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The Role of ADRs in the Development and Integration of Emerging Equity Markets

Abstract

This study measures the dynamics of the growth and expansion of international cross-listings through American Depositary Receipts (ADRs) in emerging equity markets around the world and evaluates its impact on their development and integration with world markets. Overall, I find that the increasing number of new ADR programs, their market capitalization and trading volume in those countries are positively associated with the pace of international capital flows and greater market integration, but, at the same time, adversely impact the size and liquidity of the home markets. I discuss the implications of these findings for existing research on capital market liberalization and on ADR markets and for the public policy debate on ADR markets and their impact on the global competitiveness of national stock markets.

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1. Introduction

The process of market liberalization over the past two decades has been one of the most important catalysts for the integration of international financial markets, which has, in turn, spurred economic development and overall economic growth, especially among emerging markets. International economists have identified the potential welfare gains from market integration in terms of risk-sharing benefits (Obstfeld, 1992, 1994; Lewis, 1996, 2000) and in terms of investment activity, stock market development and overall economic growth (Levine and Zervos, 1998; Bekaert and Harvey, 1995, 2000; Bekaert, Harvey and Lundblad, 2001, 2002; Henry, 2000a, 2000b; and, Kim and Singal, 2000).

In most empirical studies, the process of market liberalization focuses on important events that facilitate cross-border capital flows. Examples include regulatory actions, such as the relaxation of foreign currency controls or foreign ownership limits, and capital market events, such as the introduction of the first country fund for foreign investors. A common feature of these studies is that they depend critically on the liberalization event dates. These dates may be difficult to identify with precision and their economic impact may be delayed or reversed over time. Indeed, studies that have employed econometric approaches to measuring the dynamics of market integration (Bekaert and Harvey, 1995; Bekaert, Harvey and Lumsdaine, 2002) suggest the economic effects substantially lag the official dates of capital reform. Economies become more integrated over time, so that while the first few events that open up an economy's stock market to outside investors may be advantageous, subsequent events may be ones in which the adverse effects of globalization take over (such as competitive effects, Rajan and Zingales, 2000).

In this study, I follow a different approach. Specifically, I seek to measure capital market liberalization as a process and not an event. The vehicle through which I evaluate this process is the growth and expansion of global cross-listings, especially in the U.S. by non-U.S. companies through American depositary receipts (ADR). ADRs are negotiable claims against ordinary shares in the home market of a company created by U.S. depositary banks that trade over-the-counter, on major U.S. exchanges or as private placements. There are several reasons why this approach may be useful. First, global cross-listings and ADR programs in the U.S. have grown during the past two decades at a pace that parallels the expansion and integration of equity markets around the world. According to the Bank of New York, there are now over 1500 ADR programs for companies from 85 countries around the world, including more than 600 programs trading on major U.S. exchanges, trading around $20 billion annually.[1] ADRs bring for foreign and local investors alike the advantages of liquidity, transparency and the ease of trading of shares in U.S. markets to shares of companies in developed and emerging markets. They are perceived and marketed by depositary banks as among the most cost-effective tools for cross-border investing and diversification programs.[2]

Second, a number of researchers have uncovered the positive impact of a firm's decision to cross-list internationally on the valuation, breadth of ownership, trading, capital raising activity and overall cost of capital for the listing firms (Alexander, Eun and Janakirananan, 1988; Foerster and Karolyi, 1998, 1999, 2000; Miller, 1999; Lins,

[1] See Bank of New York's website and their half-year reports at www.bankofny.com to see the growth of ADR programs. Examples of among the most actively traded ADR programs on major exchanges include Nokia (Finland), SAP (Germany), BP (U.K.) as well as those from emerging markets like Taiwan Semiconductor, Cemex (Mexico), Tele Norte (Brazil) and Korea Electric Power (Korea).
[2] See, for example, "How Institutions View ADR programs" *International Investment Trends* (Winter 2001), Broadgate Consultants, New York, NY. Also, see the survey analysis of Fanto and Karmel (1998).

Strickland and Zenner, 2001; Ahearne, Griever and Warnock, 2001; Reese and Weisbach, 2002; Doidge, Karolyi and Stulz, 2002).[3] While some studies do examine the impact of ADRs on equity markets, as a whole, only a few examine their influence on the integration or development of markets or on the gains from international diversification (Bekaert and Harvey, 1995, Bekaert, Harvey and Lundblad, 2002; Errunza, Hogan and Hung, 1999; Errunza and Miller, 2000). While these studies show that the introduction of international cross-listings and that ADRs can be economically more important events than official liberalization dates, it is important to remember that they focus on the impact of ADRs on markets typically as a *single event*, usually related to the first company from a country to list on an overseas market, and not the *dynamics* of the growth and development of the ADR market.[4] To this end, the paper contributes importantly to both the literature on capital market liberalization and the literature on the overall importance of ADRs for international capital markets.

Third, the experimental design of this approach affords us a testable alternative hypothesis that the local market, with the growth of cross-listings and the creation of ADR programs among their constituent firms, becomes less developed and less well integrated with global markets. That is, instead of acting as a "catalyst" toward greater efficiency and integration of local markets through enhanced liquidity, visibility and credibility among global investors, the expansion of ADR programs from a country may

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[3] For a survey of earlier studies of global cross-listings and ADRs, see Karolyi (1998).

[4] There are four important exceptions to which the current study is closest in scope. Moel (2001) and Hargis and Ramalal (1998) focus only on Latin America and differ in that they focus only on how ADR markets impact financial development, not market integration. Hargis (2002) also looks at Latin America and considers other proxies for market impact, like volatility spillovers, and other forms of market liberalizations, such as country funds. Finally, Lee (2002) looks at the spillover impact of U.S. cross-listing announcements by firms in emerging markets on other "peer" firms in the same country or same industry to uncover a negative "competitive" impact and not the expected "positive" impact from integrating the market.

be a "hindrance" by diverting investment flows and trading activity away from the local market and by thus leading to an overall deterioration of the quality of local markets.[5]

Unfortunately, there are no established economic models of the dynamics of transitioning from segmented to integrated markets; usually, empiricists rely on comparative statics from standard mean-variance international asset-pricing models (IAPMs) of integration/segmentation (Stapleton and Subrahmanyam, 1977; Errunza and Losq, 1985; Alexander, Eun and Janakirananan, 1987).[6] In integrated markets, asset prices (expected returns) are decreasing (increasing) in the covariance between local and world cash flows (returns), while in segmented markets, only local cash flow volatility matters for prices (negatively) and expected returns (positively). Because the volatilities of local market cash flows and returns are much higher than covariances of local and world cash flows and returns, these models predict a positive revaluation of stocks, in general, with a liberalization event. The extent that the revaluation stems from the diversification benefits gained from integrating the market, in turn, depends on how large the investment barriers were in the first place. If the liberalization event is a cross-listing of a particular stock in the U.S., the extent of the revaluation of the market as a whole is a function of the foreign capital that flows in and the commonality of the risk attributes of the listing firm and its peer firms that do not cross-list or, at least, have not yet cross-

[5] There is substantial evidence of the concern among policy makers that the growth of ADR markets will lead to fragmentation of markets, diverting order flow to foreign markets in New York and London, reducing liquidity in the domestic market and inhibiting domestic market development. See the special report of the Federation des Bourses de Valeurs (FIBV, www.fibv.com) on "Price Discovery and the Competitiveness of Trading Systems" (2000). The theme of the 2002 FIBV Emerging Market Forum is devoted to the topic. See also, "The Incredible Shrinking Markets" cover story of *Latin Finance* (September 1999). From the legal viewpoint, Coffee (2002a, 2002b) predicts this adverse impact of international cross-listings and a natural specialization of securities markets across countries but proposes it as an outcome of "functional convergence" of legal systems.
[6] See the survey of international asset pricing models by Karolyi and Stulz (2002).

listed. In the experiments in this paper, I draw specifically from this feature of these IAPMs to evaluate the key hypotheses.

The goal of the current paper is to measure the dynamics of the growth and development of the ADR market for a number of emerging equity markets around the world and to evaluate whether they facilitate or hinder the development of local equity markets and their integration with world equity markets. I proceed in three steps. The first step will be to generate proxies for these dynamics that include the number of new ADR programs (overall and by type), the market value of those firms, and the overall trading activity in ADR stocks (number and value of shares traded). I focus on twelve emerging markets for which the scope of ADR activity relative to the overall market is varied. Section 2 presents these data. The second step (Section 3) evaluates whether these dynamic proxies impact overall stock market development. I evaluate four different indicators of stock market development, including stock market capitalization relative to Gross Domestic Product (GDP), the number of listed companies in the home market relative to GDP, the total value of trading relative to market capitalization and gross capital flows (from the *U.S. Treasury Bulletin*) relative to GDP. The regression analysis is by country and across all twelve countries using seemingly-unrelated (SUR) techniques. The third step (Sections 4 and 5) models the joint dynamics of the returns, volatility and correlations across markets in the context of an IAPM to compute the time variation in the market integration and conditional correlation over time between world and various emerging markets. I use a generalized dynamic covariance (GDC) multivariate autoregressive conditional heteroscedastic (GARCH) model to estimate the model and include mimicking portfolios of emerging market indices constructed from U.S.-traded ADRs as well as general market indices of all traded stocks.

Overall, I find that the growth of the ADR markets in the emerging markets generally is significantly positively associated with growing market integration over time, but, at the same time, it does not facilitate development of the local markets. In fact, when my proxies for the expansion of ADR markets are benchmarked against other measures of market openness, including dummy variables associated with official liberalization dates, there is evidence that it impedes the development of those markets.

2. The Growth and Development of ADR Programs in Emerging Markets

Capital market liberalization in emerging markets is a complex process. It varies so dramatically across different markets that researchers often resort to delineating chronologies of country-specific events from which they infer patterns (Bekaert and Harvey, 1995). The process that governs how companies from a particular market cross-list their shares is similarly complex. This is partly because ADRs as financial instruments are varied in form and type and partly because companies employ them in different ways and for different purposes. In this section, I offer a brief primer on what an ADR is and describe its different forms. I outline the process by which ADR listings are identified in each of the twelve emerging markets that I study and describe the different variables I use to measure the growth and development of ADR programs overall.

(a) Cross-listings with ADRs

There are a variety of ways in which firms from around the world cross-list their shares on overseas markets like the New York Stock Exchange or Nasdaq, including ordinary listings, global registered shares, and New York Registered Shares. But the most popular vehicle through which these listings occur in the U.S. -- especially from emerging markets -- is the ADR. ADRs are negotiable certificates that confer ownership of shares in the foreign company. They are quoted, traded and pay dividends in the currency of the country in which they trade (U.S. dollars) and trade in accordance with clearing and settlement conventions of the new market. The depositary bank that sponsors the ADR program provides all the global custodian and safekeeping services for a fee. Each depositary receipt denotes shares that represent a specific number of underlying shares in the home market. New receipts can be created by the bank for investors when the requisite number of shares are deposited in their custodial account in the home market. Cancellations or redemptions of ADRs simply reverse the process.

In 1985, regulatory changes by the U.S. Securities and Exchange Commission (SEC) led to a host of new and different ADR financing vehicles.[7] "Level I" ADRs were introduced as unlisted securities that could trade over-the-counter (as "pink sheet" issues on Nasdaq). Issuing firms could qualify for financial reporting exemptions and did not need to register fully with the SEC; however, no capital raising was permitted. "Level II" ADRs and capital-raising "Level III" ADRs register and disclose financial statements exactly as domestic U.S. companies in accordance with U.S. Generally Accepted Accounting Principles (GAAP) and receive wide coverage among analysts and the press (Baker, Nofsinger and Weaver, 2002; Bailey, Karolyi and Salva, 2002; Lang, Lins, and Miller, 2002).

[7] See Table 1 in Foerster and Karolyi (1999) for a summary and www.bankofny.com/adr for more details on the different types of listings in the U.S.

In April 1990, Rule 144a was adopted by the SEC. It was designed to serve a number of purposes including increasing the overall liquidity of private placement securities. Private placements are only available to qualified institutional buyers (QIBs), with at least $100 million in securities and registered broker-dealer accounts. These securities trade over-the-counter among QIBs using the PORTAL system. Another purpose of Rule 144a was to provide increased access to U.S. capital markets specifically to non-U.S. issuers, by not requiring them to undergo registration under the Securities Act. Rule 144a allows non-U.S. issuers to include U.S. tranches in global equity offerings without having to comply with certain disclosure rules.

(b) Data and Construction of Variables

I construct three measures of the growth of ADR activity. The first measure is the fraction of the total number of stocks in an emerging market with shares also listed in the U.S. as ADRs. The second measure is the fraction of the total market capitalization of all stocks in an emerging market with shares also listed in the U.S. as ADRs. Finally, my third measure is the fraction of the total value of shares traded in an emerging market with shares also listed in the U.S. as ADRs. The data for individual stocks in each market are available monthly from Standard and Poor's Emerging Markets Database (EMDB) and I include all listed firms as they become available and exclude them upon delisting, merger or acquisition. The market capitalization and value of trading variables are denominated in U.S. dollars as a common currency.

I focus my analysis on twelve emerging markets in Latin America (Argentina, Brazil, Chile, Colombia, Mexico, Venezuela) and Asia (Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand). The dates of initial availability on my measures of stock market development and market index and constituent individual stock returns varies from as early as January 1976 for Mexico to December 1989 for Indonesia. The sample ends in September 2000.

Determining which firms are ADRs and the effective dates of their respective programs is a difficult task. Listing information was obtained from the Bank of New York and was supplemented and cross-checked with data obtained from the NYSE, Nasdaq, OTCBB[8] and the September 2000 edition of the National Quotation Bureau's Pink Sheets. An important complication arises, however. Firms regularly change listing type or location in the U.S. (for example, from Rule 144a private placement to exchange listing) and the effective dates in the primary listings sources are associated with their most recent listing. For example, while Telefonos de Mexico L was the first Mexican listing on the NYSE in May 1991, its A-class shares had actually traded OTC since January 1980.[9] This problem can create a bias against uncovering the earliest development of the ADR market. To alleviate this problem, I examine previously-saved annual versions of the Bank of New York listings prior to 1996 to check for systematic changes in listing type. An appendix of all ADR listings for the twelve markets is available from the author upon request.

It is important to point out two other key limitations of the data for my analysis. The two value-based measures of ADR activity (ADR fraction of market capitalization and of value of trading) are determined by activity and shares outstanding in the home

[8] See www.otcbb.com/static/symbol.htm.
[9] It is interesting to note that a number of the studies of capital market liberalization that use the first ADR listing as an important event date often focus on those associated with major U.S. exchanges. In the case of Mexico, before Telefonos de Mexico's 1991 NYSE listing, several other Mexican companies had been trading in the U.S., such as Tubos de Acero de Mexico (OTC, since January 1964), Grupo Sidek B (OTC, September 1989), Grupo Synkro B (OTC, June, 1990) and FEMSA (Rule 144a, since April 1991).

country. That is, I do not have data on the fraction of shares outstanding that are locked up in terms of ADRs outstanding as the number of shares flowing "forward" into ADR form or flowing back into home-market ordinary shares changes daily. Similarly, I do not have data on the volume of trading of the ADRs themselves. It could very well be the case that a number of the ADR programs from a given emerging market may be dormant in terms of U.S. investor ownership and trading interest. These can be important distinctions (Foerster and Karolyi, 1999; 2000). A second limitation is that I do not distinguish the ADR programs by type in terms of the count of the number of programs, their market capitalization or value of trading. I also do not distinguish capital-raising programs from straight listings; previous research has shown that important capital market attributes, such as valuation, trading, and analyst coverage, can be significantly different for such ADR programs.

(c) Summary Statistics and Time-Series Plots

Summary statistics for the three measures of the growth of ADR activity are presented in Table 1 and plotted over time in Figures 1 to 3. The table presents the mean, standard deviation and various quantiles of the distribution of the ADR fraction of the total number of shares (NUMFRAC), the ADR fraction of total market capitalization (MCAPFRAC) and the ADR fraction of the total value of trading (VOLFRAC). The data show a dramatically wide range of ADR activity across the twelve markets. Formally, I perform a χ^2 test of the equality of the twelve time-series means for each variable and the null hypothesis is rejected easily in each case.

More interesting, however, is the different patterns across countries and regions. The scope of ADR activity is distinctly greater in countries like Argentina, Mexico, Philippines and Venezuela and lesser in countries like Colombia, Indonesia, and Malaysia. For example, NUMFRAC averages around 50 percent in Mexico and Venezuela and reaches as high as 81 percent and 78 percent, respectively, during the period of analysis. The mean NUMFRAC for Colombia, Indonesia and Malaysia, by contrast is only 13 percent, 5 percent and 6 percent, respectively.

MCAPFRAC shows the same kind of dispersion; yet, the average fraction of total market capitalization is even higher than the raw count (NUMFRAC) in Mexico (66 percent), Philippines (49 percent) and Argentina (61 percent). This reflects the intuitive finding that the largest firms in market cap are the most likely to list shares abroad (Reese and Weisbach, 2002; Doidge et al., 2002); but, it also reflects potentially the skewed distribution of market capitalization among all the listed firms in those markets. For example, among the largest five firms in Argentina (YPF, Telefonica de Argentina, Telecom Argentina, Perez Companc, and Banco Rio de la Plata, as of the end of 1998), four have NYSE ADR listings, one (Perez) trades as a Level I OTC.

Similar skewness can occur for the ADR fraction of total value of trading (VOLFRAC). Again, the highest fraction of ADR activity occurs in Mexico (70 percent) and Venezuela (63 percent); the lowest fraction, in Colombia (14 percent), Indonesia (13 percent) and Thailand (9 percent). The value of trading figures are, however, more dubious in that extreme values and unusual exceptions arise. For example, VOLFRAC in Argentina, Brazil, Chile, Mexico and Venezuela can reach as high as 90 percent of the total. Overall, the three measures of ADR activity are highly correlated for each country (over 0.80), but there are some exceptions, such as Indonesia, Korea and Philippines. It is not surprising in Philippines where one-third of the market capitalization and one-quarter of the value of trading is comprised of three firms (Philippine Long Distance, NYSE, San Miguel Corp., 144a, and Ayala Land Inc., 144a).

The time-series plots in Figures 1, 2 and 3 for each of the three variables give a better historical context for the growth of ADR programs. In each figure, the darker line represents the variables for the overall market and the lighter line, for the ADR constituents. One can contrast NUMFRAC in, for example, Argentina, Mexico and Venezuela, where the number of ADR programs have come to dominate the market, with that in Indonesia, Korea and Malaysia, where they have made only small impact. Malaysia is an interesting case in that the first ADRs were established in the mid-1980s as unsponsored programs for Boustead Holdings, Perlis Plantations, Bandar Raya, well before many other emerging markets established ADRs, but they have subsequently made only a modest impact.

Another important feature of the expansion of ADR programs from emerging markets is that companies often follow the first ADR listing from a country in “waves” and then follow “waves” from other countries within the region. For example, following the Telefonos de Mexico listing in May 1991, three other companies followed suit in 1991, another eight in 1992, 14 additional listings in 1993 and 16 more in 1994. It is important to note further that the waves of ADR listings across countries from a particular region follow a distinct pattern. For example, in Latin America, Mexican companies were the first to initiate ADRs in the U.S. in significant numbers, followed by Chilean firms (Compania Telefonos de Chile in January 1990), Argentinian and Venezuelan firms, in 1992 and 1993 and finally, the Brazilian and Colombian firms in the mid 1990s.

3. The Growth of the ADR Market and Stock Market Development

In this section, I follow the existing capital market liberalization literature and identify several measures of stock market development (Levine and Zervos, 1998; Bekaert, Harvey and Lundblad, 2001; Bekaert, Harvey and Lumsdaine, 2002). I use these as outcome measures to evaluate statistically the extent to which the expansion of ADR programs in those countries facilitate or hinder development. First, the development measures are defined and then the regression analysis is presented.

(a) Stock Market Development

Four measures of stock market development are constructed. First, the market capitalization ratio (MKTGDP) equals the value of listed shares divided by GDP, both denominated in current U.S. dollars. Many observers use this ratio as an indicator of development since stock market size is correlated positively with the ability to mobilize capital and diversify risk. Data on market capitalization and GDP is from EMDB and the World Bank's World Development Indicators database (with supplemental data for Taiwan from the International Monetary Fund's International Financial Statistics data). Second, the number of publicly traded companies divided by GDP (NUMGDP) is another measure of the importance of the equity markets but one that is not influenced by fluctuations in stock market valuations. The measure has drawbacks as it is affected by the process of consolidation and fragmentation of the industrial structure of markets (Rajan and Zingales, 2000). Third, the turnover ratio (TURNOVER) equals the value of total shares traded divided by market capitalization. It is not a direct measure of liquidity, but high turnover is expected to signal lower transactions costs. Trading value is from the

EMDB. Finally, the capital flow ratio (FLOWGDP) is the total dollar value of gross equity flows (including purchases and sales of equities from U.S. residents to the emerging market) divided by GDP. The gross flows are obtained from Treasury International Capital (TIC).[10]

Table 2 presents summary statistics for each of the four stock market development indicators for each of the twelve emerging markets. I report the mean, standard deviation, autocorrelations up to three lags, and various quantiles for each indicator. A χ^2 statistic is reported in the far-right column of the null hypothesis that the indicator time series have equal means. The results are similar to those reported in other studies cited above. Countries like Chile, Taiwan and Malaysia have, on average, unusually high levels of development in terms of market size (MKTGDP), the number of listed companies (NUMGDP) and TURNOVER. For Malaysia, MKTGDP exceeds one (1.295) and reaches as high as 2.302 in the mid 1990s. The Latin American countries of Argentina, Brazil, Colombia and Venezuela have lower values of MKTGDP and TURNOVER, on average. Turnover ratios (TURNOVER) average around 3 percent per month across all countries, but again significantly higher average ratios can be observed in Korea and Taiwan. The capital flow ratio (FLOWGDP) averages around 0.10 percent per month, but is higher in Argentina, Brazil and, especially Malaysia (0.433 percent).

An important feature of the time series for each of these development indicators is their high and slow-decaying autocorrelations. These are trending series which suggest the possibility of a unit root, a feature of the data that can affect my inferences about any statistical association with ADR growth activity variables. The first-order autocorrelation

[10] See http://www.treasury.gov/tic/ticsec.html for data construction. Also, Tesar and Werner (1995).

coefficients for MKTGDP and NUMGDP often exceed 0.90 and 0.80, respectively and Box-Ljung Q-statistics (unreported) easily reject the null of zero autocorrelation to three lags.[11] Similar numbers of rejections are realized for TURNOVER and FLOWGDP. As a result of this attribute, I perform all regressions for these indicators with multiple lagged dependent variables and compute Newey-West (1987) heteroscedasticity-consistent covariance matrices with serial correlation correction up to three lags.[12]

(b) Regression Analysis

Table 3 presents results of regression tests of the four stock market development indicators on the ADR market variables. The first four panels of regressions correspond to the four indicators and the last (Panel E) presents panel tests using seemingly-unrelated regression (SUR) in which each country is allowed country-specific intercept and lagged dependent variables. For the individual country and SUR regressions, I use a common sample from January 1986 through September 2000 (177 observations).

To generate additional power to the test of my null hypothesis about the importance of these ADR variables for stock market development, I introduce two additional variables that other researchers have examined in the literature. First, I construct dummy variables that correspond to the official liberalization dates in the respective markets. These dates come from Table 3 of Bekaert, Harvey and Lumsdaine (2002). The variable is denoted LDATE in the tables. Second, I follow Edison and Warnock (2001) and compute a measure of openness (denoted OPENNESS) as the ratio

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[11] I computed but do not report Dickey and Fuller (1979) unit-root tests in augmented form with linear time trend, intercept and one or more lags and could not reject the null of unit root for all MKTGDP and NUMGDP series, only three TURNOVER series and none of the FLOWGDP series.

[12] In another unreported series of tests, I include time trend as regressors to control for potential spurious persistence in the time series. These results did not fundamentally change the regression results.

of the market capitalization of the constituent members of the IFC investable and the IFC global indices for each country. This is a proxy variable for the extent to which the stocks in a market are available to foreign investors.[13]

The results for MKTGDP in Panel A vary considerably by country. For several countries, the coefficient on NUMFRAC (the fraction of stocks in a market with U.S. ADRs) is negative, but it is statistically significant at least at the 10 percent level only for Argentina, Mexico and Venezuela. For one country, Indonesia, NUMFRAC is actually significant and positive at that level. The pattern for MCAPFRAC (fraction of market cap trading as ADRs) is different: the coefficients are positive and significant for Argentina, Chile, and Mexico, with no statistically significant negative coefficients. Weaker results obtain for VOLFRAC with a significant negative coefficient for Malaysia and Thailand and a positive coefficient for Brazil. The two control variables play a modest role with significant positive coefficients of OPENNESS for Korea and Taiwan (negative for Chile, Indonesia and Malaysia) and of LDATE for Chile and Indonesia. The lagged dependent variable has values, as expected, close to one which suggests near unit-root behavior. Finally, the adjusted R^2 are over 0.90, which is also expected for trending variables.

The results for NUMGDP (Panel B) show weaker but similar patterns for Brazil, Thailand and Venezuela. NUMFRAC has a positive impact on the number of listings in Thailand, but negative impact in Venezuela. For Thailand, the positive influence of NUMFRAC is offset by the negative impact of VOLFRAC. The similar countervailing

[13] See *The IFC Indexes: Methodology, Definitions and Practices* (February 1998) published by the International Finance Corporation (which has since been acquired by Standard and Poor's) on criteria used to determine investability.

influence is observed for Brazil between MCAPFRAC and VOLFRAC and for Venezuela between MCAPFRAC and VOLFRAC The adjusted R^2 are lower than for MKTGDP. For TURNOVER in Panel C, there is more evidence of a negative influence of ADR market variables. NUMFRAC has significant negative coefficients in Argentina and Brazil, but positive influence in Malaysia and Thailand. At the same time, VOLFRAC retains significant, negative coefficients for Malaysia and Thailand. The country-specific regression results for TURNOVER are overall much weaker; R^2 are well below 0.50 in most cases. For FLOWGDP, there are proportionally no more significant positive coefficients than negative coefficients among the three main ADR market variables across the twelve countries, but the R^2 are much higher than for TURNOVER.

More powerful SUR tests with pooled cross-sectional, time-series results are presented in Panel E. For each of the four stock market development measures, I estimate six specifications in order to help disentangle some of the competing (correlated) influences of the ADR market variables and the control variables (LDATE, OPENNESS). The positive influence of Edison-Warnock's OPENNESS measure is statistically significant and positive for two variables, TURNOVER and FLOWGDP. Surprisingly, OPENNESS has no impact on MKTGDP and a negative impact on NUMGDP, both of which run counter to Rajan and Zingales (2000).[14] Similarly, the official liberalization dates, LDATE, are positively associated with MKTGDP and VOLGDP, and in the multivariate specification (6) for FLOWGDP. Finally, the results for the ADR variables are more consistent across development measures and for the

[14] The comparison with Rajan and Zingales (2000) is not perfect, of course. They deflate their development indicator of company listings by population, not GDP, and their time horizon is much longer (1913-1999) and their sample of countries is much broader than mine.

different specifications. Negative coefficients arise for NUMFRAC when it is alone in specification (3) and in the general specification (6) for MKTGDP, NUMGDP and TURNOVER. In most cases, they are statistically significant at the 1 percent level. MCAPFRAC and VOLFRAC obtain more mixed results. VOLFRAC has a positive impact on TURNOVER and possibly FLOWGDP, but a negative influence on NUMGDP. MCAPFRAC has a positive impact on MKTGDP and FLOWGDP, but a negative influence on NUMGDP.

Overall, the results to this point suggest that the growth in ADR activity, whether measured in terms of the number of programs, their market value or dollar value of trading relative to the domestic market as a whole, has had a positive impact on cross-border flows. However, the evidence also points to an adverse impact of ADRs on measures of domestic market quality, such as market capitalization, the number of listed companies and overall turnover in the market.[15]

4. Characterizing Market Integration over Time

The second major objective of this study is to evaluate the role of the growth and expansion of ADR markets in facilitating or hindering the integration of those markets with world equity markets over time. For this experiment, I need a model of time-varying market integration within an established IAPM and one that allows for a reasonably-flexible econometric formulation of the evolving market structure from segmentation to integration. Using a generalized dynamic covariance (GDC) multivariate autoregressive

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[15] I performed a number of supplemental tests using measures of domestic market quality that focus exclusively on the number of non-ADR firms, their market capitalization to GDP and their turnover. These supplemental findings show an even more dramatic adverse impact of the growth and expansion of ADR programs. These additional results are not reported but are available from the author.

conditionally heteroscedastic (GARCH) model, I can compute the joint dynamics of conditional expected returns, volatility and correlations across markets. The specific model that I choose is Errunza and Losq (EL, 1985) and I follow the econometric implementation of Errunza, Hogan and Hung (1999) and Carrieri, Errunza and Hogan (2001). One nice feature of the EL model is that it delivers an intuitive proxy of integration, the EL Integration Index. At the same time, it also offers a simpler measure of the time-varying conditional correlation of the emerging market returns with world market returns. I use both in the following analysis. In this section, I outline the EL model, the associated integration index measure, the econometric formulation and its estimation results with residual diagnostics. The next section will evaluate regression tests of the ADR variables for the two market integration measures estimated here.

(a) A Model of Market Integration over Time

Errunza and Losq (1985) formulate a simple model in which the expected return on a security in a market is proportional not only to its covariance with the world market portfolio, as would be the case under perfect integration, but also to its covariance risk with the home market, as in the case of perfect segmentation. That is,

$$E(R_i) = r_f + A_W\, M_W\, Cov(R_i,R_W) + (A_I - A_W)M_I\, Cov(R_i,R_I \mid R_e), \qquad (1)$$

where $E(R_i)$ is the expected return on security i in market I, r_f is the riskfree rate, A_W (A_I) is the aggregate relative risk aversion for all global (Ith market only) investors, R_W (R_I) is the return on the world (Ith) market portfolio, and M_W (M_I) is the market value of the world (Ith) market portfolio. The model starts from the null hypothesis of segmentation so that this expression applies to all of the securities i in market I which are accessible only to local residents. However, there exist "eligible" securities, denoted R_e, which can be bought by global as well as local investors. This expression implies that the expected return on security *i* commands a risk premium over and above its global risk premium that is proportional to its local market risk. But this additional risk premium conditions on the existence of eligible securities whose returns may be correlated with the returns on the restricted securities. Under those circumstances, the additional risk premium dissipates to zero. Aggregating across all stocks *i* in *I*,

$$E(R_I) - r_f = A_W M_W Cov(R_I, R_W) + (A_I - A_W) M_I Var(R_I \mid R_e). \quad (2)$$

EL construct an integration index, *II*, which features the two extreme cases of integration and segmentation within equation (2) for the market as a whole,

$$II = 1 - \frac{Var(R_I \mid R_e)}{Var(R_I)}. \quad (3)$$

For the special case of perfect market integration, *II* equals one since the $Var(R_I \mid R_e)$ would equal zero. In such a case, there exist eligible securities, or a portfolio of them, for which the return is perfectly correlated with the return on the national market index, R_I. For the special case of perfect market segmentation, *II* equals zero as $Var(R_I \mid R_e)$ equals $Var(R_I)$, the unconditional variance of the restricted securities *i*. In this case, the eligible securities are perfectly uncorrelated with the return on the national market index, R_I. The key to operationalizing this index measure is to compute $Var(R_I \mid R_e)$ which is equal to $Var(R_I)(1-\rho_{I,e}^2)$, where $\rho_{I,e}$ is the correlation coefficient between the return on the national market index and the portfolio of eligible securities. Note that, as $\rho_{I,e}$ approaches zero, *II* equals zero.

In my application, the set of eligible securities is represented by a portfolio of ADRs from a given emerging market.[16] I propose a three-equation specification for the joint dynamics of the conditional expected returns on a portfolio of all stocks in the emerging market of interest, the world market portfolio and a portfolio of ADRs from that market. For the national index return, I use the IFC Global Index from the EMDB and, for the world market portfolio, I use the Morgan Stanley Capital International world index. The ADR portfolios are computed as value-weighted averages of total returns of constituent stocks using prices, dividend from the EMDB and ADR constituents using the lists described in Section 2.

The estimated model is,[17]

$$r_{i,t} \quad = \delta_{w,t-1}\, cov_t(r_{i,t}, r_{w,t}) + \lambda_{i,t-1}\, var(r_{i,t}|r_{ADR,t}) + \varepsilon_{i,t} \qquad (4a)$$

$$r_{ADR,t} \quad = \delta_{w,t-1}\, cov_t(r_{ADR,t}, r_{w,t}) + \varepsilon_{ADR,t} \qquad (4b)$$

$$r_{W,t} \quad = \delta_{w,t-1}\, var_t(r_{w,t}) + \varepsilon_{W,t}, \qquad (4c)$$

where $r_{i,t}$ is the country index excess return, $r_{ADR,t}$, is the ADR portfolio return, and, $r_{W,t}$, is the world index return. $\delta_{w,t-1}$ is the price of world covariance risk conditional on information variables available as at time $t-1$ and $\lambda_{i,t-1}$, is the price of local market risk. I substitute $var(r_i)(1 - \rho_{I,ADR}^2)$ for $var(r_{i,t}|r_{ADR,t})$ in (4a). The elements of the error vector, $\varepsilon_t=(\varepsilon_{i,t,}, \varepsilon_{ADR,t,}, \varepsilon_{W,t})$ are jointly distributed Gaussian with a time-varying conditional

[16] This is a bold assumption, of course, but one that seems appropriate for our central hypothesis that focuses on the role of ADRs in facilitating market integration. It is indeed true that global investors can invest in domestic markets without ADRs either directly or through other vehicles, such as closed-end country funds, index futures contracts or country exchange-traded funds.

[17] I follow closely the approach of Errunza, Hogan and Hung (1999) and Carrieri, Errunza and Hogan (2001) in specifying and testing the EL model, in evaluating diagnostics and in computing the integration index. The key difference from their approach is the construction of the eligible securities (in my case, ADR portfolios).

covariance matrix, H_t, so that $\varepsilon_t|Z_{t-1}$ are distributed as $N(0,H_t)$. I further specify the prices of world covariance risk and local market risk using:

$$\delta_{w,t-1} = exp(\kappa_w' Z_{t-1}) \tag{5a}$$

$$\lambda_{i,t-1} = exp(\kappa_i' Z_{t-1}), \tag{5b}$$

where κ_w, κ_i are vectors of coefficients and Z_t are conditioning information variables. The instrumental variables I employ include a constant, the local and world dividend yields (from the IFC Global indices and Morgan Stanley Capital International), local exchange rate versus the U.S. dollar, and the U.S. 10-year Treasury bond yield (Ibbotson and Associates).

The law of motion for the time-varying conditional covariance matrix is parameterized using the Ding-Engle (1994) specification following DeSantis and Gerard (1998):

$$H_t = H_0 * (\iota\iota' - aa' - bb') + aa' * \{\varepsilon_{t-1}\varepsilon_{t-1}\} + bb' * H_{t-1} \tag{6}$$

where * denotes the Hadamard product (element by element), H_0, the unconditional covariances, a, b are $N\times 1$ vector of constants, ι, is an $N\times 1$ unit vector, and $\{\varepsilon_{t-1}\varepsilon_{t-1}'\}$ is an $N\times N$ matrix of cross error terms. The model is estimated using the Berndt, Hall, Hall and Hausman (1974) maximization technique and, for inference tests, standard errors use quasi-maximum likelihood estimates (Bollerslev and Wooldridge, 1992).

(b) Estimation Results

Table 4 presents summary statistics on the monthly U.S. dollar-denominated returns for each of the IFC Global Index and constructed ADR portfolios by emerging market. The Morgan Stanley Capital International World Index returns are presented in the final column. For each returns series, I report the mean, standard deviation, skewness, kurtosis, up to three autocorrelations and the Box-Ljung Q-statistic for three lags. I also report the simple correlations of the three returns series that will constitute each system estimated. Among the IFC Global Indexes, the Latin American markets tend to be the most volatile; in almost every case, the volatility of the emerging markets is at least four or five times that of the world market portfolio. The ADR portfolios are less volatile than their IFC Global Index counterparts in some countries, such as in Argentina, Philippines and Taiwan, and more volatile in others, like Indonesia, Malaysia and Mexico. One reason for higher ADR portfolio volatility may stem from the limited number of ADR firms across which to diversify holdings, like in Indonesia and Malaysia (see Table 1), but a mitigating factor is that the ADR firms are typically among the largest firms in their market (especially, Argentina and Indonesia). In this regard, then, Mexico represents an unusual finding. Most series reveal serial correlation up to three lags and the excess kurtosis due to fat-tailed outliers is clearly evident.

The correlations reveal important differences. The pairwise correlations of the IFC Global Indexes and the ADR portfolios with the world market portfolio, respectively, are typically low and similar to each other. Only Argentina, Indonesia, Philippines and Thailand have correlations reliably above 0.40. However, the correlations between the ADR portfolios and IFC Global Indexes vary widely. In Mexico and Taiwan, these correlations are lower than average (0.71 and 0.61, respectively), but these are not necessarily the countries where one would have expected to uncover low correlations based on Table 1 and Figures 1 to 3.

Table 5 presents specification tests and residual diagnostics for the model of time-varying expected returns, variances and covariances in equations (4) – (6). Panel A present Wald tests of the null hypothesis that the market prices of world and local covariance risk are constant. The goal of this simple test is to evaluate the viability of the information variables that have been chosen. For 9 of the 12 countries, I can reliably reject the null hypothesis for the world market price of risk at the 5 percent level; for the market price of local risk, the null can also be rejected for 10 countries, but not necessarily the same ones. Panel B presents the residual diagnostics for the two portfolios of each country. The residuals are mostly well-behaved, though, as expected, there is still some excess kurtosis (especially, Korea's two indexes).

From these model estimates, I extract my variables of interest: (1) time-varying index of market integration and (2) the conditional correlation of the returns on the IFC Global Indexes with the world market portfolio returns. My goal is to evaluate the importance of the ADR market variables for these proxies for market integration in the next section. Table 6 presents summary statistics with mean, standard deviations and various quantiles and Figure 4 gives time-series plots.

The results in Panel A of Table 6 for the integration indexes vary importantly by country. The average measure of integration for Brazil, Chile, Mexico, and Philippines is over 0.50 (by definition, the index lies between zero and one). By contrast, the indexes for Argentina, Colombia, and Taiwan are below 0.20. The extreme quantiles indicate that the index for those countries with high means listed above can reach as high as 0.90 or more. The results for conditional correlations with the world market returns in Panel B show different patterns. The highest average conditional correlations result for Brazil, Mexico and Thailand. These correspond reasonably with the rankings of unconditional correlations in Table 4.

The time-series plots of Figure 4 show both the integration index (darker line) and conditional correlations (lighter line) over time by country. Both series are volatile. It is often difficult to perceive any upward trend in either series, but a number of significant breakpoints in the series are revealed. Consider, for example, Brazil which sees a large spike in early 1988 that seems to correspond with the introduction of the Brazil country fund in the U.S. (Bekaert, Harvey and Lumsdaine, 2002), and Chile in July 1990 with the listing of Compania Telefonos de Chile. The integration index for Mexico rises quickly in 1989 around the listings by Grupo Sidek and Cifra. Finally, the integration indexes for Argentina, Colombia, Taiwan and Venezuela indicate only a modest increase, if any, over the period of analysis. The upward trend for the conditional correlations with the world market returns is less perceptible, with possible exceptions in Brazil, Indonesia and Thailand. There appears to be considerably more noise in the correlation series.

5. Does the Growth of the ADR Market Facilitate Market Integration?

In this section, I report results of my regression tests of the ADR market variables for the market integration proxies computed in Section 4. The tests parallel those in Table 3 with country-specific regressions in Panels A and B of Table 7 and pooled cross-sectional, time-series regressions using seemingly-unrelated methods in Panel C.

Country-specific regressions in Panel A indicate that the ADR variables do have explanatory power and the signs of the coefficients on key variables are more often than not positive. Again, important interactions among the control variables (OPENNESS and LDATE) and the three related ADR activity variables make inferences more complex. Across the twelve countries, the coefficient for NUMFRAC is significant and positive in three cases (one negative, Korea), for MCAPFRAC, there are five coefficients that are significant and positive (one negative, Mexico), and for VOLFRAC, there are two significant and positive coefficients (three negative). Part of this problem may stem from the role of the two control variables, OPENNESS and LDATE. For example, in Mexico, the constant in the regression is 0.26, which is statistically significantly different from zero at the 1 percent level and which is reasonably close to the Mexican IFC General Index return correlation of 0.36 with the world market portfolio. The coefficient on the LDATE variable is also significant and positive (0.43). One of the ADR variables, MCAPFRAC, has a negative association with the integration index on Mexico (-0.38), but a positive association through VOLFRAC (0.69). Overall, the R^2 is 84 percent for Mexico, though for most countries the explanatory power of the model is much lower.

The results for the country regressions on conditional correlations with the world market portfolio (Panel B) are overall weaker than those for the integration index with R^2 averaging around 10 percent. The coefficients for the control variables are typically positively associated with the correlations, especially for OPENNESS in four of the twelve countries. The coefficients on the ADR variables vary widely by country.

The pooled cross-sectional, time-series SUR regression tests in Panel C allow one to disentangle the competing influences of the different ADR and control variables with various specifications. For the integration indexes, OPENNESS and LDATE are shown independently to have significantly positive influences; for the conditional world market correlations, only the OPENNESS coefficient is positive and significant. Among the ADR variables, each of NUMFRAC, MCAPFRAC and VOLFRAC are statistically significant and positive in the individual variable regressions for the integration index and conditional correlations. In the full specification (6), however, only MCAPFRAC is significant, but the coefficient is positive for both integration proxies. This is the clearest evidence on the positive influence of the ADR market for integration across these emerging markets.

6. Conclusions

In this paper, I have shown that the growth and expansion of international cross-listings by means of ADR programs in the U.S. for companies from emerging markets has been associated with more cross-border flows and greater integration with world capital markets, but has not had a favorable effect on domestic stock market development. Specifically, I provide evidence that such activity has had a deleterious impact on the number of listed firms, their overall capitalization and trading activity in the home market.

The implications of these findings run somewhat contrary to what we understand from much of the research that exists in the literature on the economics of capital market liberalization and on cross-listings/ADRs. Most studies point to capital market events like the announcement of the first ADR program from a country as important catalysts for economic growth, expansion of international capital flows, improved market quality and overall higher stock market valuations through lower capital costs. Theories relating international cross-listings and market segmentation with companion empirical studies using firm-level analysis of ADR announcements and listings similarly uncover higher valuations, lower cost of capital, greater trading activity and liquidity, and expanded capital raising activity. On both dimensions, the evidence here suggests that the process of international market integration through international cross-listings is more complex with unexpected negative side effects related to the quality of the home market.

Just as importantly, these findings contribute to the public policy debate that ensues between agents of the ADR business (proponents), such as U.S.-based investment bankers, depositary banks, brokers, consultants and exchanges, and emerging-market securities' commissions, local brokers and exchanges (antagonists). My evidence indicates that antagonists have valid concerns about the adverse impact of globalization and integration of international markets through institutions like ADRs. While they eliminate restrictions on foreign investments in domestic stocks, cross-listings via ADRs, in conjunction with new trading technologies, facilitate the linkages among dealers and market participants around the world and divert trading activity away from domestic exchanges. Some observers, like Coffee (2002a,b), predict greater competition among national stock exchanges through increased specialization, but it may be that de facto consolidation is a more likely outcome through mergers, alliances or markets just shutting down due to fewer listings, smaller and more marginal firms, and overall lack of liquidity.

It is important to caution readers of several limitations of the current study. The scope of the analysis is limited to only twelve emerging markets from Latin America and Asia and only to four measures of stock market development and two measures of market integration. One important extension to this study would be to incorporate a longer historical analysis with capital market data from developed markets. ADR programs in Europe, especially the U.K., France, Netherlands, Sweden and Italy, grew substantially during this period and were similarly associated with capital market liberalization activity, such as the Thatcher government privatizations of British Gas, British Telecom and British Airways. Another extension of the work would be to examine other outcome measures of stock market development and integration. While proxies for the overall size and liquidity of the markets and cross-border capital flows are useful, it would be interesting to consider measures of the efficiency of the markets, including equity and debt capital growth, IPO activity, size and presence of the financial services sector. The integration indexes are likely noisy and are obtained from econometric models with some degree of model specification error; some further research of the stability of these models and their application in periods of capital market change is appropriate.

Finally, my measures of ADR activity are narrow and ignore important institutional facets of the business that need to be reconciled. For example, I do not discriminate among different types of ADR programs. The economic impact of Level II and Level III exchange listings are undoubtedly more significant than Level I OTC listings or Rule 144a private placements. Further, my ADR market variables consider only activity in the home market. This distinction is important because some ADR programs from emerging markets are associated with greater trading activity, broader ownership geographically and more aggressive capital-raising activity, while other programs are dormant. I also consider the economic impact of cross-listings in U.S. markets as a catalyst of change. While the U.S. is where most of the activity has occurred over the past decade (Pagano, Roell and Zechner, 2002; Sarkissian and Schill, 2002), it would be important to consider the impact of cross-listings in other major markets, such as Tokyo, Singapore, London and other major European markets.

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Table 1

Summary Statistics for Measures of Growth of ADR Activity

Statistics for monthly data on three measures of the growth of the ADR market in each emerging market. They are: (1) NUMFRAC, the fraction of total number of stocks included in the IFCG Global index for each market which have ADRs listed in the U.S.; (2) MCAPFRAC, the fraction of the U.S. dollar market capitalization of the IFCG Global index for each market that is represented by the market capitalization of the ADRs listed in the U.S.; and (3) VOLFRAC, the fraction of U.S. dollar value of trading in the IFCG Global index for each market that is comprised of trading in ADRs listed in the U.S. Ireport the mean, standard deviation and fractiles of the distribution for the sample periods that begin with the initial date indicated below each country's name and ends with September 2000. The data are from Standard & Poor's Emerging Markets Database and ADR constituent stocks and listing dates (Appendix) drawn from the NYSE, Amex, Nasdaq, OTC Bulletin Board and "pink sheet" lists (see Doidge, Karolyi and Stulz, 2002, for details). The final column provides a chi-squared statistics of the equality of means across the twelve markets (11 degrees of freedom, with critical values of 19.7 and 24.7 at the 5% and 1% levels, respectively).

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)	χ^2
Fraction of Total Number of Stocks in Market Listed as ADRs in the U.S. (NUMFRAC)													
Mean	0.287	0.224	0.251	0.130	0.055	0.062	0.060	0.515	0.205	0.097	0.072	0.490	2809.27
Std. Dev.	0.189	0.139	0.142	0.113	0.042	0.043	0.009	0.238	0.066	0.080	0.041	0.239	
1% quantile	0.000	0.054	0.000	0.000	0.000	0.000	0.047	0.093	0.061	0.000	0.000	0.077	
25% quantile	0.069	0.073	0.093	0.000	0.016	0.022	0.053	0.297	0.200	0.039	0.052	0.304	
50% quantile	0.382	0.242	0.319	0.160	0.040	0.056	0.058	0.585	0.228	0.065	0.066	0.563	
75% quantile	0.457	0.368	0.370	0.250	0.100	0.103	0.065	0.716	0.243	0.174	0.095	0.731	
99% quantile	0.536	0.458	0.447	0.259	0.111	0.124	0.076	0.807	0.267	0.237	0.156	0.778	
Fraction of Total Market Capitalization of Stocks in Market Listed as ADRs in the U.S. (MCAPFRAC)													
Mean	0.602	0.330	0.388	0.115	0.172	0.283	0.122	0.656	0.488	0.157	0.138	0.418	2282.25
Std. Dev.	0.310	0.203	0.208	0.104	0.137	0.215	0.037	0.194	0.232	0.149	0.096	0.161	
1% quantile	0.000	0.041	0.000	0.000	0.000	0.000	0.060	0.157	0.006	0.000	0.000	0.109	
25% quantile	0.491	0.082	0.168	0.000	0.065	0.056	0.095	0.621	0.465	0.082	0.052	0.313	
50% quantile	0.769	0.398	0.472	0.121	0.100	0.391	0.116	0.699	0.559	0.106	0.140	0.477	
75% quantile	0.795	0.480	0.568	0.219	0.316	0.492	0.143	0.796	0.669	0.251	0.191	0.535	
99% quantile	0.869	0.665	0.626	0.282	0.459	0.549	0.207	0.866	0.735	0.515	0.363	0.664	
Fraction of Total Value of Trading of Stocks in Market Listed as ADRs in the U.S. (VOLFRAC)													
Mean	0.509	0.511	0.498	0.137	0.126	0.182	0.095	0.700	0.400	0.154	0.091	0.627	1981.45
Std. Dev.	0.335	0.310	0.276	0.152	0.117	0.145	0.061	0.197	0.213	0.166	0.076	0.225	
1% quantile	0.000	0.016	0.000	0.000	0.000	0.000	0.026	0.190	0.013	0.000	0.000	0.063	
25% quantile	0.135	0.069	0.219	0.000	0.022	0.026	0.052	0.628	0.258	0.019	0.034	0.533	
50% quantile	0.578	0.584	0.600	0.123	0.076	0.215	0.075	0.782	0.433	0.070	0.085	0.691	
75% quantile	0.836	0.776	0.724	0.222	0.210	0.302	0.125	0.844	0.568	0.273	0.117	0.782	
99% quantile	0.929	0.890	0.901	0.513	0.438	0.415	0.290	0.893	0.785	0.530	0.324	0.920	

Table 2

Summary Statistics for Measures of Stock Market Development

Statistics for monthly data on three measures of stock market development are provided for each emerging market. They are: (1) MKTGDP, the market value of all listed shares divided by GDP; (2) NUMGDP, the total number of all listed companies on the home market divided by GDP; (3) TURNOVER, the total value of trades (in U.S. dollars) divided by market capitalization, and (4) FLOWGDP, the total value of gross capital flows, including purchases and sales between U.S. residents to the emerging market, divided by GDP. I report the mean, standard deviation, autocorrelations up to three lags (ρ_j, j=1, 2, 3), and fractiles of the distribution for the sample periods that end with September 2000 and begin with January 1986 for MKTGDP, NUMGDP and TURNOVER and with January 1988 for FLOWGDP. The data are from Standard & Poor's Emerging Markets Database, Treasury International Capital (TIC) and the World Bank's World Development Indicators Database (with supplemental information for Taiwan from the IMF's International Financial Statistics). The final column provides a chi-squared statistics of the equality of means across the twelve markets (11 degrees of freedom, with critical values of 19.7 and 24.7 at the 5% and 1% levels, respectively).

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela	χ^2
Market Value of All Listed Shares Divided by GDP, both in US$ millions (MKTGDP)													
Mean	0.082	0.138	0.645	0.099	0.137	0.282	1.295	0.211	0.358	0.607	0.347	0.077	1096.09
Std. Dev.	0.030	0.073	0.197	0.052	0.089	0.133	0.574	0.073	0.182	0.207	0.188	0.040	
ρ_1	0.959	0.969	0.976	0.981	0.969	0.948	0.979	0.955	0.980	0.946	0.981	0.965	
ρ_2	0.924	0.934	0.949	0.952	0.929	0.887	0.958	0.916	0.955	0.894	0.963	0.927	
ρ_3	0.895	0.901	0.923	0.917	0.893	0.846	0.929	0.873	0.928	0.828	0.943	0.880	
1% quantile	0.019	0.016	0.247	0.027	0.029	0.079	0.416	0.076	0.097	0.335	0.108	0.017	
25% quantile	0.067	0.074	0.546	0.061	0.065	0.199	0.808	0.161	0.198	0.458	0.196	0.047	
50% quantile	0.084	0.151	0.655	0.098	0.123	0.260	1.184	0.220	0.324	0.567	0.276	0.066	
75% quantile	0.105	0.190	0.740	0.124	0.176	0.320	1.877	0.256	0.498	0.677	0.521	0.103	
99% quantile	0.136	0.277	1.094	0.238	0.319	0.725	2.302	0.353	0.740	1.336	0.722	0.178	
Number of Listed Companies Divided by GDP in US$ millions (NUMGDP × 100)													
Mean	0.015	0.014	0.086	0.037	0.040	0.038	0.152	0.021	0.071	0.038	0.050	0.026	1037.44
Std. Dev.	0.006	0.003	0.016	0.010	0.016	0.008	0.023	0.004	0.008	0.004	0.004	0.005	
ρ_1	0.949	0.958	0.972	0.985	0.974	0.942	0.914	0.912	0.947	0.897	0.969	0.950	
ρ_2	0.910	0.918	0.947	0.970	0.949	0.889	0.836	0.835	0.902	0.795	0.937	0.906	
ρ_3	0.871	0.877	0.923	0.955	0.924	0.834	0.768	0.756	0.861	0.694	0.906	0.862	
1% quantile	0.008	0.011	0.067	0.023	0.022	0.029	0.112	0.012	0.062	0.031	0.041	0.015	
25% quantile	0.012	0.012	0.070	0.027	0.028	0.031	0.139	0.019	0.067	0.035	0.048	0.021	
50% quantile	0.013	0.013	0.084	0.031	0.030	0.040	0.153	0.020	0.070	0.038	0.050	0.027	
75% quantile	0.015	0.017	0.101	0.048	0.058	0.043	0.160	0.023	0.075	0.041	0.052	0.030	
99% quantile	0.031	0.019	0.115	0.051	0.070	0.056	0.203	0.028	0.090	0.046	0.059	0.034	

Table 2 (continued)
Summary Statistics for Measures of Stock Market Development

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela	χ^2
Value of Trading in All Listed Shares Divided by Market Capitalization of All Listed Shares, both in $US millions (TURNOVER)													
Mean	0.034	0.042	0.009	0.007	0.036	0.106	0.025	0.035	0.021	0.189	0.050	0.022	1376.23
Std. Dev.	0.020	0.017	0.005	0.003	0.017	0.079	0.014	0.012	0.011	0.084	0.033	0.019	
ρ_1	0.747	0.971	0.798	0.000	0.981	0.824	0.725	0.064	0.921	0.872	0.973	0.920	
ρ_2	0.579	0.942	0.597	-0.004	0.963	0.712	0.568	0.072	0.843	0.772	0.947	0.841	
ρ_3	0.474	0.914	0.396	-0.004	0.945	0.693	0.499	0.069	0.766	0.700	0.920	0.763	
1% quantile	0.010	0.012	0.004	0.002	0.015	0.022	0.007	0.017	0.006	0.043	0.015	0.004	
25% quantile	0.020	0.032	0.006	0.004	0.025	0.050	0.015	0.028	0.014	0.119	0.028	0.009	
50% quantile	0.028	0.038	0.008	0.006	0.031	0.083	0.023	0.033	0.018	0.186	0.040	0.017	
75% quantile	0.045	0.052	0.010	0.009	0.043	0.141	0.033	0.042	0.025	0.249	0.061	0.028	
99% quantile	0.088	0.096	0.029	0.018	0.094	0.357	0.069	0.073	0.052	0.374	0.162	0.073	
Gross Equity Purchases and Sales between U.S. Residents and Emerging Market divided by GDP in $US millions (FLOWGDP, in %)													
Mean	0.176	0.208	0.196	0.027	0.076	0.126	0.433	0.414	0.123	0.112	0.102	0.112	392.97
Std. Dev.	0.143	0.182	0.198	0.042	0.072	0.170	0.387	0.258	0.099	0.163	0.078	0.205	
ρ_1	0.870	0.933	0.686	0.480	0.639	0.653	0.887	0.802	0.677	0.855	0.788	0.411	
ρ_2	0.789	0.883	0.548	0.267	0.597	0.610	0.790	0.732	0.644	0.803	0.729	0.423	
ρ_3	0.753	0.837	0.453	0.233	0.567	0.582	0.739	0.651	0.582	0.777	0.644	0.141	
1% quantile	0.002	0.001	0.014	0.000	0.001	0.002	0.038	0.021	0.002	0.001	0.006	0.004	
25% quantile	0.064	0.058	0.056	0.006	0.019	0.017	0.157	0.254	0.035	0.014	0.038	0.016	
50% quantile	0.158	0.172	0.150	0.018	0.062	0.080	0.341	0.366	0.116	0.039	0.082	0.050	
75% quantile	0.254	0.332	0.291	0.032	0.113	0.135	0.623	0.536	0.180	0.133	0.144	0.117	
99% quantile	0.548	0.664	0.864	0.237	0.308	0.694	1.824	1.161	0.380	0.724	0.346	0.892	

Table 3

Regression Tests of Growth of ADR Activity on Measures of Stock Market Development

Robust regressions of the four stock market development variables (MKTGDP, NUMGDP, TURNOVER and FLOWGDP, in Table 2) on various factors related to market liberalizations and development of the ADR markets. These factors include: OPENNESS, the fraction of the market capitalization of the firms in the International Finance Corporation's (IFC) index that is investable (see *The IFC Indexes: Methodology, Definitions and* Practices, February 1998, Emerging Markets Database), LDATE, the market liberalization dates from Bekaert, Harvey and Lumsdaine (2002); NUMFRAC, the fraction of total number of stocks included in the IFCG Global index for each market which have ADRs listed in the U.S.; VOLFRAC, the fraction of U.S. dollar value of trading in the IFCG Global index for each market that is comprised of trading in ADRs listed in the U.S.; and MCAPFRAC, the fraction of the U.S. dollar market capitalization of the IFCG Global index for each market that is represented by the market capitalization of the ADRs listed in the U.S. Lagged dep. is the lagged dependent variable. Standard errors in parentheses are heteroskedasticity and autocorrelation consistent obtained from Newey-West procedures; statistical significance at the 10% and 5% levels are denoted by * and **, respectively. R^2 is the coefficient of determination adjusted for degrees of freedom. Seemingly-unrelated regression (SUR) estimates employ cross-equation restrictions on the coefficients indicated in Panel E. The common sample runs from January 1986 to September 2000 for all stock market development variables.

Panel A: Market Value of All Listed Shares Divided by GDP (MKTGDP)

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	0.0027**	0.0026	0.0307**	0.0017**	0.0137**	0.0185**	0.0129	0.0064**	0.0035**	0.0487**	0.0287**	0.0016**
OPENNESS	0.0027	-0.0031	-0.0892**	0.0057	-0.0353**	0.0427**	-0.3060**	-0.0237	0.0045	0.1741**	-0.0647	0.0191
LDATE	0.0041	0.0088	0.0386**	0.0024	0.0116*	0.0063	0.1316	0.0125	-0.0078	-0.0204	0.0034	0.0022
NUMFRAC	-0.0425*	0.0727	0.1333	-0.0095	0.4977**	-0.3246	1.7274	-0.0274**	0.1329	0.0503	0.0856	-0.0346**
MCAPFRAC	0.0247**	-0.0646	0.1776*	-0.0173	-0.0483	0.0130	0.6385	0.0920**	-0.0191	-0.0270	0.1597	0.0072
VOLFRAC	0.0150	0.0180**	-0.0727	0.0111	0.0099	0.0008	-0.3779**	-0.0024	0.0184	-0.1510	-0.2529**	0.0044
R^2	0.9285	0.9395	0.9697	0.9746	0.9129	0.9185	0.9692	0.9265	0.9698	0.9026	0.9578	0.9431

Panel B: Number of Listed Stocks divided by GDP in US$ millions (NUMGDP×100)

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	0.0050*	0.0117**	0.0110**	0.0053	0.0457**	0.0041**	0.0235**	0.0020**	0.0068**	0.0104*	0.0552	0.0040**
OPENNESS	-0.0012**	0.0029	-0.0038**	-0.0032	0.0172	0.0027	0.0154	-0.0026**	-0.0002	0.0039	-0.0424**	0.0009
LDATE	0.0015	0.0006	-0.0011	0.0014	-0.0247**	0.0016	-0.0094	0.0005	-0.0003	-0.0008	-0.0066**	0.0017*
NUMFRAC	-0.0014	0.0016	0.0054	-0.0090	-0.0789	-0.0152	-0.1675	-0.0018	0.0109	-0.0285	0.1783**	-0.0065**
MCAPFRAC	-0.0029	-0.0181**	-0.0057	-0.0003	-0.0150	-0.0001	0.0660	0.0013	-0.0045	0.0070	-0.0035	0.0031**
VOLFRAC	0.0003	0.0055**	0.0015	0.0022	-0.0005	-0.0006	-0.0118	0.0016	0.0046	0.0007	-0.0198*	0.0000
R^2	0.9158	0.6458	0.9735	0.9878	0.6136	0.8911	0.8363	0.8571	0.8998	0.8105	0.4857	0.9326

Table 3 (continued)
Regression Tests of Growth of ADR Activity on Measures of Stock Market Development

Panel C: Value of Trading in All Listed Shares Divided by Market Capitalization of All Listed Shares (TURNOVER)

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	0.0111**	0.0287**	0.0062**	0.0020**	0.0199**	0.0286**	0.0027**	0.0218	0.0362**	0.2089**	0.1190**	0.0081**
OPENNESS	0.0108*	0.0031	-0.0039**	0.0008	0.0333**	0.0843**	0.0121	-0.0006	-0.0430**	0.3054**	-0.2379**	0.0028
LDATE	-0.0008	0.0035	-0.0025**	0.0006	-0.0039	0.0084	-0.0131	-0.0033	0.0019	-0.0701**	-0.0418**	0.0277**
NUMFRAC	-0.1546**	-0.1801**	0.0040	-0.0019	-0.1519	-0.0038	0.2909**	0.0096	-0.0558	-0.3841	1.3318**	-0.0471
MCAPFRAC	0.0076	0.1580**	-0.0231	-0.0057*	0.0387	-0.0869	-0.0373	-0.0057	0.0364	-0.2377	-0.1183	0.0124
VOLFRAC	0.0750**	-0.0087	0.0243	0.0062	-0.0133	0.0326	-0.0470**	-0.0092	-0.0062	0.1294	-0.2772**	0.0025
R^2	0.6011	0.4294	0.2862	0.2805	0.4198	0.7222	0.5792	0.3268	0.2109	0.3325	0.2526	0.2906

Panel D: Gross Capital Flows From U.S. Residents to Emerging Market divided by GDP (FLOWGDP, in %)

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	0.0048	-0.0155*	0.0366*	0.0016*	0.0081	0.0004	-0.0691*	-0.0235	-0.0115	0.0056	0.0137	-0.0038
OPENNESS	-0.0069	0.0741	-0.1541	0.0241	-0.0648*	0.1064	-0.1558	0.0835	-0.0052	0.0416	-0.0180	0.2041
LDATE	0.0053	-0.0280	-0.0246	-0.0085	0.0359**	0.0157	0.0106	-0.0582	-0.0280	-0.0161**	0.0419**	-0.0652
NUMFRAC	-0.2021	-0.0753	0.9261*	0.0290	1.6614**	0.2416	6.1419**	-0.2933*	0.5886*	-0.4894*	-0.5827	0.3138**
MCAPFRAC	0.0379	0.2859*	-0.1067	0.0276	-0.2281**	0.1065	-0.6320	0.3712**	-0.0241	0.4374**	0.3932*	-0.5790**
VOLFRAC	0.1658*	-0.0425	0.0078	-0.0376	-0.1503*	-0.3088**	-0.4532*	0.0724	-0.0579*	0.1124	-0.2526*	0.1668
R^2	0.7744	0.8840	0.5099	0.2283	0.4951	0.6140	0.8017	0.6585	0.5417	0.8987	0.6609	0.3275

Table 3 (continued)
Regression Tests of Growth of ADR Activity on Measures of Stock Market Development

Panel E: Seemingly Unrelated Regressions (SUR)

Model	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
			MKTGDP							**NUMGDP**		
OPENNESS	0.00066					0.00321	-0.00177					-0.00048
	(0.24)					(0.77)	(-5.76)**					(-1.74)*
LDATE		0.00265				0.00053		-0.00086				-0.00047
		(1.16)				(1.17)		(-4.35)**				(-2.14)*
NUMFRAC			-0.00505			-0.01978			-0.00230			-0.00148
			(-1.34)			(-3.16)**			(-8.15)**			(-2.95)**
MCAPFRAC				0.00275		0.01035				-0.00163		-0.00018
				(0.81)		(1.98)*				(-7.24)**		(-0.39)
VOLFRAC					0.00255	-0.00525					-0.00090	-0.00004
					(1.03)	(-1.47)					(-6.31)**	(-0.17)
			TURNOVER							**FLOWGDP**		
OPENNESS	0.00338					0.00278	0.02389					0.00318
	(3.61)**					(2.03)*	(2.51)*					(0.26)
LDATE		0.00273				0.00205		0.01344				0.00561
		(3.50)**				(1.73)*		(2.13)*				(0.73)
NUMFRAC			-0.00059			-0.01406			0.09278			0.04933
			(-0.35)			(-4.31)**			(4.03)**			(1.47)
MCAPFRAC				0.00205		0.00410				0.06295		0.03961
				(1.55)		(1.39)				(4.32)**		(1.74)*
VOLFRAC					0.00259	0.00448					0.03557	-0.08418
					(2.53)**	(2.08)*					(2.97)**	(-0.84)

Table 4
Summary Statistics for Index and ADR Portfolio Returns

Statistics for monthly index and ADR portfolio returns include the mean, standard deviation, skewness, kurtosis, three lags of autocorrelations, and a "Q-statistics" based on the Ljung-Box test for three-lags (5%, 1% critical value of 7.80 and 11.31, respectively). The country equity indices are U.S. dollar-denominated and from the IFC Global indexes and the world equity index is from Morgan Stanley Capital International. The ADR portfolio returns are computed as value-weighted averages of total returns of component stocks using prices, dividends from Standard & Poor's Emerging Markets Database and ADR lists (Appendix) drawn from the NYSE, Amex, Nasdaq, OTC Bulletin Board and "pink sheet" lists (see Doidge, Karolyi and Stulz, 2002, for details).

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)	World (1976:1)
IFCG index													
Mean	2.710%	4.530%	2.240%	2.070%	1.040%	11.650%	1.660%	2.290%	0.840%	-0.620%	1.240%	2.980%	0.360%
Std. Dev.	14.810%	16.960%	7.790%	10.560%	14.300%	18.740%	11.700%	9.950%	11.420%	12.080%	13.040%	14.940%	1.930%
Skewness	2.208	0.835	0.082	1.460	1.080	1.550	1.512	-0.763	1.553	0.751	0.907	0.363	-0.450
Kurtosis	17.282	2.235	0.440	3.560	3.686	18.434	7.030	1.599	7.543	2.643	2.915	1.582	0.418
ρ_1	0.010	-0.005	0.238	0.447	0.191	0.494	0.079	0.106	0.245	0.132	0.102	0.039	-0.105
ρ_2	0.010	-0.116	-0.008	0.108	-0.090	0.349	0.181	-0.006	0.003	-0.009	0.084	0.135	-0.021
ρ_3	-0.147	-0.039	-0.058	-0.020	-0.041	0.384	-0.169	-0.017	-0.021	-0.014	-0.157	0.050	-0.054
Q-statistic	2.937	2.006	8.016	28.162	6.182	68.823	9.049	1.552	8.046	2.363	5.645	2.960	1.927
ADR index													
Mean	0.970%	3.190%	0.570%	-0.580%	-0.280%	19.240%	0.460%	1.140%	-0.350%	-1.740%	0.160%	1.220%	
Std. Dev.	9.630%	15.370%	7.940%	9.850%	17.340%	21.900%	13.300%	11.200%	9.920%	10.950%	17.020%	17.220%	
Skewness	-0.150	0.888	-0.604	0.821	1.439	1.091	1.137	-0.758	1.357	0.479	1.455	0.577	
Kurtosis	1.478	5.241	2.139	3.231	4.765	30.298	3.127	0.892	6.410	1.233	4.974	2.880	
ρ_1	-0.109	0.041	-0.004	0.204	-0.006	0.418	0.066	0.075	0.234	0.195	0.027	-0.128	
ρ_2	-0.103	-0.242	-0.174	-0.120	-0.141	0.226	0.205	0.023	0.030	0.259	-0.040	0.143	
ρ_3	-0.145	-0.141	-0.132	-0.163	-0.051	0.223	-0.104	0.003	-0.143	0.158	-0.123	-0.094	
Q-statistic	3.728	6.841	4.082	7.010	1.922	23.309	4.885	0.518	6.462	11.062	1.499	3.876	
Correlations													
ρ(Index, ADR)	0.948	0.898	0.857	0.798	0.837	0.775	0.909	0.707	0.743	0.605	0.800	0.861	
ρ(Index, World)	0.415	0.294	0.240	0.039	0.403	0.359	0.372	0.367	0.404	0.316	0.422	0.002	
ρ(ADR, World)	0.390	0.269	0.296	0.097	0.461	0.294	0.361	0.252	0.436	0.282	0.359	-0.037	

Table 5

Specification Tests and Residual Diagnostics for Time-Varying World Market Price of Risk

The estimated model is:

$$r_{i,t} = \delta_{w,t-1}\mathrm{cov}_t(r_{i,t},r_{w,t}) + \lambda_{i,t-1}\mathrm{var}(r_{i,t}|r_{ADR,t}) + \varepsilon_{i,t}$$

$$r_{ADR,t} = \delta_{w,t-1}\mathrm{cov}_t(r_{ADR,t},r_{w,t}) + \varepsilon_{ADR,t}$$

$$r_{W,t} = \delta_{w,t-1}\mathrm{var}_t(r_{w,t}) + \varepsilon_{W,t}$$

where $r_{i,t}$ is the country index return using the IFC Global index, $r_{ADR,t}$, is the ADR portfolio return, and, $r_{w,t}$, is the world index return. $\delta_{w,t-1}$ is the price of world covariance risk conditional on information variables available as at time t-1 and $\lambda_{i,t-1}$, is the price of local market risk. For j equal to i, ADR and w in each trivariate system, $\varepsilon_{j,t}$ are jointly distributed Normally with a time-varying conditional covariances, H_t, so that $\varepsilon_{j,t}|Z_{t-1} \sim N(0,H_t)$. The prices of world covariance and local market risk are specified by:

$$\delta_{w,t-1} = \exp(\kappa_w{}'Z_{t-1})$$

$$\lambda_{i,t-1} = \exp(\kappa_i{}'Z_{t-1})$$

and instrumental variables include a constant, the local and world dividend yields (from the IFC Global indices and Morgan Stanley Capital International), local exchange rate versus the U.S. dollar, and the U.S. 10-year Treasury bond yield (Ibbotson and Associates). $\mathrm{var}(r_{i,t}|r_{ADR,t})$ is parameterized by $\mathrm{var}(r_{i,t})[1 - \rho_{i,ADR}^2]$ where $\rho_{i,ADR}$ is the conditional correlation between the local IFC index returns and that of the ADR portfolio.

The law of motion for the time-varying conditional covariance is parameterized using the Ding-Engle (1994) specification:

$$H_t = H_0 * (\iota\iota' - aa' - bb') + aa' * \{\varepsilon_{t-1}\varepsilon_{t-1}'\} + bb' * H_{t-1}$$

where * denotes the Hadamard product (element by element), H_0, the unconditional covariances, a, b are N×1 vector of constants, ι, is an N×1 unit vector, and $\{\varepsilon_{t-1}\varepsilon_{t-1}'\}$ is an N×N matrix of cross error terms. The model is estimated by quasi-maximum likelihood using the Broyden, Fletcher, Goldfarb, Shanno maximization technique. P-values for robust Wald tests for the hypotheses of interest are reported. Residuals are standardized and diagnostics include the mean, standard deviation, t-statistic (equal to zero), skewness, kurtosis and "Q-statistics" based on the Ljung-Box test (5%, 1% critical value of 7.80 and 11.31, respectively).

Panel A: Specification tests

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)
H_0: World market price of covariance risk is constant, $\kappa_{w,j} = 0$ for j > 1												
p-values	143.64	33.79	51.21	49.40	12.73	26.43	33.88	2.03	4.11	38.74	9.56	8.86
	<0.001	<0.001	<0.001	<0.001	0.013	<0.001	<0.001	0.730	0.391	<0.001	0.048	0.064
H_0: Market price of local market risk is constant, $\kappa_{i,j} = 0$ for j > 1												
p-values	87.58	57.86	52.26	33.29	17.37	29.26	39.05	64.49	8.26	21.29	9.26	15.20
	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.083	<0.001	0.055	0.004

Table 5 (continued)

Specification Tests and Residual Diagnostics for Time-Varying World Market Price of Risk

Panel B: Residual diagnostics

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)
IFCG Index												
Mean	0.005%	0.317%	0.199%	0.186%	0.013%	0.444%	0.149%	0.268%	0.154%	0.048%	0.095%	0.113%
Std. Dev.	1.105	1.234	1.051	1.032	1.047	1.105	1.071	1.118	1.211	1.096	1.139	1.105
T-statistic	0.059	3.180	2.581	2.473	0.144	5.523	1.915	3.294	1.700	0.588	1.011	1.371
Skewness	3.248	0.285	0.016	1.107	0.035	4.456	0.323	-0.686	0.745	1.344	0.774	0.598
Kurtosis	17.011	1.006	0.402	4.099	2.449	38.699	4.011	3.117	2.417	4.226	3.043	1.696
Q-statistics	0.937	1.222	10.911	16.906	2.815	1.009	4.735	5.436	6.960	3.227	2.813	1.439
ADR Portfolio												
Mean	0.181%	0.273%	0.178%	-0.019%	-0.013%	0.463%	0.196%	0.229%	-0.064%	-0.209%	0.091%	0.094%
Std. Dev.	1.299	1.233	1.099	0.865	1.127	1.411	1.088	1.207	1.346	0.920	1.111	1.099
T-statistic	1.917	2.753	2.208	-0.306	-0.137	4.486	2.481	2.607	-0.636	-3.021	0.955	1.133
Skewness	3.009	0.399	1.739	1.278	0.156	5.590	0.406	0.749	-2.093	-1.212	1.519	1.869
Kurtosis	0.803	2.969	13.039	11.499	2.956	44.644	2.271	6.175	14.569	12.201	6.444	7.937
Q-statistics	.3794	4.416	0.154	7.561	1.226	8.898	5.578	9.549	9.032	41.559	1.854	1.391

Table 6

Summary Statistics of the Time-Varying Index of Market Integration and the Conditional Correlation of the National Index and Morgan Stanley Capital International World Market Returns

Panel A contains statistics of the estimates for the integration indices estimated as $1 - var(r_{i,t}|r_{ADR,t})/var(r_{i,t})$ using parameters from the model in Table 5 for each market. Statistics include mean, standard deviation, skewness, kurtosis and various fractiles. Panel B contains the same statistics for the time-varying conditional correlation between each country and the world.

Panel A: Integration Indexes

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)
Mean	0.182	0.795	0.667	0.120	0.275	0.432	0.454	0.945	0.702	0.139	0.336	0.248
Std. Dev.	0.166	0.130	0.257	0.172	0.268	0.219	0.260	0.076	0.290	0.147	0.271	0.225
ρ_1	0.798	0.971	0.751	0.703	0.981	0.850	0.881	0.965	0.917	0.916	0.975	0.917
ρ_2	0.667	0.941	0.502	0.619	0.961	0.735	0.819	0.928	0.834	0.833	0.950	0.833
ρ_3	0.593	0.911	0.254	0.576	0.942	0.666	0.788	0.901	0.750	0.749	0.924	0.749
1% quantile	0.000	0.409	0.000	0.000	0.000	0.090	0.010	0.743	0.001	0.000	0.000	0.000
25% quantile	0.033	0.745	0.618	0.000	0.028	0.257	0.266	0.931	0.632	0.006	0.088	0.048
50% quantile	0.157	0.805	0.744	0.029	0.185	0.389	0.437	0.987	0.828	0.105	0.308	0.184
75% quantile	0.268	0.890	0.842	0.184	0.506	0.599	0.680	0.992	0.907	0.217	0.596	0.379
99% quantile	0.657	0.976	0.928	0.640	0.862	0.948	0.935	0.998	0.979	0.547	0.866	0.777

Panel B: Conditional Correlations with World Market Returns

Market (initial date)	Argentina (1985:01)	Brazil (1987:12)	Chile (1985:5)	Colombia (1985:1)	Indonesia (1989:12)	Korea (1984:12)	Malaysia (1984:12)	Mexico (1985:1)	Philippines (1986:1)	Taiwan 1986:1)	Thailand (1988:7)	Venezuela (1986:1)
Mean	0.089	0.249	0.122	0.018	0.071	0.077	0.106	0.141	0.134	0.061	0.197	0.014
Std. Dev.	0.142	0.244	0.222	0.193	0.170	0.133	0.188	0.175	0.118	0.130	0.239	0.125
ρ_1	0.685	0.970	0.750	0.371	0.981	0.298	0.371	0.719	0.916	0.916	0.975	0.916
ρ_2	0.474	0.941	0.501	0.052	0.961	0.049	0.186	0.515	0.833	0.833	0.949	0.833
ρ_3	0.315	0.911	0.251	0.017	0.942	0.099	0.046	0.351	0.749	0.749	0.924	0.749
1% quantile	-0.228	-0.323	-0.319	-0.345	-0.301	-0.194	-0.291	-0.164	-0.106	-0.223	-0.302	-0.387
25% quantile	-0.001	0.125	-0.066	-0.103	-0.035	0.007	-0.007	0.021	0.073	-0.016	0.052	-0.031
50% quantile	0.083	0.203	0.137	-0.002	0.042	0.057	0.084	0.097	0.109	0.051	0.213	0.015
75% quantile	0.150	0.342	0.293	0.117	0.160	0.141	0.217	0.249	0.212	0.114	0.368	0.079
99% quantile	0.511	0.737	0.574	0.487	0.499	0.418	0.590	0.574	0.348	0.469	0.603	0.284

Table 7

Regression Tests of Growth of ADR Activity on Integration Indexes and Conditional Correlations of National Index and Morgan Stanley Capital International World Market Returns

Robust regressions of the pre-estimated integration indexes and conditional correlations estimated with the models in Table 2 on various factors related to development of the ADR markets. These factors include: OPENNESS, the fraction of the market capitalization of the firms in the International Finance Corporation's (IFC) index that is investable (see *The IFC Indexes: Methodology, Definitions and* Practices, February 1998, Emerging Markets Database), LDATE, the market liberalization dates from Bekaert, Harvey and Lumsdaine (2002); NUMFRAC, the fraction of total number of stocks included in the IFCG Global index for each market which have ADRs listed in the U.S.; VOLFRAC, the fraction of U.S. dollar value of trading in the IFCG Global index for each market that is comprised of trading in ADRs listed in the U.S.; and MCAPFRAC, the fraction of the U.S. dollar market capitalization of the IFCG Global index for each market that is represented by the market capitalization of the ADRs listed in the U.S. Standard errors in parentheses are heteroskedasticity and autocorrelation consistent obtained from Newey-West (1987) procedures; statistical significance at the 10% and 5% levels are denoted by * and **, respectively. R^2 is the coefficient of determination adjusted for degrees of freedom. Seemingly-unrelated regression (SUR) estimates employ cross-equation restrictions on the coefficients indicated in Panel E. The common sample runs from January 1986 to September 2000 for all stock market development variables.

Panel A: Integration Indexes

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	-0.0005	0.3714**	0.0039	0.0000	-0.1191*	0.3212**	-0.0074	0.2590**	0.0041	0.0000	-0.1352	0.0305
OPENNESS	0.0062	1.1530	-0.0999	0.1420	0.9428**	0.1248	1.3259**	0.0418	0.0865	-0.0073	0.5570	0.4222
LDATE	-0.0144	-0.3809*	0.3034**	-0.0804	-0.1149	-0.0514	-0.9652**	0.4279**	-0.0944	0.0411	0.0902	0.0809
NUMFRAC	-0.1689	0.0136	-0.3835	1.3289*	-1.3730	-4.4033*	5.6980	-0.0069	1.7993*	1.1763*	2.5765	-0.3322
MCAPFRAC	0.3972**	-0.5822	1.2823*	-0.1204	0.5083	1.2330*	0.3826	-0.3883*	0.5991*	0.4298*	1.0104	-0.4224
VOLFRAC	0.0000	0.2813	0.0303	-0.4785*	-0.3915*	0.0379	-0.7264*	0.6873**	0.1804	-0.5086	-1.4286**	0.2824*
R^2	0.5078	0.4182	0.8642	0.3969	0.6144	0.1721	0.5714	0.8412	0.8932	0.4276	0.5328	0.1992

Panel B: Conditional Correlations with World Market Returns

Market	Argentina	Brazil	Chile	Colombia	Indonesia	Korea	Malaysia	Mexico	Philippines	Taiwan	Thailand	Venezuela
Constant	-0.0166	0.1104**	0.1798**	0.0498*	-0.0643	0.0616**	0.0662	0.0719	0.1470**	0.0608	-0.1115	-0.0118
OPENNESS	-0.2704**	-0.0348	-0.0755	-0.1517	0.2004*	0.0678	0.1368	0.3528*	0.0971	0.3580*	1.1400*	-0.0765
LDATE	0.2846**	0.1230	-0.3279**	0.0948	-0.0033	-0.0747*	-0.0532	-0.1497*	0.1633*	-0.0465	-0.1093	-0.0253
NUMFRAC	0.1121	-0.7825	1.0485	0.0503	2.2691*	0.4133	-0.3901	0.4595*	-0.6378	0.3506	-1.5665	0.0376
MCAPFRAC	0.0794	1.9971**	0.1511	-0.4228	-0.5607*	0.1511	0.2965	-0.4397	-0.4149*	-0.2018	0.4792	0.1276
VOLFRAC	0.0004	-0.8292**	-0.0208	0.2012	-0.0304	-0.1081	-0.3355	-0.0618	0.3238**	-0.2206	0.3651	0.0552
R^2	0.2025	0.4176	0.3047	0.0022	0.1899	0.0569	-0.0094	0.1060	0.1173	0.0196	0.2253	0.0184

Table 7 (continued)

Regression Tests of Influence of ADR Markets on Integration Indexes and Conditional Correlations of National Index and Morgan Stanley Capital International World Market Returns

Panel C: Seemingly Unrelated Regressions (SUR)

Model	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Integration Indexes						**Conditional Correlation with World Market Returns**					
OPENNESS	0.08351					0.04847	0.03917					0.03489
	(5.81)**					(2.93)**	(2.84)**					(2.39)*
LDATE		0.04847				0.02554		-0.00963				-0.03292
		(3.92)**				(1.99)*		(-0.95)				(-2.74)**
NUMFRAC			0.10601			-0.00406			0.07181			0.00552
			(6.07)**			(-0.11)			(2.71)**			(0.15)
MCAPFRAC				0.10096		0.09204				0.04751		0.06809
				(6.44)**		(3.15)**				(3.12)**		(2.39)*
VOLFRAC					0.06126	-0.02691					0.02982	-0.01567
					(4.76)**	(-1.23)					(2.14)*	(-0.67)

Figure 1
Number of Stocks Listed Overall and as ADRs by Country

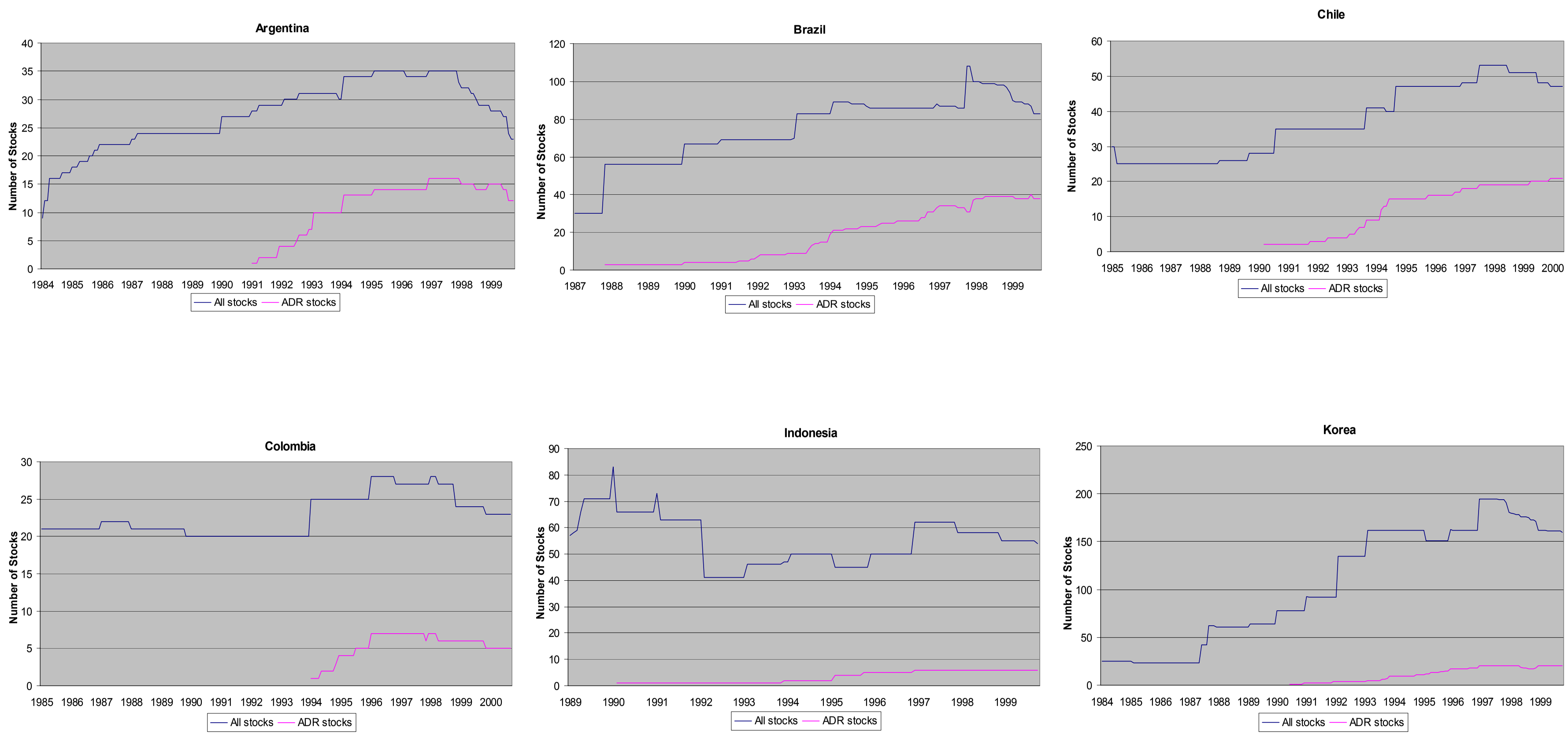

Figure 1 (continued)
Number of Stocks Listed Overall and as ADRs by Country

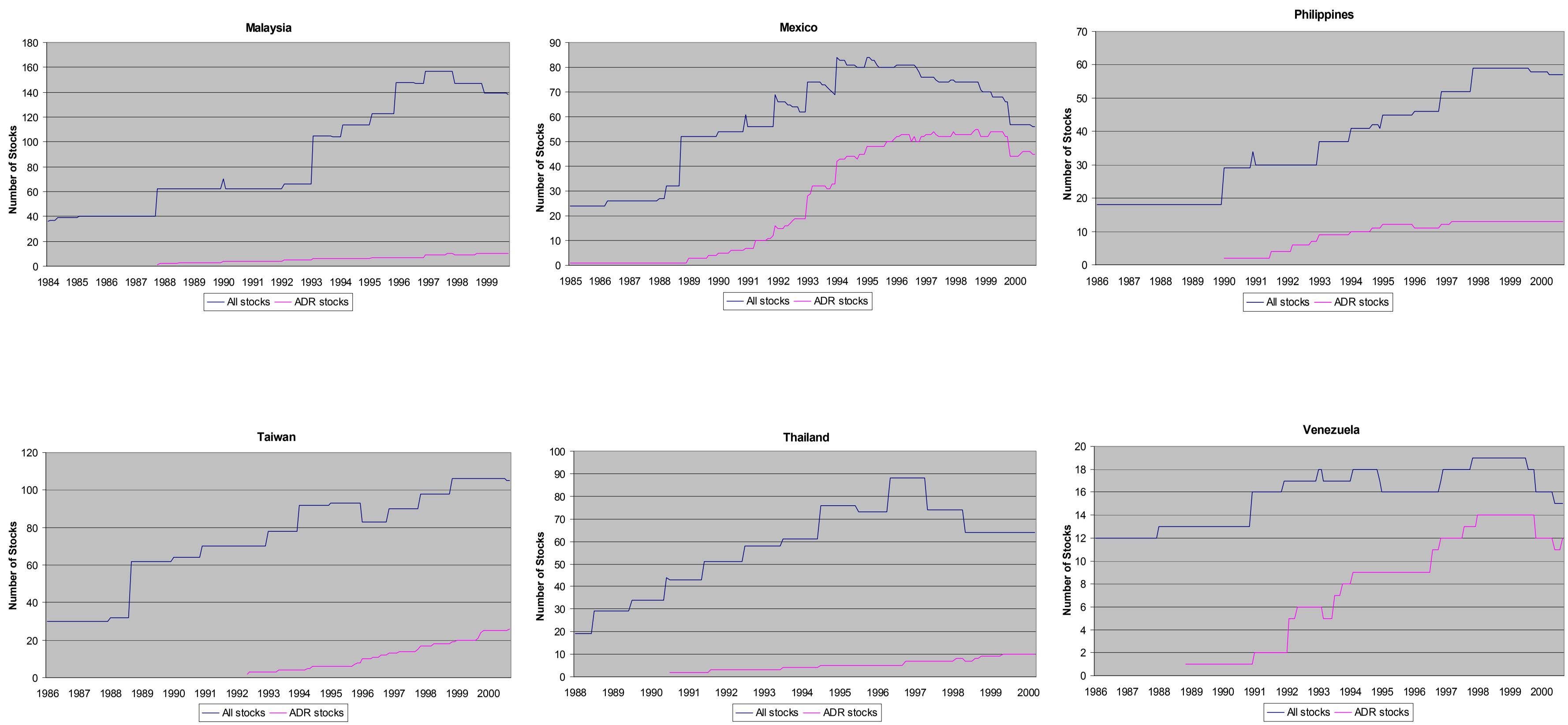

Figure 2
Market Capitalization of Stocks Listed Overall and as ADRs by Country

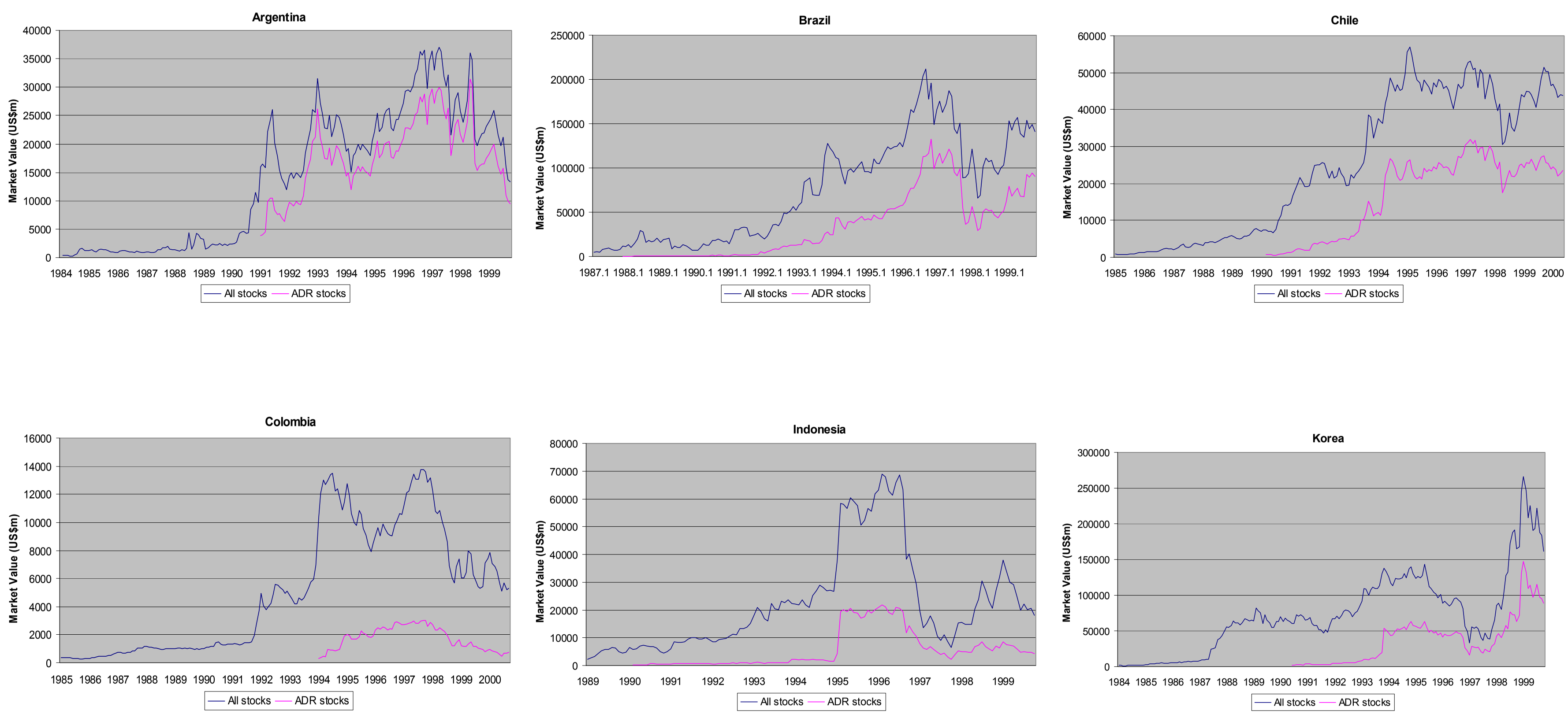

Figure 2 (continued)
Market Capitalization of Stocks Listed Overall and as ADRs by Country

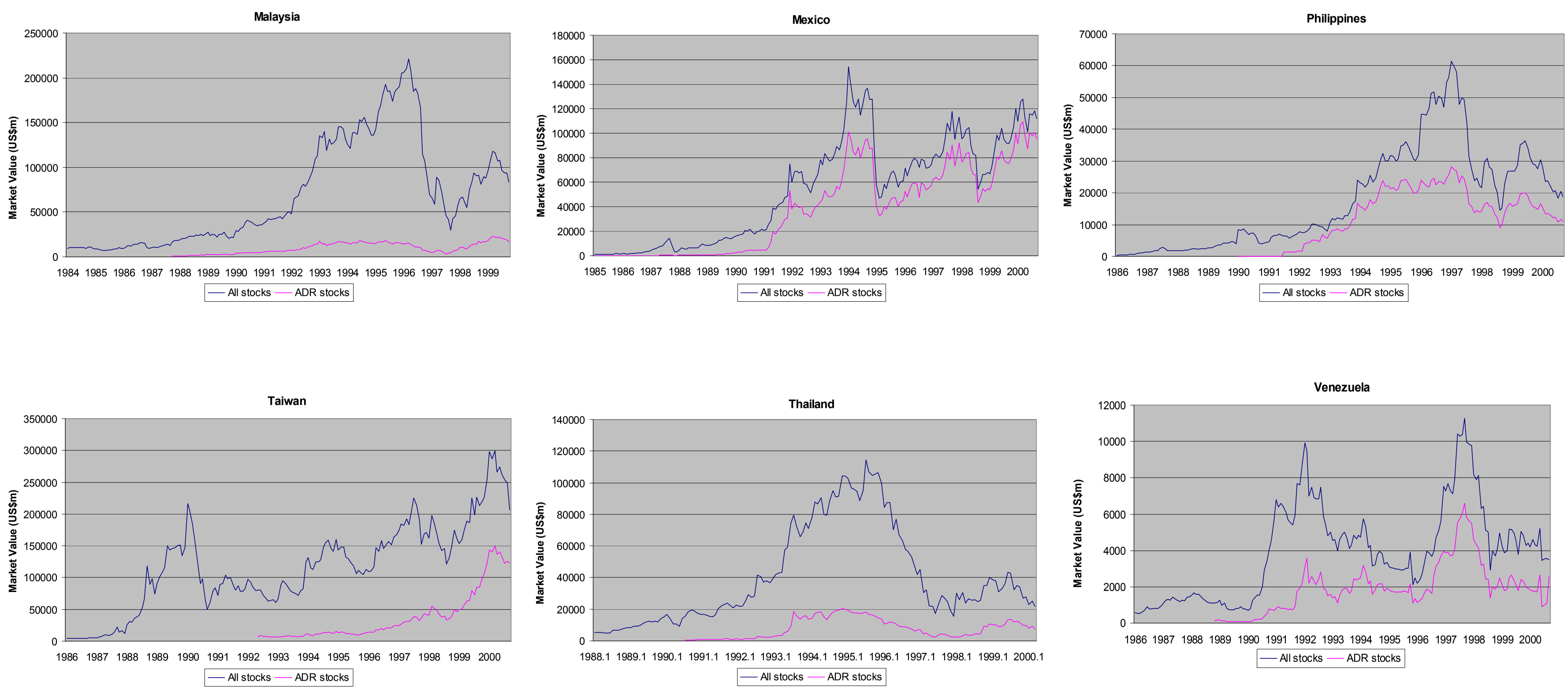

Figure 3
Value of Trading of Stocks Listed Overall and as ADRs by Country

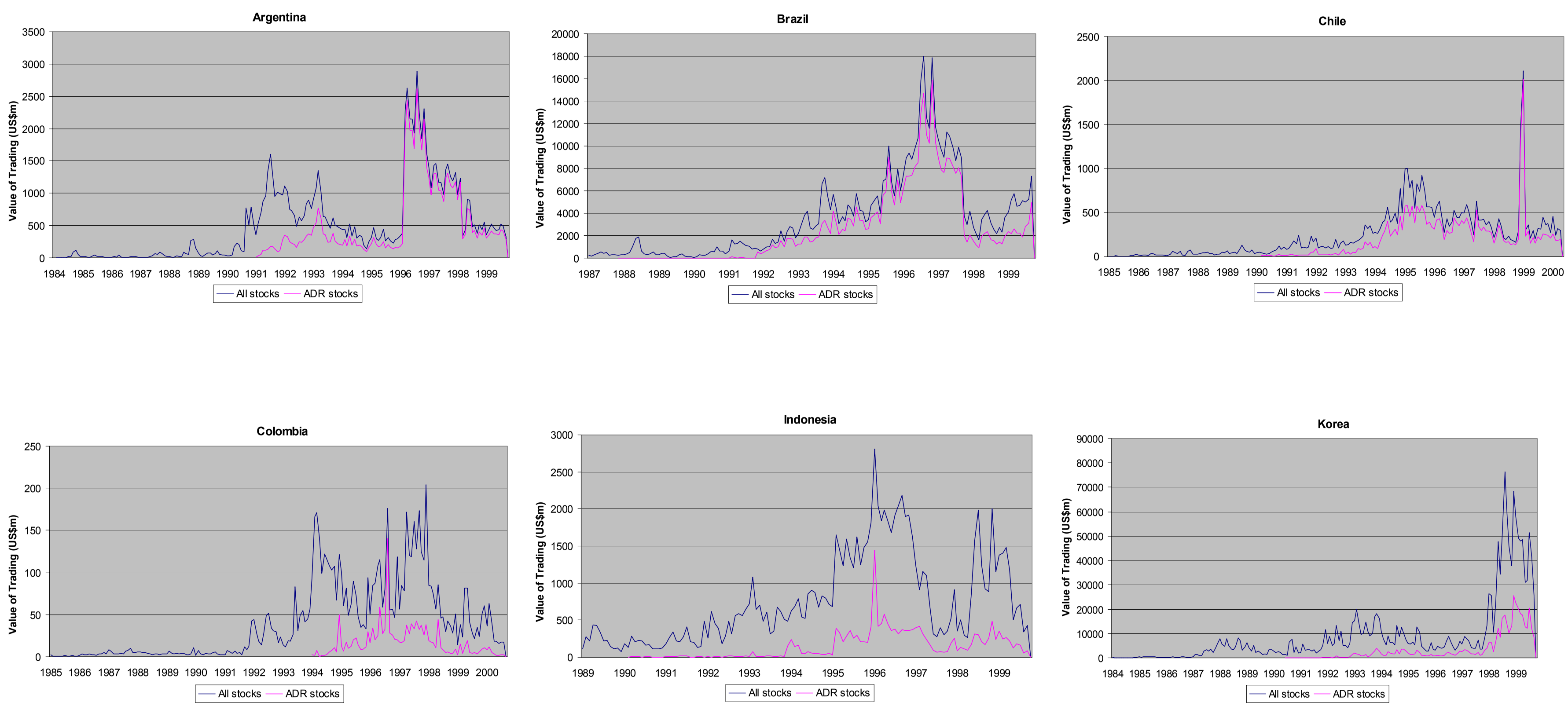

Figure 3 (continued)
Value of Trading of Stocks Listed Overall and as ADRs by Country

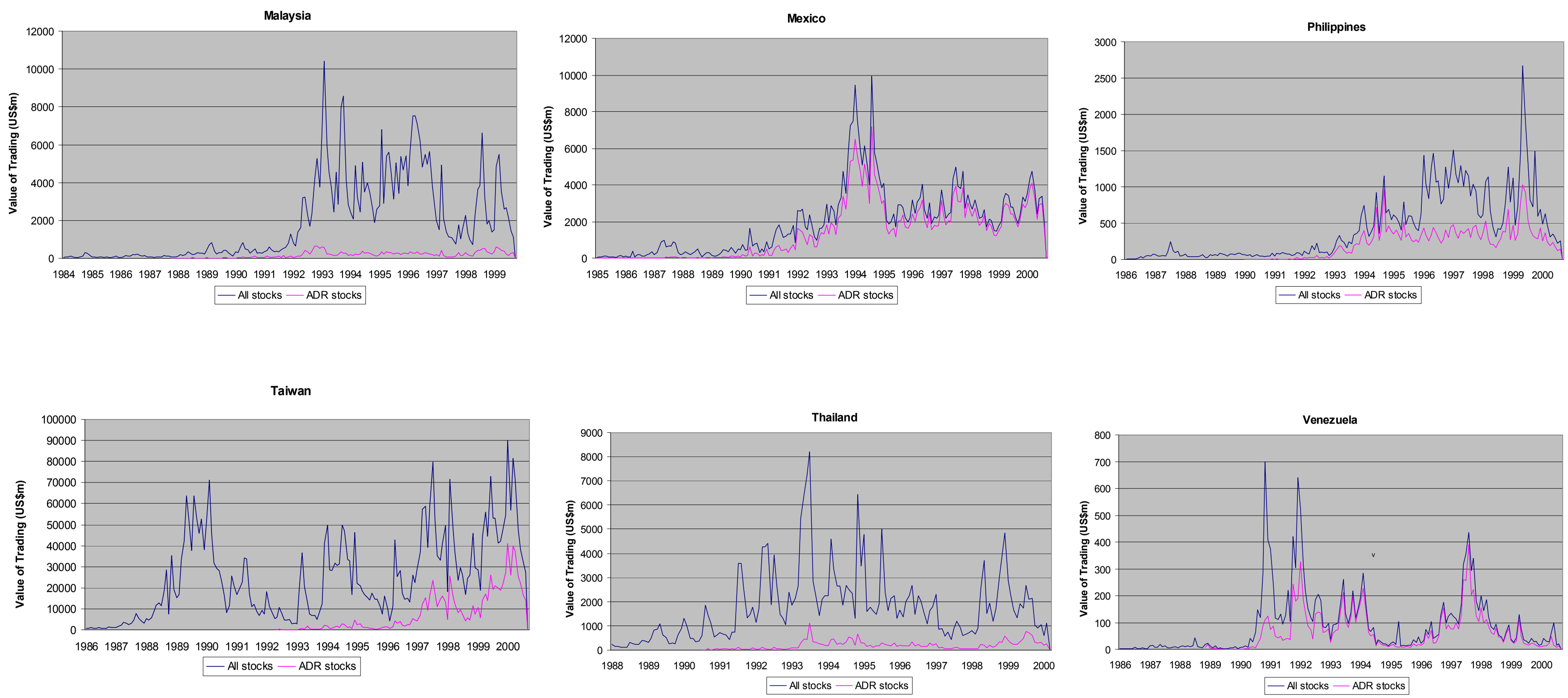

Figure 4
Integration Indexes and Conditional Correlations of Market Index Returns with World Market Returns

Figure 4 (continued)
Integration Indexes and Conditional Correlations of Market Index Returns with World Market Returns