.0000	E3_13	453.7	0.0000
E2_17	51.4	0.0000	E3_14	144.0	0.0000
E2_18	44.3	0.0000	E3_15	236.6	0.0000
E2_19	120.6	0.0000	E3_16	130.0	0.0000
E2_21	335.9	0.0000	E3_17	781.4	0.0000
E2_22	91.8	0.0000	E3_18	37.9	0.0000
E2_24	9.0	0.0114	E3_19	302.3	0.0000
E2_26	99.5	0.0000	E3_21	224.5	0.0000
E2_27	8.0	0.0185	E3_22	1114.7	0.0000
E2_28	181.8	0.0000	E3_23	2190.4	0.0000
E2_29	123.3	0.0000	E3_24	80.6	0.0000
E2_31	81.5	0.0000	E3_25	620.2	0.0000
E2_32	46.9	0.0000	E3_26	199.2	0.0000
E2_33	92.5	0.0000	E3_27	94.0	0.0000
E2_34	323.9	0.0000	E3_28	122.6	0.0000
E2_35	318.7	0.0000	E3_29	242.9	0.0000
E2_37	80.3	0.0000	E3_30	687.0	0.0000
E2_38	90.0	0.0000	E3_31	140.4	0.0000
E2_39	512.0	0.0000	E3_32	355.6	0.0000
E2_40	16.0	0.0003	E3_33	327.1	0.0000
E2_41	3999.8	0.0000	E3_34	499.1	0.0000
E2_43	353.1	0.0000	E3_35	71.6	0.0000
E2_45	901.7	0.0000			

Jarque-Bera (JB) test of normality for Latin American Level II and Level III ADR cross-market premium. The null hypothesis of normality is tested against the alternative of no normality.

ADR	Jarque-Bera	*p*-value	ADR	Jarque-Bera	*p*-value
LA2_1	175.6	0.0000	LA3_1	5.2	0.0725
LA2_2	550.1	0.0000	LA3_2	386.4	0.0000
LA2_3	497.1	0.0000	LA3_3	2346.2	0.0000
LA2_4	186.7	0.0000	LA3_4	1555.8	0.0000
LA2_5	273.5	0.0000	LA3_5	64.7	0.0000
LA2_6	470.1	0.0000	LA3_6	118.4	0.0000
LA2_7	4600.1	0.0000	LA3_7	108.7	0.0000
LA2_8	191.9	0.0000	LA3_8	27.4	0.0000
LA2_9	108.6	0.0000	LA3_9	98.6	0.0000
LA2_10	578.4	0.0000	LA3_10	5244.7	0.0000
LA2_11	185.6	0.0000	LA3_11	357.3	0.0000
LA2_12	519.5	0.0000	LA3_12	148.4	0.0000
LA2_13	259.8	0.0000	LA3_13	151.5	0.0000
LA2_14	54.9	0.0000	LA3_14	8523.3	0.0000
LA2_15	1621.7	0.0000	LA3_15	297.3	0.0000
			LA3_16	2938.9	0.0000
			LA3_17	42.4	0.0000
			LA3_18	88.9	0.0000
			LA3_19	483.2	0.0000
			LA3_21	210.5	0.0000
			LA3_22	75.7	0.0000

APPENDIX J

APPENDIX J

DICKEY-FULLER UNIT ROOR TEST

Dickey-Fuller test
The null hypothesis of the DF is the presence of a unit root in the time series or that the time series is integrated of order one, i.e. I(1).
Level II and Level III Asian ADR cross-market premiums

ADR	*t*-statistic	*p*-value	ADR	*t*-statistic	*p*-value
A2_1	-1.65	0.4586	A3_1	-2.23	0.1940
A2_2	-1.12	0.7118	A3_2	-2.67	0.0797
A2_3	-1.25	0.6530	A3_3	-2.13	0.2319
A2_4	-2.28	0.1802	A3_4	-1.27	0.6473
A2_5	-2.02	0.2767	A3_5	-2.08	0.2535
A2_6	-2.44	0.1306	A3_6	-1.42	0.5720
A2_7	-2.48	0.1193	A3_7	-1.48	0.5432
A2_8	-2.26	0.1840	A3_8	-1.37	0.6008
A2_9	-3.07	0.0290	A3_9	-2.47	0.1235
A2_10	-0.89	0.7905	A3_10	-3.03	0.0326
A2_11	-1.64	0.4641	A3_11	-2.30	0.1712
A2_12	-1.78	0.3927	A3_12	-0.43	0.9019
A2_13	-1.44	0.5636	A3_13	1.23	0.9984
A2_14	-1.58	0.4935	A3_14	0.08	0.9640
A2_15	-1.85	0.3556	A3_15	-2.41	0.1383
A2_16	-2.50	0.1160	A3_16	-0.85	0.8030
A2_17	-1.75	0.4059	A3_17	-2.17	0.2165
A2_18	-1.64	0.4636	A3_18	-1.87	0.3447
A2_19	-2.72	0.0708	A3_19	-2.50	0.1145
A2_20	-0.74	0.8354	A3_21	-2.58	0.0983
A2_21	-0.67	0.8528	A3_22	-2.34	0.1611
A2_22	-1.89	0.3371	A3_23	-1.48	0.5460
A2_23	-2.27	0.1831	A3_24	-1.19	0.6814
A2_24	-2.13	0.2311	A3_25	-1.86	0.3537
A2_25	-2.17	0.2175	A3_26	-2.34	0.1593
A2_26	-0.44	0.9000	A3_27	-2.34	0.1600
A2_27	-2.87	0.0488	A3_28	-1.50	0.5342
A2_28	-1.69	0.4379	A3_29	-3.85	0.0025
			A3_30	-2.51	0.1142
			A3_31	-1.08	0.7261
			A3_32	-0.23	0.9318
			A3_33	-1.76	0.4010
			A3_34	-4.30	0.0005

			A3_35	-2.39	0.1441
			A3_36	-0.62	0.8642
			A3_37	0.04	0.9613

Dickey-Fuller test

The null hypothesis of the DF is the presence of a unit root in the time series or that the time series is integrated of order one, i.e. I(1).

Level II and Level III European ADR cross-market premiums

ADR	*t*-statistic	*p*-value	ADR	*t*-statistic	*p*-value
E2_1	-0.62	0.8642	E3_1	-1.98	0.2957
E2_2	-3.47	0.0092	E3_2	-1.64	0.4596
E2_4	-1.60	0.4804	E3_3	-1.78	0.3933
E2_5	-0.24	0.9283	E3_4	-2.65	0.0825
E2_6	-1.17	0.6897	E3_5	-3.30	0.0150
E2_7	-0.93	0.7791	E3_6	-1.72	0.4194
E2_9	-2.23	0.1943	E3_7	-1.54	0.5142
E2_10	-7.93	0.0000	E3_8	-0.65	0.8571
E2_11	-0.58	0.8722	E3_9	-6.19	0.0000
E2_12	-1.80	0.3826	E3_10	-2.03	0.2725
E2_13	-1.13	0.7032	E3_11	-1.43	0.5680
E2_14	-1.62	0.4742	E3_12	-1.44	0.5643
E2_15	-1.00	0.7542	E3_13	-1.47	0.5491
E2_17	-2.65	0.0824	E3_14	-1.80	0.3800
E2_18	-2.43	0.1334	E3_15	-1.95	0.3089
E2_19	-2.32	0.1650	E3_16	-1.49	0.5373
E2_21	-1.33	0.6177	E3_17	-2.53	0.1083
E2_22	-1.45	0.5577	E3_18	-1.50	0.5332
E2_24	-2.15	0.2263	E3_19	-1.86	0.3521
E2_26	-1.49	0.5390	E3_21	-1.23	0.6621
E2_27	-2.30	0.1726	E3_22	-2.16	0.2219
E2_28	-1.30	0.6300	E3_23	4.25	1.0000
E2_29	-1.90	0.3323	E3_24	-1.97	0.2998
E2_31	-2.57	0.0998	E3_25	-1.52	0.5232
E2_32	-2.97	0.0378	E3_26	-3.56	0.0069
E2_33	-2.07	0.2568	E3_27	-1.68	0.4437
E2_34	-0.97	0.7643	E3_28	-1.72	0.4197
E2_35	-0.92	0.7815	E3_29	-0.79	0.8208
E2_37	-1.78	0.3920	E3_30	-1.38	0.5953
E2_38	-1.59	0.4860	E3_31	-0.97	0.7655
E2_39	-1.38	0.5915	E3_32	-0.90	0.7873
E2_40	-1.91	0.3260	E3_33	-1.41	0.5786
E2_41	-1.40	0.5822	E3_34	-4.00	0.0014
E2_43	-1.48	0.5420	E3_35	-1.67	0.4456
E2_45	-1.01	0.7511			

Dickey-Fuller test
The null hypothesis of the DF is the presence of a unit root in the time series or that the time series is integrated of order one, i.e. I(1).
Level II and Level III Latin American ADR cross-market premiums

ADR	*t*-statistic	*p*-value	ADR	*t*-statistic	*p*-value
LA2_1	-2.35	0.1558	LA3_1	0.30	0.9781
LA2_2	0.00	0.9577	LA3_2	-1.97	0.3017
LA2_3	-2.08	0.2510	LA3_3	-0.21	0.9353
LA2_4	-1.95	0.3089	LA3_4	0.04	0.9839
LA2_5	-0.36	0.9134	LA3_5	-1.80	0.3793
LA2_6	-1.44	0.5620	LA3_6	-2.05	0.2649
LA2_7	3.93	1.0000	LA3_7	-1.77	0.3943
LA2_8	-0.90	0.7900	LA3_8	-2.01	0.2831
LA2_9	1.61	0.9995	LA3_9	-1.82	0.3703
LA2_10	-1.12	0.7092	LA3_10	-2.01	0.2817
LA2_11	-1.67	0.4485	LA3_11	-1.32	0.6223
LA2_12	-2.41	0.1400	LA3_12	-3.09	0.0277
LA2_13	-1.67	0.4453	LA3_13	-1.58	0.4928
LA2_14	-2.91	0.0440	LA3_14	2.84	1.0000
LA2_15	-0.03	0.9549	LA3_15	-1.70	0.4327
			LA3_16	0.70	0.9922
			LA3_17	-1.56	0.5051
			LA3_18	-2.19	0.2100
			LA3_19	1.19	0.9982
			LA3_21	-0.97	0.7664
			LA3_22	-2.19	0.2084

BIOGRAPHICAL SKETCH

Jorge Vidal obtained his Doctor of Philosophy in Business Administration with emphasis in finance in 2011 from the University of Texas-Pan American in Edinburg, Texas. He has been a lecturer of economics and finance at the University of Texas-Pan American since 2007. Prior to that Mr. Vidal obtained a Masters of Business Administration with emphasis in finance in 1999 from the University of Saint Thomas in Houston, Texas. While attending school in Houston Mr. worked in the oil industry for Seitel, Inc.. Mr. Vidal graduated in 1995 with a Bachelor of Science in Chemical Engineering with a minor in business administration from the Universidad de Monterrey in San Pedro Garza Garcia, NL, Mexico. After graduation, Mr. Vidal worked at Acumuladores Mexicanos, a car battery manufacturing company, in the areas of design and production.

Mr. Vidal lives with his wife and sons in McAllen, Texas.