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ABSTRACT

Financial integration is a multidimensional process through which allocation of financial assets becomes increasingly borderless. This paper assesses the progress achieved thus far in capital market integration in Asia, and compares regional capital market integration with global financial integration. The results of the analysis on which the paper is based indicate that while the pace of regional integration of financial markets in Asia's emerging economies has accelerated in recent years, these markets remain more integrated with global financial markets than with other financial markets in the region. Further, integration of the region's domestic local-currency bond markets with their regional and global counterparts lags the pace of integration of its equity markets. The study also assesses the degree to which volatility in equity- and bond-market returns driven by financial turmoil originating at both the regional and global levels spills over into emerging Asia domestic equity and bond markets. The results of this analysis indicate that such spill-over significantly impacts both domestic equity and bond markets in the region. This finding suggests that ongoing regional capital market integration initiatives should take into account the risk of contagion that regional financial integration presents, and introduce measures for mitigating such risk as a means of ensuring financial stability in the region.

I. INTRODUCTION

As articulated by Cavoli, Rajan, and Siregar (2004) in their survey of East Asian financial integration, financial integration is a multidimensional process closely associated with development of financial markets. It is thus unsurprising that the deregulation of the financial sector in Asia that began during the 1980s and resulted in a significant increase in cross-border financial transactions ultimately led to the region's ongoing financial integration.

During the period following the Asian financial crisis of 1997, many Asian economies modernized their financial sectors and strengthened linkages with the financial sectors of other economies in the region. This has led to considerable maturation of many of the region's domestic capital markets, its local-currency bond markets in particular. The soundness of the region's domestic banking systems has likewise improved, in that domestic capacity for financial supervision has become more sophisticated. Intra-regional financial sector policy coordination has likewise strengthened, as demonstrated by the ongoing development of regional arrangements for macroeconomic monitoring and liquidity support. Nevertheless, there remains significant variation in the degree to which the region's domestic capital markets have matured and integrated with others in the region and beyond.

Economic theory suggests that financial integration brings with it significant benefits, including lower costs of trading financial assets, more diverse investor portfolios, and more stable consumption patterns, particularly during periods when the level of economic activity fluctuates widely. Given the absence of restrictions on capital mobility, financial integration allows the level of domestic investment to no longer be constrained by the size of the domestic savings pool, since integration allows foreign capital to be used to underwrite domestic investment. This appears to be an important feature of financial integration, given the direct, positive relationship between domestic savings and investment confirmed by publication of Feldstein and Horioka's seminal paper in 1980, as well as similar literature that followed in its wake. While more recent studies report a weakening in this relationship in advanced economies due to international financial integration, the Feldstein–Horioka puzzle of why investment remains linked to domestic savings remains unresolved, the conventional wisdom of financial globalization that has developed over the past few decades notwithstanding.

Economic theory suggests that absence of restrictions on capital mobility increases the degree of efficiency with which international financial resources are allocated. The rationale for this view is that capital should automatically flow from capital-abundant to capital-scarce countries, the returns to capital being higher in the latter set of countries than in the former. In turn, the rationale holds that capital flows of this nature supplement the domestic savings pool in capital-scarce countries, thereby allowing domestic investment in such countries to increase and economic growth to accelerate. However, the empirical evidence concerning this matter suggests quite the opposite. It in fact confirms that Asia's considerable net savings tend to flow to capital-abundant countries rather than to capital-scarce ones as the theory would predict. In the wake of Lucas' now-famous 1990 paper, this disparity between what economic theory would predict and what actually occurs is often referred to as the "Lucas Paradox" or the "Lucas Puzzle."

Many economists—including Lucas himself—have offered explanations as to why capital fails to flow from capital-abundant to capital-scarce countries. These explanations fall into two broad groups (Alfaro, Kalemli-Ozcan, and Volosovych 2005), the first of which focuses on differences in fundamental economic variables. Examples of the latter include the degree of technological development, presence or absence of particular critical factors of production, or

differences in the level of the output–capital price ratio, government policies, or institutional quality. Ultimately, this set of explanations attempts to provide a rationale for the real-world fact that some countries attract more foreign investment than others.

The second group of explanations focuses on capital market imperfections, and the differing stage of development of financial markets in advanced and emerging economies (Martin and Taddei 2012, and Matsuyama, 2007). The theoretical foundation for this group of explanations is that capital flows respond to the risk-adjusted rate of return to capital rather than to its corresponding nominal rate. Thus, the higher level of risk associated with the nominal expected returns to capital in capital-scarce countries prevents real-world flows from corresponding to those predicted by the theory. In other words, once adjusted for risk, the difference in the rate of return to capital in capital-scarce countries as compared to capital-abundant countries is simply insufficient to cause capital to flow in the direction suggested by economic theory. Further, because of the sheer volume and quality of information transmitted by credit markets in advanced countries, more capital flows into such economies than would otherwise be the case.

To sum up thus far, while the volume of cross-border capital flows has increased substantially since the mid-1990s (Figure 1), the paradox that articulates the inconsistency between the direction of capital flows predicted by the theory and what actually occurs remains largely unresolved. Indeed, Gourinchas and Jeanne (2007) find a natural tendency for capital to flow toward countries that invest and grow *less* than other countries. This phenomenon was dubbed the "allocation puzzle" by Prasad et al. (2007), as it flies in the face of the neoclassical view that differences in productivity growth determine the international allocation of capital. Prasad, Rajan, and Subramanian (2007) also find that developing countries that invest more and rely less on foreign capital grow faster than countries that invest more, but rely more on foreign capital as a funding source for financing such investment. They suggest that even in faster-growing developing countries, the capacity for absorbing foreign capital may still be limited, either because of underdeveloped financial markets, or because of a natural tendency toward overvaluation of domestic currency resulting from rapid capital inflows.

Ultimately, the recurring episodes of financial turmoil that have occurred over the past 2 decades illustrate that increasingly integrated financial markets have a tendency to experience financial crises, and that the negative impacts of such crises tend to spill-over into the markets in which financial assets are traded. In this regard, there is little doubt that abrupt swings in global investor sentiment have impacted the performance of Asia's domestic equity markets over previous decades. For example, during the global financial crisis of 2008–2009, emerging Asia's equity markets experienced sharp reversals in foreign portfolio investment inflows as a result of deleveraging of global financial institutions, as well as a sharp increase in investor risk aversion, this being particularly true of markets in which foreign investor participation had been relatively high.

Such outcomes suggest that the benefits of financial integration predicted by economic theory have somehow not been fully achieved. There are a number of reasons why this may be so. For example, financial integration at the global level is incomplete. This may be one reason why the actual pattern of international capital flows diverges considerably from that predicted by theory as noted above. Further, financial integration often brings with it increased risk in the form of volatility of asset prices and then financial market returns, as well as abrupt reversals in capital flows. Such outcomes—which are familiar to many emerging market economies— underscore the importance of appropriate financial supervision when moving the domestic

economy toward greater overall financial openness, and loosening of restrictions on capital accounts in particular.

In this regard, it is important for policymakers to understand that there are varying degrees of financial integration, each of which has implications for stability of the domestic financial system, as well as the ability of the domestic economy to absorb shocks such as increased volatility in financial market returns or reversals in international capital flows. Finally, particularly in cases in which financial integration is pursued in a deliberate and methodical manner—such as in emerging Asia—the progress achieved tends to be far from uniform across individual economies, as well as across the various subsectors that comprise the overall domestic financial sector.

This study has two major objectives. First, it reviews the progress emerging Asia has achieved thus far in capital market integration. Second, it assesses the degree to which the financial integration that has been achieved has increased the vulnerability of the region's individual economies to the negative impacts of financial crises generated elsewhere in the region or at the global level. The overall goal of such analysis is to better understand how the costs to the domestic economy associated with financial integration may be minimized, so as to maximize the net benefits potentially available from financial integration. From a policy-making perspective, a key issue confronting regional financial cooperation and integration is how best to shape national and regional policies in a way that allows the region's individual economies to maximize the potential gains from financial integration, while at the same time minimizing exposure to the risks associated with it.

This paper is organized as follows. Section II assesses the degree to which *de facto* as opposed to *de jure* financial integration has been achieved in emerging Asia. In this regard, Section II uses several widely-accepted quantitative indicators to highlight recent developments in financial integration at the regional and subregional levels. Section III then quantitatively estimates the degree to which actual integration has been achieved in equity and bond markets in emerging Asia. Section IV uses principal component analysis to assess the extent to which financial crises generated at the regional and global levels have impacted the financial markets of individual economies in emerging Asia. The conclusions and policy recommendations presented in Section V then complete the paper.
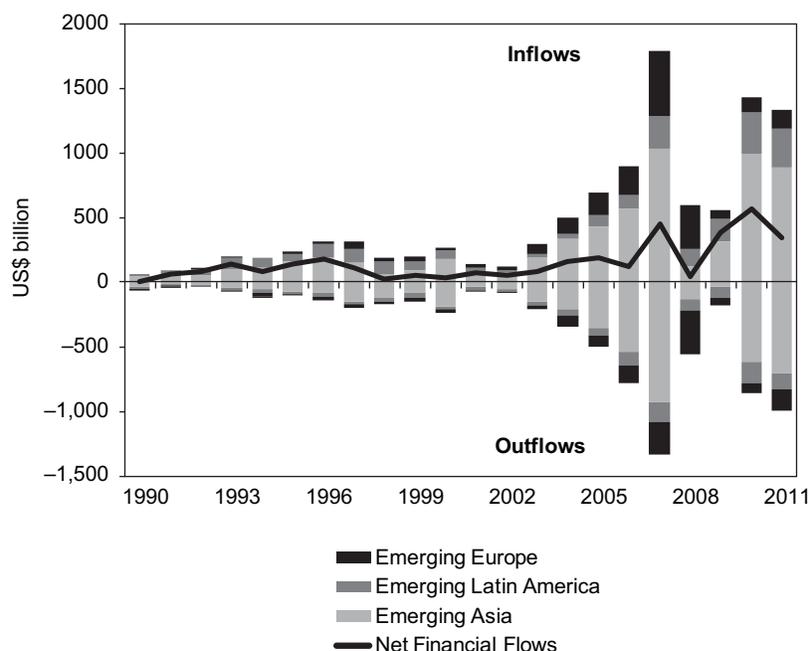
II. *DE FACTO* VS. *DE JURE* FINANCIAL Integration

While there is no universally accepted definition or singular quantitative measure of financial integration, most observers agree that it is closely associated with financial openness and capital mobility. Figure 1 depicts gross and net financial flows in and out of emerging market economies in Asia, Europe, and Latin America. Mirroring the global trend in financial and capital account deregulation that occurred during the 1980s and 1990s, capital flows into emerging market economies surged and then peaked just prior to the global financial crisis of 2008.[1] Asia has become a major destination for such capital flows, accounting for nearly 60% of total

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[1]   In this paper, the phrase "emerging market economies" refers to the emerging economies of Asia, Europe, and Latin America. Similarly, "emerging Asia" refers the People's Republic of China (PRC); Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia, the Philippines; Singapore; Taipei,China; Thailand; and Viet Nam. "Emerging Europe" thus refers to Belarus, Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, the Russian Federation, the Slovak Republic, and the Ukraine, and "emerging Latin America" refers to Argentina, Brazil, Chile, Columbia, the Dominican Republic, Ecuador, Guatemala, Mexico, Peru, and Venezuela.

financial flows into emerging market economies during the period prior to the global financial crisis.

Figure 1: Financial Inflows and Outflows In and Out of Emerging Asia, Europe, and Latin America, 1990–2011

Note: Emerging Asia includes the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipe,China; Thailand; and Viet Nam. Emerging Europe includes Belarus, Bulgaria, Czech Republic,Estonia, Hungary, Latvia, Lithuania, Moldova, Poland, Romania, Russian Federation, Slovak Republic, and Ukraine. Emerging Latin America includes Argentina, Brazil, Chile, Colombia, Dominican Republic, Ecuador, Guatemala, Mexico, Peru, and Venezuela. Emerging Markets includes countries in Emerging Asia, Europe and Latin America. Data on inflows are liabilities, while outflows are assets. Foreign direct inflows from 1990–2004 refer to direct investments in the reporting country. Other investments include financial derivatives. Data from 2005 onwards follow Balance of Payments Manual 6 (BPM6).

Source: Author's calculations using data from *International Financial Statistics*, International Monetary Fund; and national sources.

There are several ways to quantitatively assess financial openness, and thence financial integration. The first of these would be to count the number of legal restrictions on cross-border capital flows applicable to the economy concerned. This would constitute a *de jure* measure of financial integration, since it is based on legal restrictions currently in force. A wide variety of such restrictions are currently in use, including price- and quantity-based controls on the international movement of capital, as well as restrictions on equity holdings by nonresidents. Indeed, the International Monetary Fund reports more than 60 different types of such controls in its *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). The inherent weakness of this approach is that counting capital controls gives us no information whatsoever regarding the degree to which such restrictions are effective in limiting the extent of international capital flows.

A second approach would be to use an actual measure of financial openness, such as assessing actual cross-border capital flows, since the latter directly reflect the degree of financial openness of the economy concerned. In many ways, such an approach constitutes an improvement over the legal approach, in that, what matters is not how open capital markets

appear on paper, but how integrated they are in practice. However, such a measure raises the question as to whether gross or net financial flows constitute the more suitable measure, particularly since both tend to be volatile and often subject to procedural issues in their measurement. Because of such shortcomings, the stock of foreign assets and liabilities (IMF 2009) is often used as an additional measure of actual financial openness and then financial integration.

Figures 2a–c depict *de jure* and *de facto* financial integration indexes for emerging Asia and its various subgroupings. The measure of legal financial integration used is the index initially developed by Chinn and Ito (2006) to measure capital account openness, which assesses the existence of legal restrictions on cross-border financial transactions as reported in the AREAER, values of greater magnitude indicating a greater degree of financial openness. Conversely, the summed gross stock of foreign assets and liabilities as a percentage of gross domestic product is the actual measure of financial integration depicted in Figure 2a–c. The values depicted in Figure 2 were calculated from an update of the dataset constructed by Lane and Milesi-Ferretti (2007), and were extended with data from the International Monetary Fund's (IMF) *International Investment Position Database.*

As depicted in Figures 2a–c, emerging Asia's legal financial integration index rose sharply during the late 1970s and early 1980s, reflecting the wave of financial deregulation that occurred across the region during this period. Although there were some adjustments to legal restrictions relating to financial integration in the wake of this "big bang" style of financial deregulation that occurred during the 1970s and 1980s, the legal financial integration index remained high up until the late-1990s, the period just prior to the Asian financial crisis. The fall in the legal financial integration index around the time of the Asian financial crisis reflects increased foreign exchange interventions by Asian economies in the run-up to the crisis of 1997, as well as the introduction of capital control measures following the outbreak of the crisis. Notably, the trends in the legal financial integration indexes for the newly industrializing economies (NIEs) and the ASEAN-4 countries diverge quite widely in the wake of the crisis of 1997.[2] In particular, while the NIEs quickly dismantled the temporary capital control measures put into place in the wake of the crisis and continued on their medium-term path of financial deregulation, the ASEAN-4 countries sustained their post-Asian financial crisis controls overall, and even introduced additional controls during the global financial crisis of 2008.

Interestingly, the actual financial integration indexes for all three sets of countries—emerging Asia overall, the ASEAN-4, and the NIEs—show a steady uptrend despite the declines that occurred in the legal financial integration index in the ASEAN-4. This highlights the substantial gap between *de facto* and *de jure* measures of financial openness and integration. In short, the fact that numerous developing countries impose significant legal controls on the international movement of capital does not mean that such controls are particularly effective in curbing international capital flows. Actual financial integration—as measured by capital flows and cross-border financial asset holdings—may significantly exceed the level implied by corresponding legal controls. This seems particularly relevant to the ASEAN-4 countries, where *de facto* financial integration measure increased rather sharply during the period following the 1997 crisis, just when the *de jure* measure of financial integration fell significantly.

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[2]   As used in this chapter, the phrase "newly industrializing economies" (NIEs) refers to Hong Kong, China; the Republic of Korea; Singapore, and Taipei,China. Similarly, the phrase "ASEAN-4" refers to Indonesia, Malaysia, the Philippines, and Thailand, these countries being four of the ten members of the Association of Southeast Asian Nations (ASEAN). At this writing, ASEAN's full membership includes Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

Figure 2: *De Jure* and *De Facto* Financial Integration in Emerging Asia, 1970–2010

Figure 2a: Emerging Asia

Figure 2b: ASEAN-4

Figure 2c: Newly Industrializing Economies

De facto (LHS)
De jure (RHS)
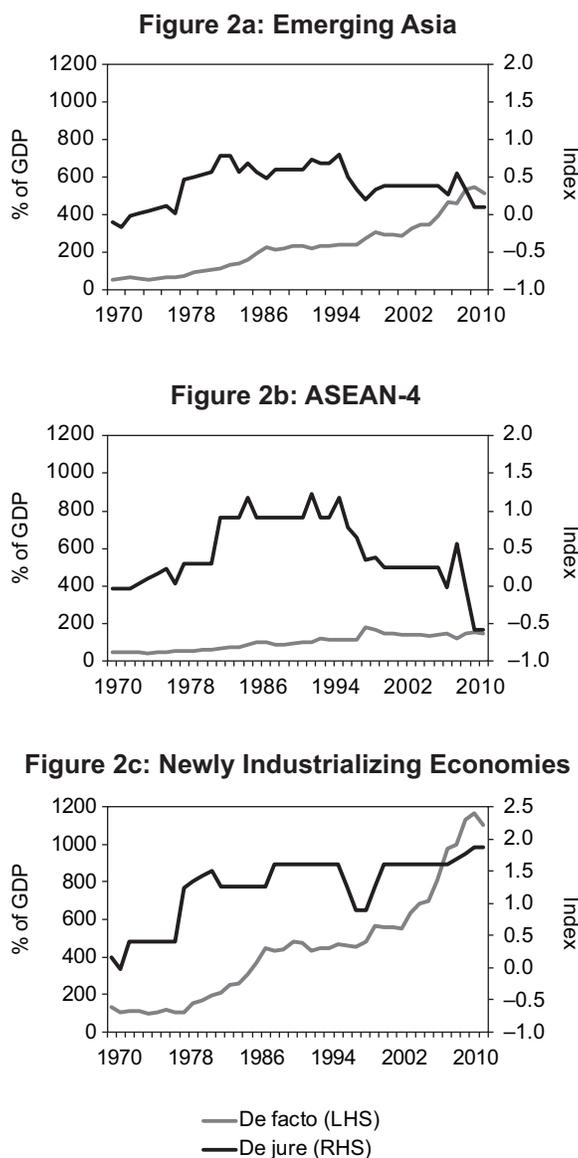
Note: The *de facto* (LHS = left hand scale) measure that appears in Figures 2a-c refers to the sum of foreign assets and liabilities expressed as a percentage of GDP. This measure is taken from the Lane and Milesi-Ferreti External Wealth of Nations dataset (available at http://www.philiplane.org/EWN.html), and was extended using data from the International Monetary Fund's (IMF's) International Investment Position (IIP). The *de jure* (RHS = right hand scale) measure refers to the estimated Chinn-Ito Index, which is based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (available at hhtp://web.pdx.edu/~ito/Chinn-Ito_website.htm). The Emerging Asia grouping includes the People's Republic of China, India, Indonesia, Malaysia, the Philippines, and Thailand. The Newly Industrializing Economies (NIEs) grouping includes Hong Kong, China; the Republic of Korea; Singapore, and Taipei,China.

Source: External Wealth of Nations Dataset and the Chinn–Ito Index.

Park and Lee (2011) report that capital flows in and out of emerging Asia have consistently increased, and that over the past decade these have been particularly driven by portfolio investment flows. Their study likewise analyzed international portfolio asset holdings using the IMF's *Coordinated Portfolio Investment Survey* (CPIS), which disaggregates each economy's stock of portfolio investment assets by country of residence of the issuer of the asset concerned[3] Park and Lee find a sharp increase in emerging Asia's international portfolio asset holdings over the study period, implying a significant increase in the degree of financial openness and integration achieved by the region overall. However, when disaggregated by subregional grouping as well as asset classification, their assessment of the region's foreign asset holdings suggests that the degree of financial integration achieved by the region's various subgroupings of economies and market segments is far from uniform.

Such findings suggest that there remains considerable room for improvement in regional financial integration in two ways. First, although emerging Asia's foreign portfolio assets are increasingly held within the region, advanced economies still account for a major share of its foreign portfolio assets. Second, there is a considerable difference in the degree of financial market development and integration as regards the equity and bond markets. In particular, Park and Lee find that the region's equity markets are relatively more open and integrated as compared to its domestic currency bond markets. Emerging Asia's foreign asset holdings are also skewed toward equities as opposed to debt securities. Further, the region's domestic currency bond markets remain largely segmented, their limited integration probably reflecting a correspondingly limited level of development of this segment of the financial market.

III. CAPITAL MARKET INTEGRATION IN EMERGING ASIA

De facto measures of financial integration can be grouped into two broad types: price- and quantity-based measures. Quantity-based measures reflect actual financial flows and cross-border asset holdings, as previously discussed. Conversely, the theoretical foundation for price-based measures is the "law of one price," which holds that given full financial integration, markets price assets with similar risk characteristics in a similar manner. In other words, once risk has been fully accounted for, the greater the degree of financial integration, the more closely correlated the movements of prices of assets of similar risk profiles.

A. Integration of Stock Markets in Emerging Asia

A substantial body of literature reports that stock price movements tend to be correlated with one another over time, international boundaries notwithstanding. Further, this correlation tends to be closer during market downturns and periods of financial turmoil than during other periods (King and Wadhwani 1990, Longin and Solnik 1995, Karolyi and Stulz 1996, and Forbes and Rigobon 2002). This gives rise to a natural concern that financial crises raise the degree of correlation between asset price movements across international borders, thus increasing the possibility of contagion of financial turmoil from one domestic market to another. This increased correlation between asset price movements across international borders occurred in emerging Asian markets in the aftermath of the global crisis of 2008, as regional and global cross-border asset price correlations tended to be closely associated during that period (Park and Lee, 2011). Hinojales and Park (2010) also find that the degree of integration of emerging Asia stock

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[3] The first *Coordinated Portfolio Investment Survey* (CPIS) dataset which was published in 1998 reflected data for 1997. However, annual CPIS data only became available in 2001.

markets has increased over time, thereby suggesting increased risk of contagion from one domestic market to another.

This section of the paper assesses the degree to which movements in stock-market returns in emerging Asian economies are correlated with those at the regional and global level. Individual economy, regional, and global stock price indexes are used for this purpose. The stock price indexes of individual economies used in performing the analysis are those computed by *Datastream International*, these indexes including firms of large, medium, and small market capitalization. The dataset includes 10 emerging Asia economies and 19 advanced countries The 10 emerging Asia economies include the People's Republic of China (PRC); India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. The advanced economies include Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom (UK), and the United States (US). Financial returns to stocks are expressed in local currency units, with a weekly frequency beginning 13 January 1993 and ending 28 December 2011.[4] These weekly data refer to the mid-week (Wednesday) closing price for each stock concerned. Weekly stock market returns are computed as the difference between the current and previous week's closing price expressed in percent.

Ultimately, the purpose of the study is to measure the degree to which financial returns in emerging and advanced countries converge over time, as such convergence indicates financial integration. To do this, the study employs two notions of convergence. The first is σ-convergence, which uses the filtered cross-sectional dispersion of financial returns in individual economies following the methodology used by Adam et al. (2002) and European Central Bank (2004). This measure indicates an increase in the degree of convergence of financial returns across economies (and thence financial integration) by a *decrease* in the cross-sectional standard deviation σ of financial returns across study economies. Full integration is thus achieved when the cross-sectional distribution ends in a single point, and the standard deviation approaches zero.

Figure 3 graphically depicts changes over time in σ-convergence in stock market returns across the study, economies included in the emerging Asia grouping and its subgroupings. As seen in the figure, the cross-market dispersions of weekly stock market returns have declined over time for both the emerging Asia grouping and its subgroupings, thus suggesting increasing integration of the stock markets in the emerging Asia grouping and its subgroupings. The same holds true for the cross-market dispersion of weekly stock market returns in emerging Asia and its subgroupings as compared to the average of stock market returns globally. It is noteworthy that this dispersion declined to a greater degree for the newly industrializing economies (NIEs) than for the ASEAN-4 countries. Interestingly, the cross-market dispersion of weekly stock-market returns in emerging Asia increased during the crisis periods of 1997–1998 and 2008–2009, reflecting the impact of these crises on individual market returns, as well as on asset price volatility.

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4   In order to net out the impact of changes in the exchange rate, the stock and bond market returns used in performing the analysis are expressed in domestic-currency terms. This was deemed an important feature of the analysis, since the magnitude of variation in weekly returns is generally small as compared to the magnitude of changes in the exchange rate, especially in the case of bond markets. While some financial market integration studies use financial returns denominated in US dollars, the impact of exchange rate variations on the results achieved remains a source of debate.

Figure 3: σ-Convergence of Weekly Stock-Market Returns for Selected Groupings of Economies (September 1991—November 2011)
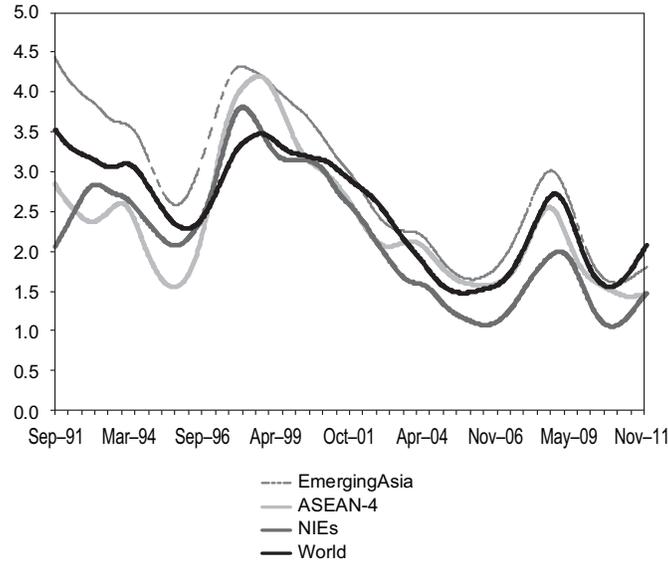
Note: The values depicted on the x-axis refer to the standard deviation of the filtered country returns obtained by employing the Hodrick-Prescott method, with the parameter (lambda) set to a value of 270,400. The Emerging Asia grouping refers to the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore, Taipei,China; and Thailand. The Newly Industrializing Economies (NIEs) grouping refers to Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China. The ASEAN-4 grouping includes Indonesia, Malaysia, the Philippines, and Thailand. The World grouping includes 34 advanced and emerging economies including those in the Emerging Asia grouping identified above. The stock price indexes for all individual economies included in the analysis are expressed in units of domestic currency. All stock-price-index data were downloaded from *Datastream.*

Source: Author's calculations using data accessed from Datastream accessed July 2012.

The second measure of convergence employed by the study is β-convergence, which was first used in growth theory, but was then later applied to financial integration by Adam et al. (2002) and Rizavi et al. (2011). Using the specification employed by Rizavi, Naqvi, and Rizvi (2011), β is estimated by the equation:

$$\Delta ER_{i,t} = \alpha_{i,t} + \beta ER_{i,t-1} + \sum_{i=1}^{L} \gamma_1 \Delta ER_{i,t-1} + \varepsilon_{i,t} \tag{1}$$

where ER_i represents the difference between the return in economy i and the computed regional return (rr), and $\Delta ER_{i,t}$ is the difference between the returns in two successive periods, and

$$ER_{i,t} = R_{i,t} - R_{rr,t} \tag{2}$$

where $R_{i,t}$ refers to weekly returns computed as the natural log difference between the value of the current and previous stock (or bond) price index. The regional returns are calculated using principal component analysis.

A negative value for β suggests that the values of the returns converge, the magnitude of β indicating the rate at which convergence (i.e., financial integration) takes place. As explained by Rizavi, Naqvi, and Rizvi (2011), the β-convergence coefficient in [equation (1)] can take on a value ranging from 0 to –2. A negative sign for the coefficient indicates financial integration, with the highest possible speed of convergence (financial integration) being indicated by a value of–1. The extreme values 0 and –2 indicate no financial integration whatsoever. Conversely, a value for β between 0 and –1 indicates gradual unidirectional

convergence between the returns in the two markets concerned, while a value for β between –1 and –2 implies that the convergence is oscillating or fluctuating.

Given that financial returns vary over time, it is possible for the estimated values for β-convergence to change over time. To address the problem of β-convergence changing over time, the study uses a rolling estimation procedure following Fratzscher (2001). This procedure estimates β over a fixed 1-year (52-week) period beginning January 1993 and ending in January 1994. This 1-year window is then moved forward 1 week at a time until the final observation in the dataset is included in the calculation.

Figure 4 depicts the β-convergence coefficients for weekly equity market returns for individual economies as compared to the returns for the emerging Asia grouping as a whole, the latter being calculated as the unweighted average of βs for all economies in the emerging Asia grouping. The negative values assumed by the βs indicate convergence in individual economy equity market returns with the equity market returns at the regional level, those these βs oscillate over time. This oscillating pattern of convergence is notable during the crisis periods of 1997–1998 and 2007–2008, as it indicates a significant slowdown in the convergence process, though this slowdown quickly reversed during 1999–2000 and 2009–2010, the years directly following the two crises. The NIEs show the greatest degree of convergence, followed by the ASEAN-4 grouping. The convergence between the weekly equity-market returns for the PRC and the emerging Asia grouping as a whole takes place in a gradual manner.

Figure 4: β-convergence of Individual-Economy Weekly Equity Market Returns with the Weekly Equity Market Returns of the Emerging Asia Grouping as a Whole
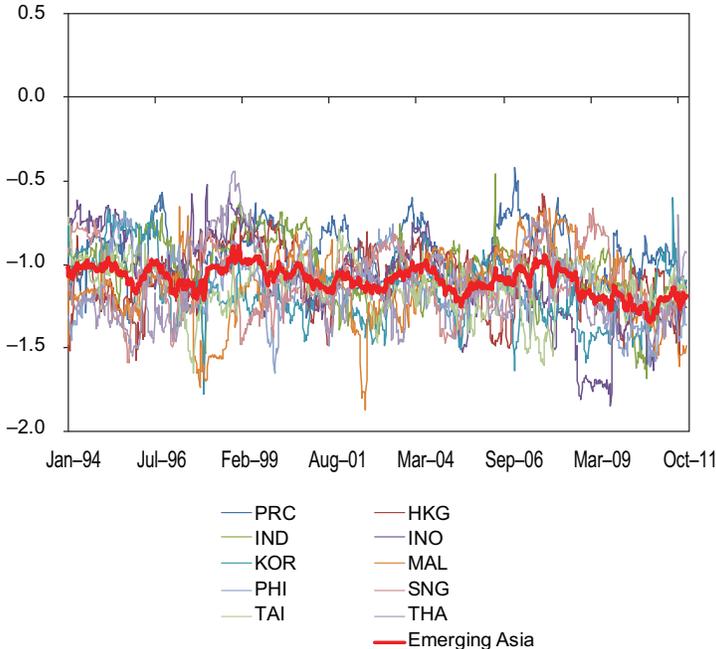
PRC= People's Republic of China; HKG = Hong Kong, China; IND = India; INO = Indonesia; KOR = Republic of Korea; MAL = Malaysia; PHI = Philippines; SNG = Singapore; TAI = Taipei,China; THA = Thailand.

Note: The values for the emerging Asia correspond to the unweighted average of the β-convergence coefficients for each of the individual economies included in the emerging Asia grouping. The regional returns for each member country are computed using the first principal component analysis.

Source: Author's calculations.

B. Integration of Bond Markets

The present study also assesses the degree of convergence between individual economy, local currency bond yield indexes and the corresponding index for the emerging Asia groupng as a whole, as well as the former with the composite global bond yield index. The data used pertain to the zero coupon yield curve for each economy under study, since this nets out differences in coupon rates, maturities, and individual bond idiosyncrasies across economies, thus allowing a straightforward comparison of bond yields across individual economies and groupings (Gürkaynak, Sack, and Wright, 2007). Data for the bond yields pertaining to individual economies are the relevant benchmark yields sourced from Bloomberg LP.

Figure 5 depicts the σ-convergence of composite 10-year government bond yields for (i) the NIEs, (ii) the ASEAN-4 grouping, and (iii) the emerging Asia grouping, all of these being compared with US Treasury bond yields of the same tenor. Since the year 2000, the dispersion of bond yields for the ASEAN-4 has declined significantly as compared to the other groupings, while the NIEs' dispersion of bond yields remained limited as compared to the emerging Asia grouping as a whole. Interestingly, the dispersion of bond yields for the emerging Asia grouping as a whole declined to a greater extent than did the dispersion of the bond yields for the global grouping since late 2009. This implies growing convergence among bond yields for the emerging Asia grouping. In contrast, the dispersion of bond yields for the overall global grouping has increased since 2010, as some countries included in this grouping have encountered sovereign debt problems.

Figure 5: σ-Convergence of 10-Year Government Bond Yields
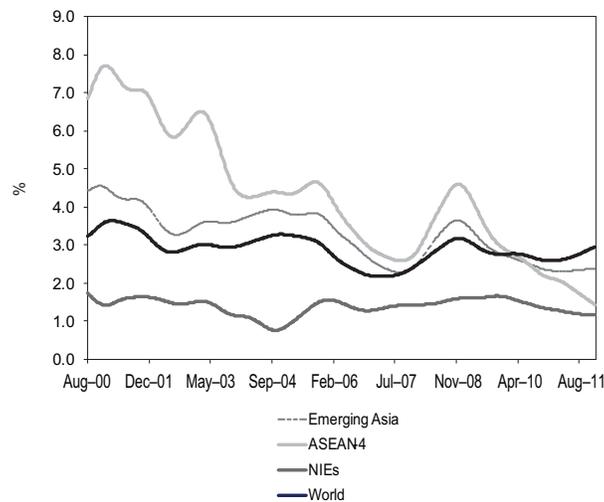
Notes:

1. Values refer to standard deviation of country bond yield spreads over 10-Year US government bond yields. Data are filtered using Hodrick-Prescot tmethod.

2. Emerging Asia includes the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore, Taipei,China; and Thailand.

3. ASEAN-4 = Association of Southeast Asian Nations includes Indonesia, Malaysia, the Philippines, and Thailand.

4. NIEs = newly industrialized economies include Hong Kong, China; the Republic of Korea, Singapore; and Taipei,China.

5. World includes 26 advanced and emerging economies including those from Emerging Asia.

Source: Author's calculations using data accessed from Bloomberg LP accessed July 2012.

Figure 6 presents the σ-convergence of bond yields for the emerging Asia grouping as compared with US Treasuries with the same tenor for varying maturities. It shows that the dispersion of government bond yields for various maturities has declined since late 2005, although this trend was interrupted during the crisis years of 2008–2009. Notably, the dispersion of yields across the various maturities was of roughly equal magnitude in 2005, implying that the degree of dispersion became similar over time across tenor.

Figure 6: σ-Convergence of Emerging Asia Government Bond Yields for 2-Year, 5-Year, and 10-Year Maturities
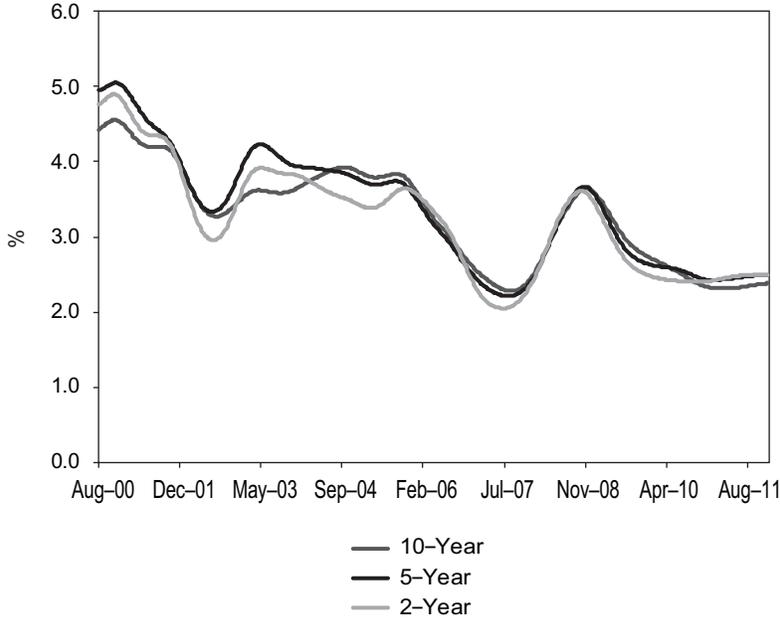

Note: Values refer to the standard deviation of country bond yield spreads over 10-Year, 5-Year, and 2-Year US government bond yields. Values are filtered using Hodrick-Prescot t method with parameter λ set to 14,400. Emerging Asia includes the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore, Taipei,China; and Thailand.

Source: Author's calculations using data accessed from Bloomberg LP accessed July 2012.

Figure 7 shows the β-convergence of weekly coefficients of the unweighted regional average and individual-economy five-year government bond yields as compared with computed regional yields (derived using principal component analysis). Several points regarding Figure 7 are noteworthy. First, the β-convergence coefficients approach zero during the sample period. Although they are generally negative in sign, which suggests some convergence in bond yields, their magnitudes are much smaller as compared to the corresponding values for equities. In fact, for some economies, the coefficients turn positive at some points, indicating divergence. Second, the convergence of individual economy bond yields with regional yields has been consistently gradual over time, as the values for the βs range between 0 and –1. Third, the degree of convergence among regional bond yields increased significantly during the global financial crisis, though this sharp increase in convergence appears to have been transitory.

Figure 7: β-convergence of Individual-Economy 5-Year Government Bond Yields with Regional Bond Yields
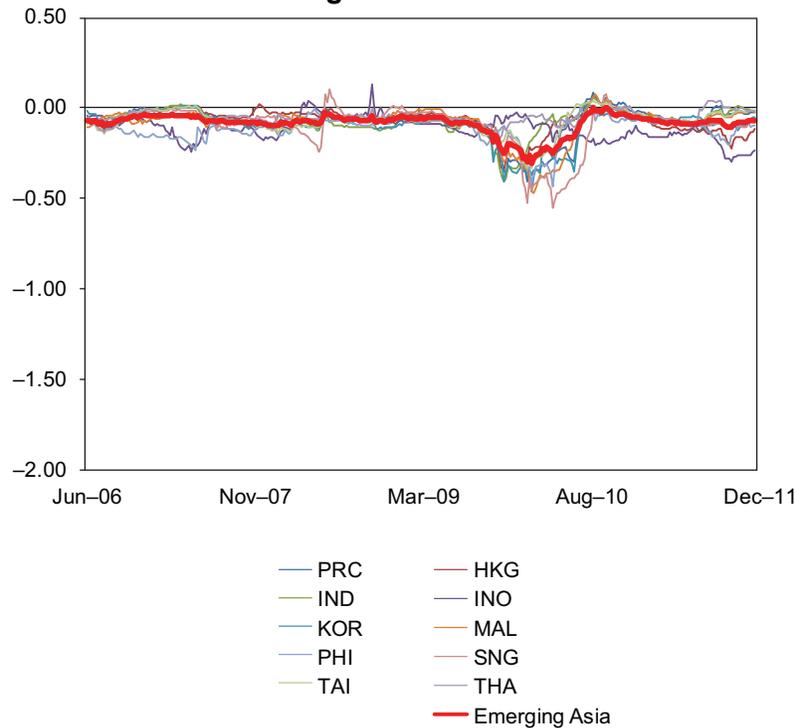
PRC= People's Republic of China; HKG = Hong Kong, China; IND = India; INO = Indonesia; KOR = Republic of Korea; MAL = Malaysia; PHI = Philippines; SNG = Singapore; TAI = Taipei,China; THA = Thailand.

Note: The values for the emerging Asia correspond to the unweighted average of the β-convergence coefficients for each of the individual economies included in the emerging Asia grouping. The regional yields for each member country are computed using the first principal component analysis.

Source: Author's calculations.

C.   Degree of Financial Integration and Extent of Spillover of the Negative Impacts of Regional and Global Financial Crises into Emerging Asia Economies

Financial integration with countries both within and outside the region may increase the degree to which emerging Asia economies are negatively impacted by external financial shocks. However, direct evidence of this remains incomplete at this writing. What can be said with relative certainty is that given that emerging Asia equity and bond markets are fully integrated with their counterpart markets globally, and given absence of financial disturbances specific to emerging Asia economies, then the only information to which the stock prices and bond yields in emerging Asia markets will respond is that same information that impacts all markets globally. By extension, analyzing the reaction of these markets to regional and global shocks allows us to assess the extent to which emerging Asia equity and bond markets are financially integrated with markets within and beyond the region.

1.   The Data

For the individual economy stock market returns included in the study, the same data as those referred to in Section III. A were used. These include the stock price indexes of individual economies computed by *Datastream International*, which encompasses firms of large, medium,

and small market capitalization. The dataset includes 10 emerging Asia economies and 19 advanced countries. The 10 emerging Asia economies include the PRC; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. The advanced economies include Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, the UK, and the US. Financial returns to stocks are expressed in local-currency units with a weekly frequency beginning 13 January 1993 and ending 28 December 2011.[5] These weekly data refer to the mid-week (Wednesday) closing price for each stock concerned. Weekly stock returns are computed as the difference between the current and previous week's closing price expressed in percent.

For the indexes of returns to bonds, the HSBC Asia Local Bond Index (ALBI) was used for economies in the emerging Asia grouping, and the Citigroup World Government Bond Index for all others. Both datasets are denominated in domestic currency, with a weekly frequency beginning on 13 January 1993 and ending on 28 December 2011 for stocks, and from 10 January 2001 to 28 December 2011 for bonds.[6]

While price-based measures such as those used by the present study are often useful, they present some practical problems. In particular, returns to financial assets may be subject to a multitude of risk and liquidity premiums that are difficult to quantify. Further, the pricing mechanism in emerging-market financial markets may not function in an efficient manner. This is particularly true in shallow emerging-economy financial markets where trading is thin. Further, given that such markets are fully integrated globally, domestic asset prices may be particularly impacted by global and regional financial distress. Moreover, in such cases, empirical results are often swayed by the benchmark equity and bond indexes selected. Thus, if selection of the latter is inappropriate, the results may be misleading. Earlier studies have often included unexpected returns on regional and global indexes of particular asset classes. However, these regional or global indexes themselves may not be the best benchmark index for representing regional or global assets.

An important question for the present study is whether or not there is a common feature among Asian asset prices that can capture co-movement of prices at the regional level. One way of addressing this issue is to use regional price indexes as benchmark indexes. However, these are often simply weighted averages of individual economy stock and bond market indexes. As a result, they do not necessarily capture co-movement of Asian asset prices.

The present study uses principal component analysis to create benchmark indexes of returns to stocks and bonds at the regional level. Principal component analysis yields principal components, capturing as much information common to the variables concerned as possible. The first principal component has the largest possible variance, and thus accounts for as much

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[5] In order to net out the impact of changes in the exchange rate, the stock and bond market returns used in performing the analysis are expressed in domestic currency terms. This was deemed an important feature of the analysis, since the magnitude of variation in weekly returns is generally small as compared to the magnitude of changes in the exchange rate, especially in the case of bond markets. While some financial market integration studies use financial returns expressed in US dollars, the impact of exchange rate variations on the results achieved remains a source of debate.

[6] Both datasets include 10 emerging Asian economies (the PRC; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand), as well as advanced countries including Austria, Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The equity dataset also includes Argentina, Chile, Mexico, South Africa, and Turkey. The dataset for analyzing the bond market also includes Greece and Norway.

of the variation in the data as possible.[7] It is similarly possible to use principal component analysis to construct a benchmark index for global asset prices.

The reason the present study uses principal component analysis is that it casts stock-market (and bond market) returns relating to individual Asian economies into a single variable (regional returns) by forming linear combinations of the observed returns. The resulting regional returns are derived from the first principal component, which refers to the coefficients of the linear combination that maximize the variance of the resulting regional returns. To remove economy-specific factors, the regional returns for both stocks and bonds are computed in a manner that excludes the returns relevant to the economy in question from calculation of the regional return index with which that economy's returns will be compared. For example, the regional returns excluding the PRC comprise the first principal component of the stock and bond market returns of Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. Similarly, principal component analysis is used to calculate global stock- and bond-market returns. Thus, the global returns used in the analysis capture the returns of all economies in both datasets, except those of the emerging Asia grouping.

Tables 1a–b report the results of principal component analysis for stock and bond market returns pertaining to 10 emerging Asia markets with the five principal components that have the largest eigenvalues. For example, the first regional principal component for emerging Asia stock market returns, which corresponds to the largest eigenvalue of 4.32, accounts for about 50% of the total variation, and about 30% of the variation in the individual returns of all economies.

Table 1a: Principal Component Analysis Pertaining to Regional Stock-Market Returns

| Number | Regional Stock Returns | | | | |
	1	2	3	4	5
Eigenvalue	4.323	0.989	0.902	0.760	0.647
Variance Proportion	0.432	0.099	0.090	0.076	0.065
Cumulative Proportion	0.432	0.531	0.622	0.698	0.762
Eigenvector					
China, People's Rep. of	0.093	0.939	0.280	−0.134	−0.005
Hong Kong, China	0.383	0.048	−0.076	−0.243	−0.014
India	0.237	0.239	−0.535	0.729	0.027
Indonesia	0.331	−0.056	0.262	0.336	−0.182
Korea, Rep. of	0.317	−0.006	−0.349	−0.357	−0.578
Malaysia	0.326	−0.153	0.340	−0.014	0.433
Philippines	0.321	−0.092	0.317	0.220	0.072
Singapore	0.400	−0.041	0.000	−0.102	0.077
Taipei,China	0.294	0.020	−0.431	−0.306	0.565
Thailand	0.351	−0.148	0.194	−0.003	−0.338

Note: Number refers to the principal components i.e. 1 is the first principal component, and so on.

It includes returns from all countries in the region.

Source: Author's estimates.

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[7] Typically, the composite indicator corresponds with the principal component that has the largest eigenvalue. Well-known composite indicators that use this method include the Chicago Fed National Activity index and the General Indicator of Science and Technology published by the National Institute of Science and Technology Policy. The OECD handbook (2008) discusses the numerous approaches that have been used in formulating a composite indicator.

Table 1b: Principal Component Analysis Pertaining to Regional Bond-Market Returns

| | Regional Bond Returns | | | | |
Number	1	2	3	4	5
Eigenvalue	2.368	1.325	1.087	0.986	0.898
Variance Proportion	0.237	0.133	0.109	0.099	0.090
Cumulative Proportion	0.237	0.369	0.478	0.577	0.666
Eigenvector					
China, People's Rep. of	0.152	0.132	0.631	0.276	0.554
Hong Kong, China	0.467	−0.282	−0.065	0.118	−0.088
India	0.192	0.239	0.570	−0.092	−0.616
Indonesia	0.070	0.636	−0.277	0.054	0.356
Korea, Rep. of	0.356	0.096	0.171	−0.343	0.104
Malaysia	0.316	0.130	−0.309	−0.295	−0.006
Philippines	0.129	0.437	−0.163	0.662	−0.330
Singapore	0.467	−0.195	−0.213	0.156	−0.086
Taipei,China	0.326	−0.353	0.017	0.331	0.217
Thailand	0.386	0.250	−0.010	−0.348	0.069

Note: Number refers to the principal components i.e., 1 is the first principal component, and so on.
It includes returns from all countries in the region.

Source: Author's estimates.

2. Methodology

Following the specification of Park and Lee (2011), individual economy equity (bond) returns for emerging Asia economies are modeled as having both expected and unexpected components. The expected component is obtained by regressing individual market returns on a constant term, and on the returns in the previous period:

$$y_{c,t} = \gamma_{c,t} + \beta_{c,t} y_{c,t-1} + \varepsilon_{c,t} \tag{3}$$

where $y_{c,t}$ is the current period's stock-market (bond-market) return and $y_{c,t-1}$ is the previous period's stock-market (bond market) return. The error term in equation (3) captures the unexpected component of the returns, or financial shocks.[8] This unexpected component of individual stock-market (bond-market) returns can be decomposed into (i) purely local shocks ($\alpha_{c,t}$), (ii) a reaction to a regional shock (represented by the unexpected component of the regional market returns, $\varepsilon_{EA,t}$), and (iii) a reaction to a global shock (proxied by an unexpected component of the global market returns, $\varepsilon_{G,t}$), expressed as:

$$\varepsilon_{c,t} = \alpha_{c,t} + \beta_{c,t}^{EA} \varepsilon_{EA,t} + \beta_{c,t}^{G} \varepsilon_{G,t} \tag{4}$$

where $\beta_{c,t}^{EA}$ and $\beta_{c,t}^{G}$ represent the economy-specific sensitivity to regional and global market shocks respectively. If the domestic stock (bond) market is integrated regionally or globally, a regional or global shock will dominate in explaining the unexpected component of the return to an individual market. That is, economy-specific sensitivity to a regional ($\beta_{c,t}^{EA}$) or global shock ($\beta_{c,t}^{G}$) will increase. On the other hand, the relative importance of domestic-market shocks ($\alpha_{c,t}$) will decrease.

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[8] The conditional variance of the error terms is assumed to follow a symmetric GARCH (1,1) process.

It is assumed that changes in returns at the level of the individual economy that are not explained by regional or global factors are due entirely to local news. Further, if the individual equity (bond) market concerned is fully integrated globally and there is no economy- or region-specific disturbance, then it is assumed that all changes observed are driven by global factors. That is, in the latter case, an unexpected component of the returns in any individual market should react exclusively to common global news, and should therefore be reflected in an unexpected component of global market returns. Hence, under the assumption of complete global integration, α and $\beta_{c,t}^{EA}$ are nearly zero, and $\beta_{c,t}^{G}$ is nearly 1.

In order to investigate the trend of economy-specific betas over time, time-varying spillover betas are computed for 1993–2011 for stocks and 2001–2011 for bonds. The time-varying betas are derived by running the above regression within a 52-week rolling window. This data window is then moved forward 1 week at a time and the equation re-estimated until the final observation has been included in the calculation.

Variance ratios for individual market returns are also estimated to calculate the percentage of total domestic equity (bond) market volatility explained by either regional or global shocks. The conditional variance is estimated by the GARCH (1,1) model for individual economy-specific returns. Two variance ratios were derived for each individual market. First, the regional variance ratio was computed as:

$$VR_{c,t}^{EA} = \frac{(\beta_{c,t}^{EA})^2 \sigma_{EA,t}^2}{\sigma_{c,t}^2} \tag{5}$$

Second, the global variance ratio was calculated as:

$$VR_{c,t}^{G} = \frac{(\beta_{c,t}^{G})^2 \sigma_{G,t}^2}{\sigma_{c,t}^2} \tag{6}$$

Variance ratios are derived under the assumption that domestic shocks are correlated neither with regional nor global market returns, and that regional and global shocks are themselves uncorrelated. The sum of the two variance ratios will approach one if $\beta_{c,t}^{EA}$ is nearly zero and $\beta_{c,t}^{G}$ is nearly 1, and the volatilities of individual, regional, and global market returns are of a similar magnitude.

3.   Empirical Results

The empirical results indicate that emerging Asia capital markets have become increasingly integrated, both globally and regionally. However, the extent of this integration with global and regional markets differs substantially between individual economy equity markets and bond markets. For the equity markets, the extent of global integration appears to exceed that of regional integration, although in recent years, the extent of regional spillover has strengthened to such a degree that it matches that of the global spillover. For the bond markets, the extent of spillover is much weaker than for the equity markets at both the regional and global levels. These results suggest that Asian currency bond markets generally remain fragmented regionally and segmented from global markets. Such results are broadly consistent with those of previous studies (Park and Lee 2011), and demonstrate the robustness of results that use principal component analysis to measure regional equity- and bond-market returns.

Figures 8 and 9 depict the estimated extent of spillover from regional and global shocks into individual economy equity and bond markets respectively. Overall, the results depicted confirm that the influence of global financial shocks on Asian equity and bond markets is significant. They likewise confirm that the extent of spillover from regional financial shocks on emerging Asia equity and bond markets is increasingly significant.[9]

Both figures depict the unweighted regional average of individual economy α's and β's. For the equity market (Figure 8), the extent of spillover of global financial shocks into emerging Asia markets generally appears to exceed that of regional financial shocks up to the period of the global financial crisis of 2008–2009 (except for the period of the Asian financial crisis) as $\beta_{c,t}^{G}$ is higher than $\beta_{c,t}^{EA}$. While the degree of integration with global markets also increased from the late-1990s up until 1996, this trend was interrupted by the global financial crisis. Interestingly, the sensitivity of emerging Asia stock markets to regional shocks appears to have increased significantly during the 1997–1998 Asian financial crisis as well, suggesting possible contagion due to the region's financial instability during this period, as the region's sensitivity to regional shocks rose again at the onset of the global financial crisis. Such increased sensitivity may also reflect heightened investor risk aversion, which translates into greater sensitivity to regional news.

Figure 9 addresses the bond markets. For returns to Asian government bonds denominated in local currency, the relatively low $\beta_{c,t}^{G}$ suggests weaker integration with global markets over the period 2001–2011 as compared to stock-market returns. The average estimated $\beta_{c,t}^{EA}$ also suggests that the extent of spillover of regional financial shocks into emerging Asia bond markets has remained relatively muted, although it has increased significantly since the mid-2000s.

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[9] The greater influence of global shocks is supported by the results from recursive regression, where the starting date is held fixed, and only the end-date is moved forward one week at a time. The standardized residuals of regional stock returns are highly correlated with those of the global returns. To purge the regional shocks of global influences, the regional returns are regressed on their own lagged value, lagged global returns, and contemporaneous global shocks, following Christiansen (2005).
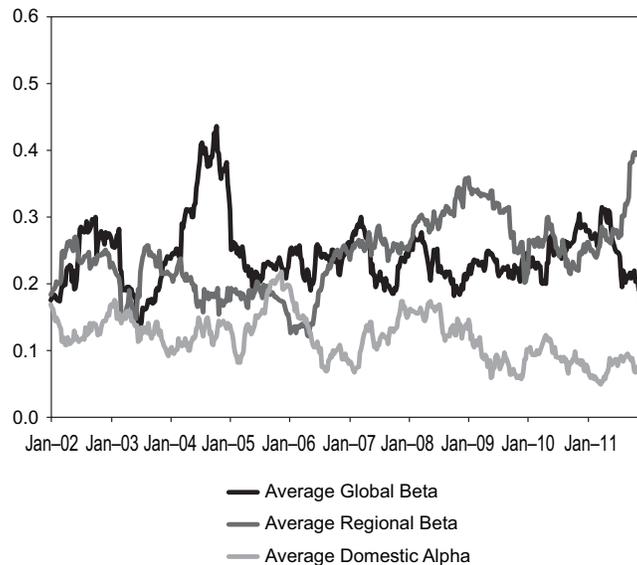
Figure 8: Extent of Impact of Global and Regional Financial Shocks on Stock Market Returns in Emerging Asia Markets
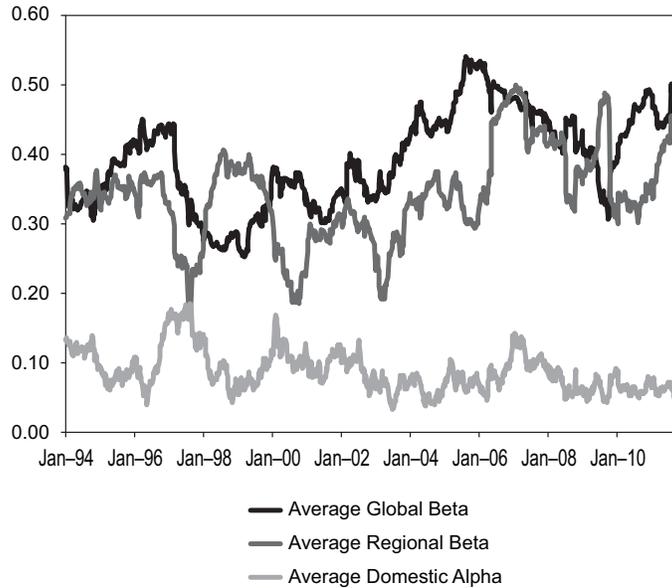
Note: Emerging Asia includes the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. Values refer to the unweighted average of the absolute value of the spillover coefficients.

Source: Author's calculations.

Figure 9: Extent of Impact of Global and Regional Financial Shocks on Bond Market Returns in Emerging Asia Markets

Note: Emerging Asia includes the People's Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. Values refer to the unweighted average absolute value of the spillover coefficients.

Source: Author's calculations.

On the other hand, the results for the equity market indicate that $\alpha_{c,t}$ has gradually declined after reaching a peak just prior to the Asian financial crisis of 1997–1998. This suggests that the extent to which purely local news impacts stock market returns in emerging Asia markets is limited. Similarly, for the bond market, the average value for α is likewise lower in 2009–2011 than earlier. In general, the average α for the bond market exceeds that for the equity market. This suggests that local news impacts the bond market to a greater extent than it does the equity market. In this regard, it is important to note that the magnitude of α and β are not directly comparable. While α is a component of a financial shock that is purely local, β represents the sensitivity of an individual economy market to a financial shock that is either global or regional in origin. Thus, a relatively small value for α does not necessarily imply a relatively limited influence on emerging Asia markets of a financial shock of regional origin as compared to that of a financial shock of global or regional origin.
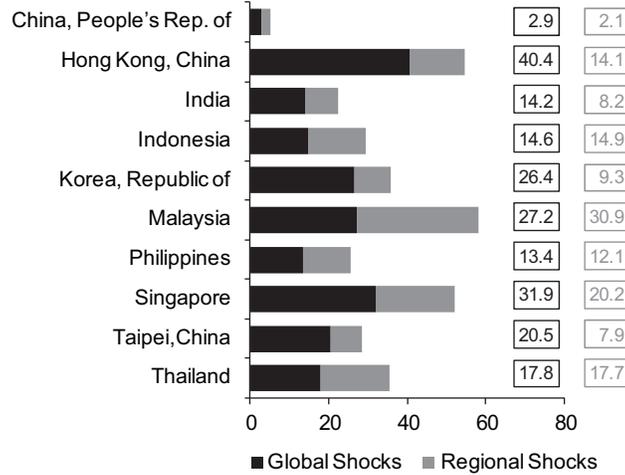
Figures 10a and 10b depict the percentage of total volatility in domestic equity market returns explained by global and regional shocks over the period 1994–2011.[10] In many emerging Asia markets, global shocks are an important driver of volatility in returns in domestic equity markets. The extent of spillover of volatility in returns driven by global financial shocks into the equity markets of Hong Kong, China; the Republic of Korea; Singapore; Taipei,China; and to a lesser extent India, exceeds that for other emerging Asia markets. For the ASEAN stock markets as a whole, the extent of spillover of volatility in returns generated by regional financial shocks is generally the same as that generated by global financial shocks, although for Indonesia and Malaysia, the spillover of volatility in returns generated by regional shocks exceeds that of global shocks. For the PRC, the extent of spillover of volatility in returns generated by global financial shocks exceeds that of regional shocks over the sample period, although both of these impacts are relatively muted when compared to the other study economies.

Interestingly, the extent of spillover of volatility in returns driven by global financial shocks appears to have increased over time. The spillover of volatility in returns generated by global financial shocks into most emerging Asia markets rose significantly beginning in 2002, particularly for the NIEs and India. For the ASEAN countries, the extent of spillover of volatility in returns generated by regional financial shocks also began increasing roughly at the same time. Overall, the study results indicate that integration of the emerging Asia stock market with the global stock market exceeds emerging Asia's degree of integration with the regional market.

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[10] The estimated global and regional conditional variances for stock and bond market returns significantly exceed the domestic variance. Consequently, variance ratios are calculated using scaled domestic, regional, and global variances. The variances are scaled by dividing each by their respective means.

**Figure 10a: Percentage of Variance in Individual Economy Equity Returns Explained
by Global and Regional Shocks, 1994–2011**

Economy	Global Shocks	Regional Shocks
China, People's Rep. of	2.9	2.1
Hong Kong, China	40.4	14.1
India	14.2	8.2
Indonesia	14.6	14.9
Korea, Republic of	26.4	9.3
Malaysia	27.2	30.9
Philippines	13.4	12.1
Singapore	31.9	20.2
Taipei,China	20.5	7.9
Thailand	17.8	17.7

■ Global Shocks   ■ Regional Shocks

Source: Author's calculations.

**Figure 10b: Percentage of Variance in Subregional Equity Returns Explained
by Global and Regional Shocks, 1994–2011**
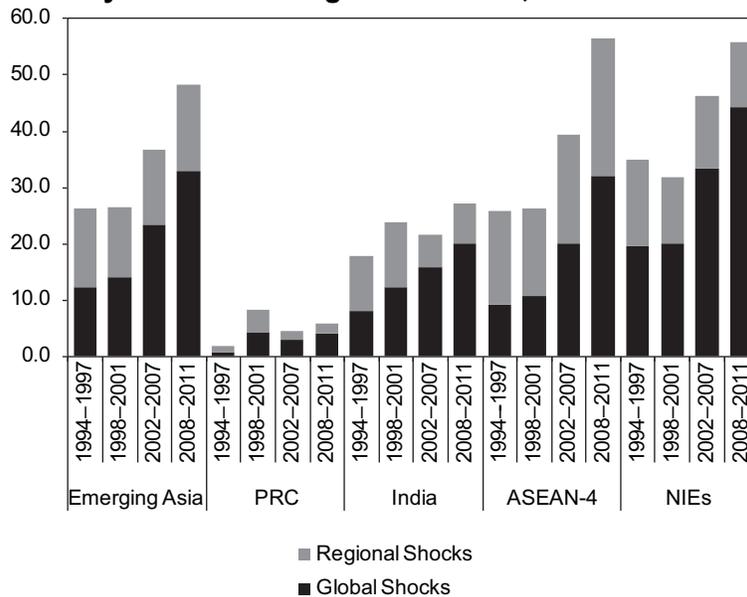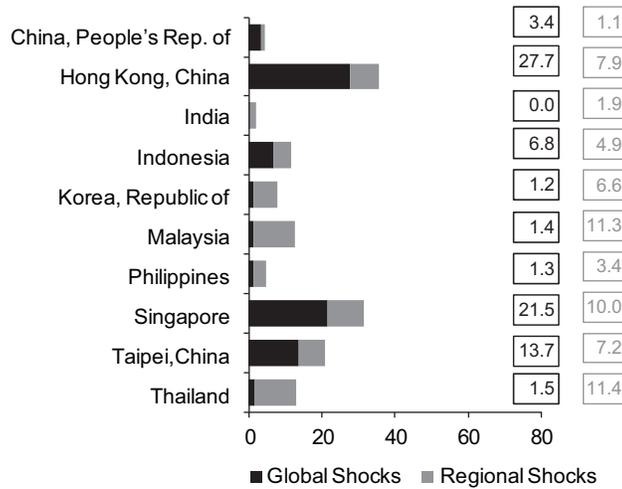

■ Regional Shocks
■ Global Shocks

Note: Emerging Asia includes the People's Republic of China (PRC); Hong Kong, China; India (IND); Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. ASEAN = Association of Southeast Asian Nations includes Indonesia; Malaysia; the Philippines; and Thailand. NIEs = newly industrialized economies include Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China.

Source: Author's calculations.

Figures 11a and 11b show the percentage of volatility in local currency bond market returns explained by global and regional shocks. Global disturbances account for a relatively larger share of total volatility in local-currency bond-market returns in the PRC; Hong Kong, China; Indonesia; Singapore; and Taipei,China. In both the Hong Kong, China and Singapore bond markets, the degree of global influence exceeds that in the other study countries, reflecting that monetary policy in these economies is closely tied to that of the US, due to their currency pegs to the US dollar and their managed float exchange rate systems. The bond markets in Indonesia and Taipei,China show a modest degree of global integration. However, for the bond markets of India, the Republic of Korea, Malaysia, the Philippines, and Thailand, the influence of regional shocks outweighs the influence of global shocks. This also suggests that the bond markets in the ASEAN countries are increasingly susceptible to volatility generated by regional shocks. The above notwithstanding, both global and regional factors have limited influence on Asian local-currency bond-market returns, as indicated by the generally small values of the combined percentage share of both global and regional volatilities in explaining total volatility in the region. These results are generally consistent with the results of other studies that suggest that Asian local-currency bond markets are relatively segmented from both regional and global bond markets.

Figure 11a: Percentage of Variance in Individual-Economy Bond Market Returns Explained by Global and Regional Shocks, 2001–2011

Source: Author's calculations.

Figure 11b: Percentage of Variance in Sub-Regional Bond Market Returns Explained by Global and Regional Shocks, 1994–2011
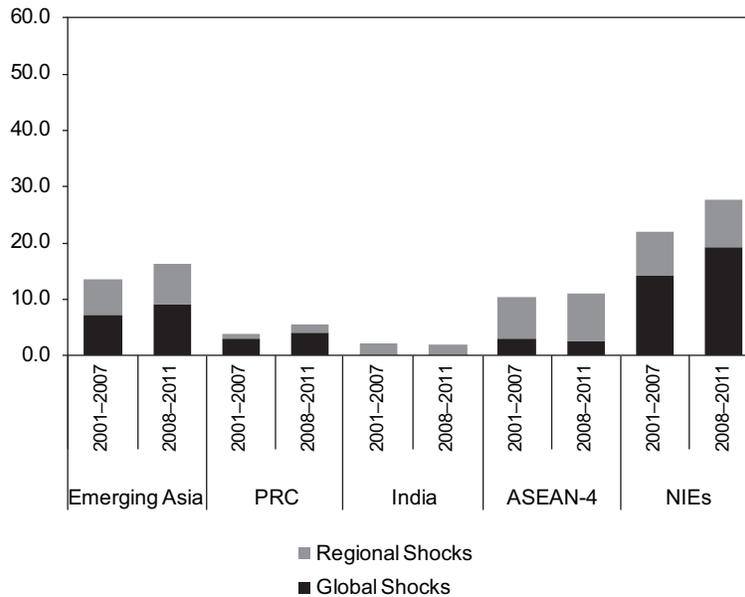
Note: Emerging Asia includes the People's Republic of China (PRC); Hong Kong, China; India (IND); Indonesia; the Republic of Korea; Malaysia; Philippines; Singapore; Taipei,China; and Thailand. ASEAN = Association of Southeast Asian Nations includes Indonesia; Malaysia; Philippines; and Thailand. NIEs = newly industrialized economies include Hong Kong, China; Republic of Korea; Singapore; and Taipei,China.

Source: Author's calculations.

IV. CONCLUSIONS AND RECOMMENDATIONS

The degree to which emerging Asia domestic capital markets are integrated with regional and global markets has important implications for policymaking as it relates to the financial sector development in general, and regulatory supervision of the financial system in particular. Further, this is true both at the regional level and the level of the individual economy. Financial integration both at the regional and global level holds the potential for increasing the efficiency with which international financial resources are allocated, as well as risk sharing across international boundaries, and smoothing of the consumption stream. However, it likewise holds the potential for raising the risk of exposure to the negative impacts of externally generated financial crises. Maximizing the potential net benefits of financial integration requires addressing such risks by appropriate policymaking and regulatory supervision.

This papers (i) summarizes the evolution of *de jure* and *de facto* financial integration in emerging Asia equity and bond markets, and (ii) assesses the degree to which regional and global integration of domestic equity and bond markets in emerging Asia has exposed these markets to volatility in financial market returns driven by externally generated financial crises. This assessment employed empirical tests of convergence of the movements of equity and bond market indexes of individual emerging Asia economies as compared to markets elsewhere in the region and beyond, and of the extent to which volatility in market returns driven by externally generated financial crises has spilled-over into the equity and bond markets of individual emerging Asia economies and their corresponding subregional groupings.

With regard to (i), the analysis presented in this paper confirms the results of earlier studies that find that emerging Asia capital markets have become increasingly integrated with capital markets elsewhere in the region and globally. Despite the fact that *de jure* financial integration has diminished over time, *de facto* financial integration in emerging Asia has steadily increased. This is consistent with the fact that capital flows to emerging Asia have increased substantially over time, and that movements in the region's domestic equity and bond market indexes have converged with those in markets elsewhere, both within the region and globally. Such findings indicate increasing financial openness and integration of equity and bond markets in emerging Asia economies, observed increases in *de jure* restrictions on capital flows notwithstanding.

With regard to (ii), as with earlier studies of Asian financial integration, the present study finds that global financial crises are closely associated with periods of increased volatility in financial market returns in Asian equity markets. By extension, these results suggest that despite the substantial progress achieved thus far in regional financial integration, the region's equity markets continue to integrate with the global financial market. However, it is important to note that there is considerable variation in the progress achieved in intra-regional financial integration, both across individual economies and across the various subgroupings of economies that comprise emerging Asia. In particular, the degree of regional financial integration achieved in the economies that make up the ASEAN-4 subgrouping (Indonesia, Malaysia, the Philippines and Thailand) exceeds the degree achieved by the newly industrializing economies or NIEs (Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China).

Interestingly, the results of the empirical tests of both convergence of movements in equity and bond market indexes and volatility spill over into emerging Asia markets referred to above suggest that the extent to which market-return volatility driven by financial crises generated within the region spills over into markets in individual emerging Asia economies tends to increase during periods of market distress. This outcome may reflect heightened concern on the part of international investors that volatility generated elsewhere could impact market returns in domestic emerging Asia markets, as this would cause these investors to unwind portfolio investments in regional markets

Finally, the extent of financial integration in emerging Asia domestic bond markets falls short of that of its domestic equity markets. This may simply reflect the relatively limited degree of development of the region's bond markets as compared to its equity markets, since emerging Asia's financial systems have traditionally been bank-dominated as a result of limited development of financial infrastructure and legal frameworks pertaining to debt securities. In particular, accounting and auditing standards in many emerging Asia financial markets remain sub-par as compared to international standards, limited transparency and weak governance further hampering development of its local currency bond markets. Similarly, the absolute size of local currency bond markets in emerging Asia is smaller than that of its domestic equity markets in general, as its bond markets lack depth and liquidity, and in many cases remain fragmented.

On the whole, emerging Asia is both a net saver and ironically, a net capital exporter. As articulated by the Lucas paradox, the fact that overall, the region exports its excess savings to advanced economies runs counter to what economic theory would suggest. This is confirmed by the fact that even though the return to capital in emerging Asia's capital-scarce economies exceeds the return to capital in capital-abundant countries, this does not prevent export of financial capital from emerging Asia to more advanced economies. This suggests that for

whatever reason, the region's financial systems are unable to effectively channel its surplus savings into intra-regional development financing. As a result, the very funding required for financing development in many of the region's emerging market economies is inadequate. This results in a relatively high cost of capital for financing development, and in turn, reliance on external funding, the latter increasing the region's vulnerability to changes in external market conditions and shifts in international investor sentiment.

In the aftermath of the Asian financial crisis of 1997–1998, the economies of emerging Asia actively promoted regional financial integration. The region has pursued two types of efforts in this regard: (i) establishing a platform for development of the region's financial markets, and (ii) creating a regional defense against the impact of market returns volatility driven by externally generated financial crises. Specific examples of such initiatives include the ASEAN+3 Economic Review and Policy Dialogue, the Chiang Mai Initiative, the Asian Bond Market Initiative, and the Asian Bond Fund Initiative.

Despite the progress in regional financial integration achieved thus far, full integration of the region's capital market is incomplete. This is obvious from the unevenness of the progress in financial integration achieved thus far, both across the subgroupings of economies that comprise emerging Asia, as well as across the various capital-market segments. Notably, the degree of regional and global financial integration achieved by the NIEs exceeds that of other regional subgroupings, financial markets in the NIEs being more open and advanced than in the other subgroupings.

Further, regional financial integration and globalization of financial markets appear to not be mutually exclusive, as the financial markets in many of the region's individual economies have become more integrated regionally without negatively impacting the pace of integration with global financial systems. However, while the region's equity markets have become more integrated both regionally and globally, the corresponding degree of progress achieved by the region's local currency bond markets has been lackluster (Park 2011). In particular, the pace of development of corporate bond markets has considerably lagged that of other bond market segments.

Both fragmentation of the region's capital markets and limited availability of regional financial products continue to hinder efficient allocation of the region's financial resources available from its considerable savings. Thus, improving intra-regional financial allocative efficiency by increasing the region's degree of financial integration will require loosening of restrictions on capital accounts, adopting common financial transactions standards at the regional level, and establishing region-wide financial infrastructure that can better support cross-border financial transactions.

That said, the impacts of previous financial crises on the region's financial markets underscore the fact that such financial integration increases the exposure of financial markets in emerging Asian economies to greater volatility in financial market returns driven by externally generated crises. As a result, the greater openness that financial integration entails must be counterbalanced by appropriate regulatory supervision at all levels, including the level of the individual economy, the region, and the global financial system as a whole. As mentioned earlier, the present study finds that the extent to which volatility in market returns driven by financial crises generated within the region spills over into markets in individual emerging Asia economies tends to increase during periods of market distress. For this reason as well as others, this paper supports such regulatory supervision.

Ensuring financial stability while at the same time furthering capital market development and financial integration requires that policy-making addresses several key issues. First, at the level of the individual economy, sound macroeconomic management and prudential regulation are critical to maintaining investor confidence. Second, increasing allocative efficiency as it pertains to financial resources and improving the resiliency of the region's domestic financial systems requires that the achievement of deep and liquid domestic capital markets remains a long-term overall goal at the regional level. Specific measures for achieving this objective include broadening the investor base; encouraging greater diversity in the financial products offered; improving the legal, regulatory, and institutional framework at both the domestic and regional level; upgrading governance and transparency; and establishing sound market infrastructure and institutions.

Finally, the negative impact of previous financial crises on the region's domestic capital markets suggests that financial supervisory and regulatory mechanisms more effective than at present are required at the national, regional, and global levels. International cooperation is essential in this regard. Significant progress has been achieved thus far in regional financial cooperation, as evidenced by regional initiatives undertaken since the global financial crisis of 2008, such as the multilateralization of the Chiang Mai Initiative and establishment of the ASEAN+3 Macroeconomic Research Office. Further regional cooperation initiatives in information sharing, monitoring and surveillance, and financial crisis management including establishment of a regional financial safety net would further improve regional financial stability.

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Asian Capital Market Integration: Theory and Evidence
The paper assesses the progress of emerging Asia's capital market integration at both regional and global levels. The results indicate that, while the pace of the region's capital market integration has accelerated in recent years, it remains more integrated with global financial markets than with regional financial markets. Integration of the region's domestic local-currency bond markets with their regional and global counterparts lags the pace of integration of its equity markets.

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