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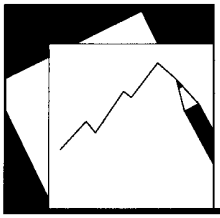
Asia's Stock Markets: Are There Crouching Tigers and Hidden Dragons?

INTERNATIONAL MONETARY FUND

WP/14/37



IMF Working Paper

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Fabian Lipinsky and Li Lian Ong

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Monetary and Capital Markets Department

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Abstract

Stock markets play a key role in corporate financing in Asia. However, despite their increasing importance in terms of size and cross-border investment activity, the region's markets are reputed to be more "idiosyncratic" and less reliant on economic and corporate fundamentals in their pricing. Using a model that draws on international asset pricing and economic theory, as well as accounting literature, we find evidence of greater idiosyncratic influences in the pricing of Asia's stock markets, compared to their G-7 counterparts, beyond the identified systematic factors and local fundamentals. We also show proof of a significant relationship between the strength of implementation of securities regulations and the "noise" in stock pricing, which suggests that improvements in the regulation of securities markets in Asia could enhance the role of stock markets as stable and reliable sources of financing into the future.

JEL Classification Numbers: G11, G12, G14, G15, G18.

Keywords: arbitrage pricing theory, Asian financial crisis, fundamentals, global financial crisis, idiosyncratic factors, integration, IOSCO, securities regulation, stock market, stock pricing, term structure of interest rates.

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I. INTRODUCTION

The Chinese proverb, “Crouching tiger hidden dragon," is an apt description of Asia’s stock markets today. It refers to the mysteries or undiscovered potential that lie beneath the surface—which appropriately captures the stage of development of the region’s stock markets. They have been and are a key source financing for local corporates but their potential is yet to be fully realized. They are an important destination for foreign investment but some markets are still perceived to be somewhat opaque and more idiosyncratic in nature.

The role of Asia’s stock markets as important drivers of growth in the region is under-appreciated. Probably unknown to many, the share of stock market capitalization as a percentage of GDP in most Asian countries is comparable to their total banking sector assets, with debt securities markets coming a distant third (Figure 1). It contrasts with developments in many advanced countries, where the banking sector continues to dominate financial intermediation [see *Financial Sector Structure: Recent Developments and Evolving Trends, forthcoming*]. To illustrate the breadth and depth of Asia’s stock markets, statistics published by the World Federation of Exchanges show that:

- Equity issuances have been an important source of financing in many countries in the Asian region. New capital raised by stock issuance in Asia in 2012 amounted to $198 billion, compared to $234 billion in the Americas and $102 billion in Europe, Middle-East and Africa (EMEA) combined.

- With a capitalization of almost $15 trillion, Asia’s stock market capitalization is about equivalent in value to those of EMEA combined (Table 1).

- Almost 20,000 companies are listed in Asia’s stock markets as at end-2012, just under the rest of the world combined—over 10,000 in the Americas and a total of 13,300 in EMEA.

- Market liquidity in 2012, measured as the ratio of total turnover to average capitalization, was 0.9 for Asia, compared to 1.2 for the Americas and 0.65 for EMEA.

Asia’s stock markets have also become more integrated with the international financial system. Foreign investment in many of the region’s stock markets have grown since the Asian financial crisis (AFC) and exponentially so in some of the larger markets, resuming their expansion following the sharp retrenchment during the global financial crisis (GFC) (Figure 2). Meanwhile, cross-listings, including in the form of Depository Receipts, from within the region and elsewhere have also expanded as companies seek to tap the region’s liquidity (BNY Mellon, 2012; JPMorgan, 2012). The number of foreign listings in Asia’s stock markets has tripled over the past 10 years, albeit still low at around 2 percent of the total (compared to 10 percent each in the Americas and EMEA). In turn, emerging market

firms, including those from Asia, have over the years sought to access more developed capital markets to benefit from lower cost of capital, higher valuations, enhanced investor recognition, better corporate governance, among other reasons.

Although Asia's stock markets have been an important source of funding for the region, their full potential remains to be exploited (Ghosh and Revilla, 2007). One possible reason is the perception that the pricing of Asian stocks are more idiosyncratic in nature, notably:

- Speculative activity rather than economic and corporate fundamentals are seen to be driving prices in some of these stock markets. Researchers and the financial press often ascribe sharp drops in Asia's stock markets to the bursting of speculative bubbles,[2] with some of the more recent literature on the topic providing support for this view.[3] Anecdotal evidence suggests that such perceptions of the region's stock markets has prevailed, despite analyses showing that such findings are not exclusive to Asia—evidence of speculative bubbles has also been found in stock prices of advanced economies.[4]

- Other related research suggests that stock returns variation is larger in emerging markets, appears unrelated to co-movement of fundamentals and are therefore consistent with "noise trading."[5] In addition to macroeconomic conditions, the literature has also contemplated the importance institutional quality—such as political, legal, regulatory and governance considerations—for the development of Asia's capital markets.[6] The evidence also suggests that pricing efficiency in Asian stock markets depends on the level of development as well as the regulatory framework for transparent corporate governance.[7]

This paper analyzes the pricing of Asia's stock markets to determine the validity of some of these long-held views. Our study draws on asset pricing and economic theory, as well as the

[2] See Melloan (1993); Samuelson (1994); Nam (1999).

[3] See Girardin and Liu (2003); Hanim Mokhtar and others (2006); Wu and Xiao (2008); Mei and others (2009); Homm and Breitung (2012).

[4] See West (1987); Homm and Breitung (2012).

[5] Morck and others (2000) find that stock prices tend to move together more in emerging market economies than in advanced economies, and while factors such as market and country size, economic and firm-level fundamentals matter for stock returns, a large residual effect remains and is correlated with measures of institutional development, such as property rights protection. Separately, De Long and others (1989, 1990) find that a reduction in informed trading can increase market-wide noise trader risk.

[6] See, for example, Pagano (1993); Pistor and others (2000); Mayer and Sussman (2001); Yartey (2008); Law and Habibullah (2009), Cherif and Gazdar, 2010).

[7] See Kim and Shamsuddin (2008).

empirical evidence from accounting literature. It examines the extent to which well-established systematic international factors and domestic fundamentals influence Asian stock markets vis-à-vis more "idiosyncratic" factors. Specifically, our model:

- First incorporates: (i) international factors common to the universe of assets across national boundaries, such as global and regional risks; (ii) the domestic economic and financial fundamentals, such as the local business cycle and the financial performance of the corporate sector, to extract the "idiosyncratic" component in stock returns.

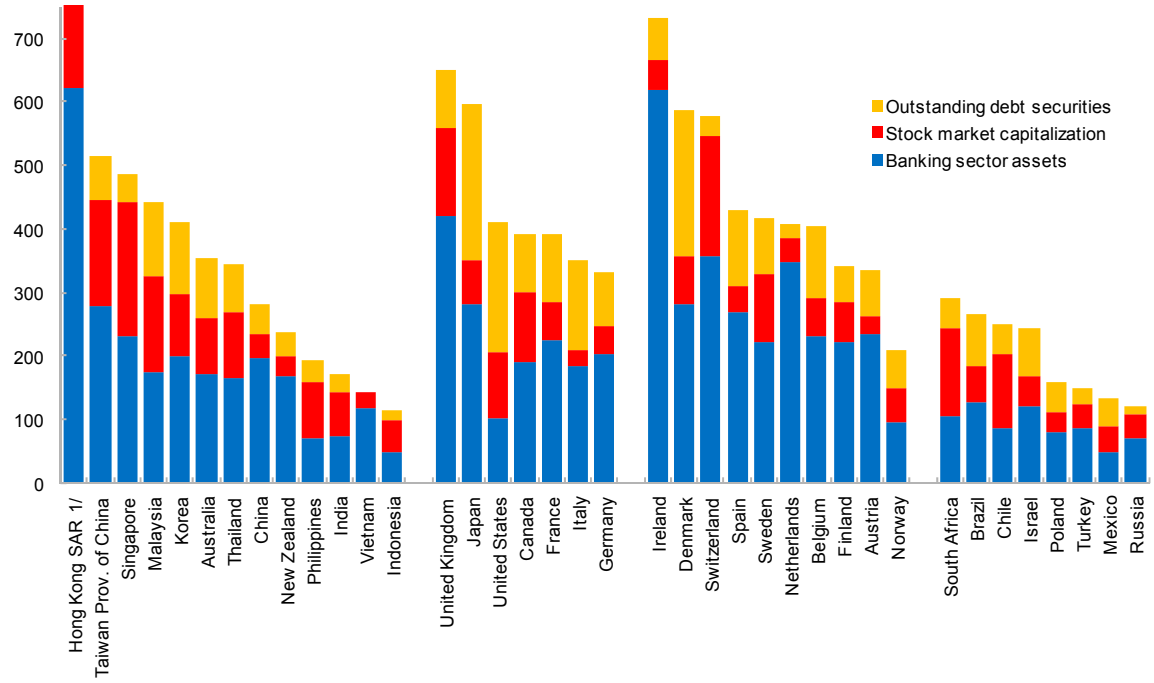
- We subsequently test for the relationship between this idiosyncratic component and the strength of implementation of securities regulations to represent the role of institutional quality in the pricing of stocks.

Our findings corroborate the existing literature on stock market pricing. We find evidence of greater idiosyncratic influences in Asia-Pacific stock markets, compared to their G-7 counterparts, beyond the identified systematic international factors and local economic and financial fundamentals. The influence of these international and local factors appears to be time-varying, and is most significant during the current GFC, with regional developments having become the most important. Among local factors, forecast earnings appears to carry the most information for stock pricing, markedly so during the GFC period. These results suggest that investors may be seeking more guidance from fundamentals in their pricing decisions during this crisis, in both emerging and advanced country markets. Separately, asset allocation decisions by foreign investors also appear to affect stock market volatility and returns in both groups of countries.

We also find a direct and significant connection between market regulation and the importance of idiosyncratic factors. Countries which have been better at implementing internationally accepted principles of securities regulation tend to be less subject to idiosyncratic influences in the pricing of their stocks. Thus, improvements in the regulation of securities markets in Asia would likely strengthen investor confidence by ensuring that these markets are operated efficiently and fairly. In turn, this would enhance the role of local stock markets as attractive investment destinations and thus as reliable sources of financing [see *Financial Sector Structure: Recent Developments and Evolving Trends, forthcoming*]. That said, we acknowledge that some of the "noise" in stock returns may be attributable to other country-specific factors that are not captured in our model.

This paper is structured as follows. Section II discusses the construction of our asset pricing model and details the sources of data required for this exercise. The results and analysis are presented in Section III. Section IV considers the policy implications of our findings and Section V concludes.

Figure 1. Asia-Pacific Ex-Japan, G-7 and the Rest of the World: Structure of the Financial Sector as at End-2012
(In percent of GDP)



Sources: Bank for International Settlements; Bloomberg; Haver Analytics; International Monetary Fund (IMF); and authors' estimates.

1/ The Hong Kong SAR column is truncated for presentation purposes, given the relatively large size of its financial system, with stock market capitalization amounting to almost 13 times GDP and outstanding debt securities issued domestically amounting to 54 percent of GDP as at end-2012.

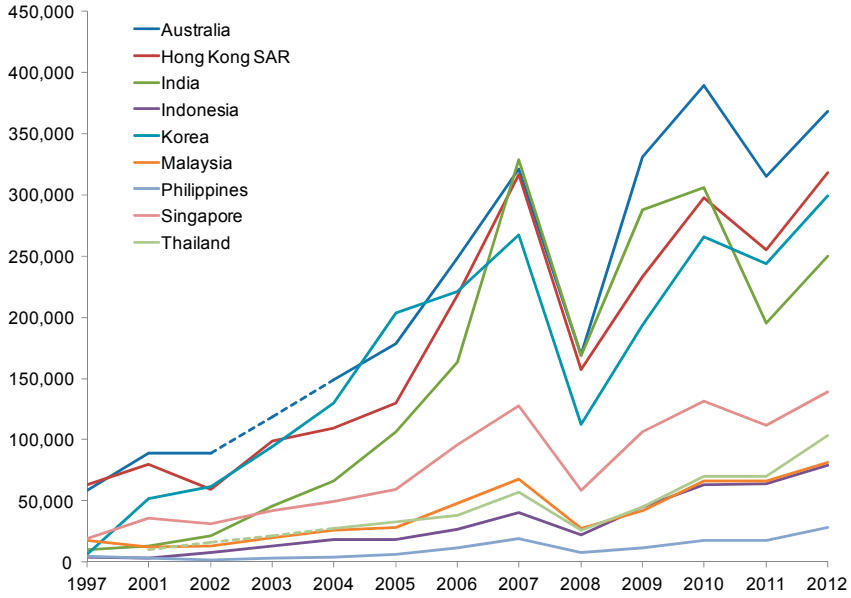
Table 1. Stock Markets around the World: Capitalization as at End-2012

Region	Country	Exchange	Amount (Millions of U.S. dollars)	Share of Region (Percent)	Share of World (Percent)
Americas			23,193,460	100.0	42.5
	Brazil	BM&FBOVESPA	1,227,447	5.3	2.2
	Canada	TMX Group	2,058,839	8.9	3.8
	Chile	Santiago SE	313,325	1.4	0.6
	Colombia	Colombia SE	262,101	1.1	0.5
	Mexico	Mexican Exchange	525,057	2.3	1.0
	Peru	Lima SE	102,617	0.4	0.2
	United States	NASDAQ OMX	4,582,389	19.8	8.4
		NYSE Euronext (US)	14,085,944	60.7	25.8
	Others		35,742	0.2	0.1
Asia-Pacific			16,928,860	100.0	31.0
	Australia	Australian SE	1,386,874	8.2	2.5
	China	Shanghai SE	2,547,204	15.0	4.7
		Shenzhen SE	1,150,172	6.8	2.1
	Hong Kong	Hong Kong Exchanges	2,831,946	16.7	5.2
	India	BSE India	1,263,335	7.5	2.3
		National Stock Exchange India	*1,234,492*	7.3	2.3
	Indonesia	Indonesia SE	428,223	2.5	0.8
	Japan	*Osaka SE*	*202,151*	1.2	0.4
		Tokyo SE Group	3,478,832	20.5	6.4
	Korea	Korea Exchange	1,179,419	7.0	2.2
	Malaysia	Bursa Malaysia	466,588	2.8	0.9
	Philippines	Philippine SE	229,317	1.4	0.4
	Singapore	Singapore Exchange	765,078	4.5	1.4
	Thailand	The Stock Exchange of Thailand	389,756	2.3	0.7
	Others		812,116	4.8	1.5
EMEA			14,447,481	100.0	26.5
	Germany	Deutsche Börse	1,486,315	10.3	2.7
	United Kingdom and Italy	London SE Group	3,396,505	23.5	6.2
	Includes France	NYSE Euronext (Europe)	2,832,189	19.6	5.2
		Others	6,732,473	46.6	12.3
World			54,569,801		

Source: World Federation of Exchanges.

Notes:
1. Korea Exchange: includes Kosdaq market data.
2. NASDAQ OMX Nordic Exchange: OMX includes Copenhagen, Helsinki, Iceland, Stockholm, Tallinn, Riga and Vilnius Stock Exchanges.
3. Singapore Exchange: market capitalization includes domestic listings and a substantial number of foreign listings, defined as companies whose principal place of business is outside of Singapore. Inactive secondary foreign listings are excluded.
4. Total for Asia-Pacific excludes Osaka and National Stock Exchange of India to avoid double counting with Tokyo and Bombay SE respectively.

Figure 2. Asia-Pacific ex-Japan: Outstanding Foreign Investment in Equity Securities, 1997–2012 (In millions of U.S. dollars)



Sources: IMF; and authors' estimates.

Note: Broken lines denote interpolation of data.

II. DATA AND STYLIZED FACTS

The countries in our sample comprise the main emerging and advanced economies in the Asia-Pacific (excluding Japan), benchmarked against the G-7 countries. The former consists of China, Hong Kong and Korea (in North-East Asia) and Indonesia, Malaysia, the Philippines, Singapore and Thailand (in South-East Asia), plus Australia and India. The weekly market and earnings data are sourced from Bloomberg and I/B/E/S via Datastream (Appendix I, Appendix Tables 1 and 2). Market capitalization statistics are available from Bloomberg and the World Federation of Exchanges (WFE), while annual data on foreign investment and periodic (confidential) information on regulatory implementation are sourced from the IMF.

Broadly speaking, diversified world and regional portfolios have not always been the most optimal investments, *ex post*. In other words, they have not been mean-variance efficient—i.e., at the asset allocation efficient frontier—relative to some individual stock markets (Figure 3 and Appendix II, Appendix Table 3).

- Asia's stock markets have generally yielded better returns over time relative to their G-7 counterparts, but have tended to be more volatile.

- Asia's markets underperformed the G-7 during the AFC, in terms of the average risk-return tradeoff. Excluding the GFC, they recorded their highest volatility and lowest returns during this period.

- The "peacetime" period immediately before the GFC was the most rewarding for investors. Markets posted their highest returns and were among the least volatile.

- All regions recorded their worst performance during the GFC. Across the board, stock markets posted negative returns (except for India, Malaysia, Philippines and Thailand) and many experienced their greatest volatility.

The empirical evidence indicates that:

- *Stock markets have become more integrated.* As a simple proxy, return correlations between individual and regional stock markets and between individual and world stock markets have trended upwards over the past decade-and-a-half. These correlations tend to be lower for the emerging Asia-Pacific markets compared to the advanced economies in the region and the G-7 countries (Appendix II).

- *Foreign investors play a role in influencing stock market volatility and returns (Appendix III).*

    - While there is little relationship between the share of foreign holdings in a country's stock markets and the volatility of returns, their asset allocation

decisions matter. An examination of the relationship between foreign investment in equities as a proportion of average stock market capitalization and the volatility of weekly stock market returns for both the G-7 and Asia-Pacific countries over the 2001–12 period shows no significant relationship between the two. However, pullout by foreign investors, especially during the GFC period, tends to exacerbate market volatility.

- Asset allocation decisions by foreign investors have a clear impact on stock market returns. On average, stock market returns tend to be higher in markets with a higher share of foreign holdings, albeit less obviously so among the G-7 markets. For both groups of countries, stock market returns exhibit a strong positive relationship with net foreign portfolio flows.

III. METHOD

The existing literature suggests that the stock market returns of a country are dependent on local and international factors. We apply Ross' (1976) arbitrage pricing theory (APT) in our modeling of individual stock market returns in the form of a factor model in the following generalized form (see Appendix IV for a detailed exposition on the model design):

$$(1) \qquad R_{c,t} = b_{c,0} + b_{c,1,}BC_{c,t} + b_{c,2}EPS^{f}_{c,t} + b_{c,3}EPS^{a}_{c,t} + b_{c,4}R_{w,t} + b_{c,5}R_{r} + e_{c},$$

where:
$R_{c,t}$ represents the stock market return for country *c* at time *t*;
$BC_{c,t}$ represents the business cycle for country *c* at time *t*;
$EPS^{f}_{c,t}$ is the one-year ahead forecast corporate sector EPS for country *c* at time *t*;
$EPS^{a}_{c,t}$ is the actual (realized) corporate sector EPS for country *c* at time *t*;
$R_{w,t}$ is the world stock index return at time *t*;
$R_{r,t}$ is the regional stock index return at time *t*;
e_c is the idiosyncratic error term; and all the variables are expressed in local currency terms.

In an efficient market, stock prices respond very quickly to incorporate all relevant publicly available information in their pricing (Fama, 1970). Thus, R_c should reflect the information contained in the right-hand-side variables, with e_c representing relevant pricing information that is not captured in the model. Unfortunately, the inclusion of other emerging market regions for comparison purposes is not possible owing to the lack of availability of requisite market data.

Figure 3. Stock Markets around the World: Mean-Variance Analysis of Country, Regional and World Returns, March 1998 – November 2012
(Weekly U.S. dollar returns, in percent)

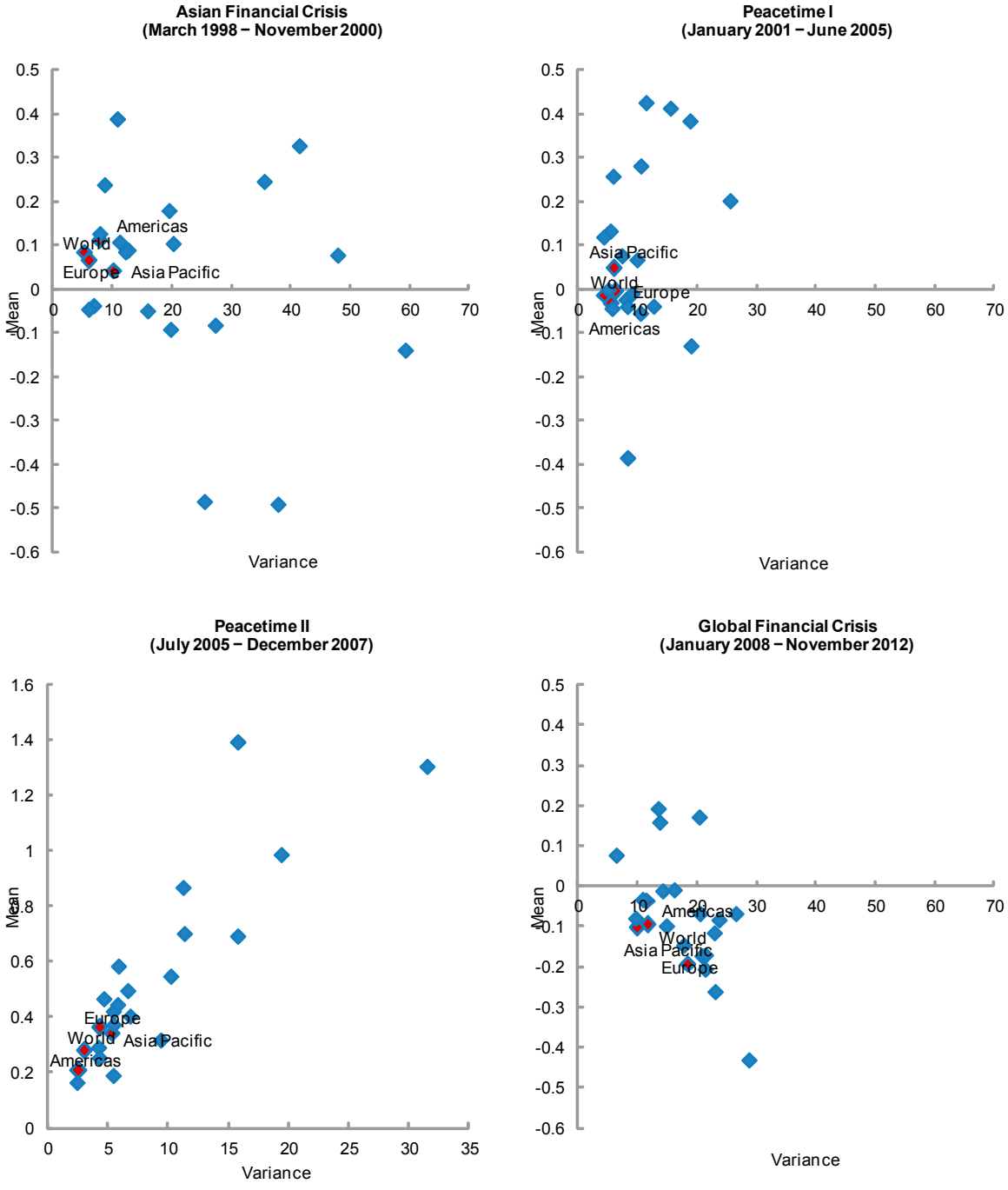
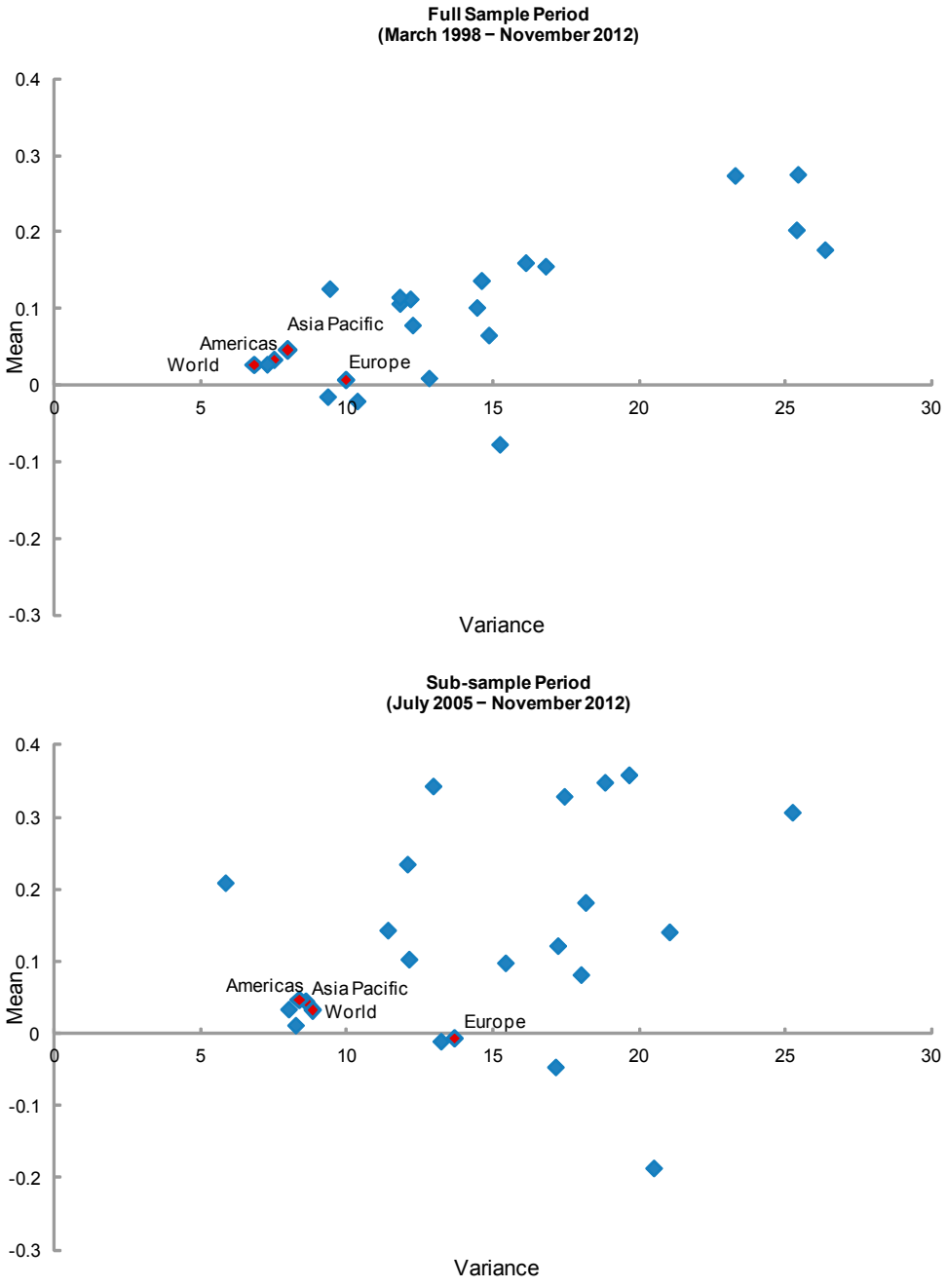


Figure 3. Stock Markets around the World: Mean-Variance Analysis of Country, Regional and World Returns, March 1998 – November 2012
(Weekly U.S. dollar returns, in percent)
(continued)



Sources: Bloomberg; and authors' calculations.

IV. ANALYSIS

A. The Pricing of Stocks

We run preliminary regressions to determine the most parsimonious form for the relationship between stock market returns and the explanatory variables. First, we apply equation (1) to **Dataset 1**, which comprises all independent variables for all countries over the July 2005 – November 2012 period. The results show that the systemic regional factor is the most important explanatory variable. Forecast EPS is significant for more countries during the GFC. However, two of the local factors—the business cycle and realized EPS—are largely not significant in explaining stock market returns (Appendix V, Appendix Table 4). The general lack of explanatory power of these variables could mean that much of the related information content may already be captured by the forecast EPS variable. We also confirm that the individual stock market returns are generally not autocorrelated and are stationary, according to our respective Durbin-Watson and unit root tests; the regression residuals are homoskedastic, according to the White's test results.

Next, we apply equation (1) to **Dataset 2**, which comprises *all* independent variables for a *subset* of countries over the March 1998 – November 2012 period. The results show that the systemic regional factor remains the most important factor through the extended period (Appendix V, Appendix Table 5). Similar to the GFC period, forecast EPS is significant for more countries during the AFC, suggesting that investors may look for more market guidance during stressed periods.

Based on these findings, we reduce the form of equation (1) by omitting two of the largely insignificant local factors. In doing so, we are able to include all countries over the full March 1998 – November 2012 period. In this version of the model, the stock market return of a country, *c*, is generated by a factor model comprising one local factor (forecast EPS) and the two international (world and regional) ones. This relationship is represented as follows:

$$(2) \qquad r_{c,t} = b_{c,0} + b_{c,1}EPS^{f}_{c,t} + b_{c,2}R_{w,t} + b_{c,3}R_{r,t} + e_{c},$$

where:
$EPS^{f}_{c,t}$ is the one-year ahead forecast corporate sector EPS for country *c* at time *t*;
$R_{w,t}$ and $R_{r,t}$ are the world and regional stock index returns, respectively, at time *t*;
e_c is the idiosyncratic error term; and all the variables are expressed in local currency terms.

The application of equation (2) allows us to use **Dataset 3**, which covers the full March 1998 – November 2012 period. Our results suggest that while the pricing of Asian stock markets may be more idiosyncratic, the general trends over time are similar to those seen in their G-7 counterparts (Table 2):

- *The findings corroborate the existing literature which shows that stock market returns in emerging markets are less related to fundamentals and more influenced by*

idiosyncratic factors. On average, the adjusted-R^2 for Asia's stock markets is much lower than for the G-7 countries, while the average SE for Asia is larger by several multiples, compared to the G-7 countries. Correspondingly, the more developed stock markets in the region (Australia, Hong Kong, Korea and Singapore) typically show higher adjusted-R^2 than their regional peers, and more in line with the G-7 markets.

- *In general, the influence of international factors on Asia's stock markets has become more significant over time, underscoring the increasing integration across borders.* The systematic regional factors have been relatively more dominant than the world factor at any point in time, supporting the empirical evidence of greater intra-regional activity; the importance of regional factors has also increased over time. This feature is consistent with that seen in the G-7 markets for some time, where regional factors have consistently represented the main pricing influence for stock markets. Within Asia, China's stock markets stand out in terms of their growing openness to international influences—all four markets were largely unaffected by world events up until the GFC, but have become significantly so since its onset.

- *Local developments have been relatively less important in the pricing of Asia's stock markets.* Any information conveyed by changes in anticipated corporate earnings appears to have had little influence on stock prices in general, both during the AFC and "peacetime" periods. This is consistent with the empirical literature which shows evidence of greater pricing inefficiency during the AFC owing to the chaotic financial environment (Lim and others, 2008). However, this trend changed during the GFC, with the information imparted by forecast earnings becoming significant for many more markets. The implication is that investors may be relying more on expert forecasts for guidance during volatile times. The trend is similar for the G-7 stock markets.

- *There are few similarities in the pricing of stock markets between the AFC and GFC periods, except for the common lack of "pricing errors"* (possible abnormal returns). Pricing errors reflect, in part, returns that are not accounted for by systematic factors, fundamentals or idiosyncratic influences and are captured in the intercept term in equation (2). They have been significantly different from zero for several Asian markets during "peacetime," notably for China and India, suggesting that abnormal returns may not have been arbitraged away in the relatively more insulated markets.

Table 2. Regression Results: Stock Market Returns, Systematic Factors and Corporate Sector Performance, March 1998 – November 2012

	Adjusted R2	Standard Error of Regression	Sum of Squared Residuals	Constant		Return on World Portfolio ($r_{WC,t}$)		Return on Regional Portfolio ($r_{RC,t}$)		Change in Forecast EPS ($e^{r}_{C,t}$)	
				Coefficient	Probability	Coefficient	Probability	Coefficient	Probability	Coefficient	Probability
Mar 1998 - Dec 2000											
G-7											
Canada	0.551	0.021	0.064	-0.001	0.539	0.003	0.988	0.842	0.000	0.382	0.055
France	0.820	0.013	0.025	0.001	0.679	0.087	0.335	0.984	0.000	0.331	0.337
Germany	0.785	0.016	0.038	0.000	0.842	-0.300	0.008	1.454	0.000	-0.108	0.524
Italy	0.600	0.021	0.061	0.002	0.417	-0.169	0.239	1.116	0.000	-0.395	0.401
Japan	0.789	0.014	0.029	-0.001	0.454	-0.268	0.000	1.218	0.000	0.085	0.592
United Kingdom	0.721	0.013	0.024	-0.001	0.439	0.094	0.305	0.711	0.000	0.450	0.140
United States	0.994	0.002	0.001	0.000	0.397	-0.039	0.059	1.021	0.000	0.004	0.902
Mean	*0.751*	*0.014*	*0.034*								
Asia-Pacific ex-Japan											
Australia	0.232	0.016	0.037	0.001	0.457	0.251	0.000	0.117	0.027	-0.608	0.055
China Shanghai A	-0.018	0.033	0.155	0.004	0.190	-0.055	0.698	0.033	0.747	-0.037	0.544
China Shenzhen A	-0.016	0.032	0.142	0.004	0.180	-0.057	0.674	0.023	0.811	-0.046	0.431
China Shanghai B	0.045	0.058	0.478	0.001	0.816	0.200	0.419	0.337	0.059	-0.155	0.154
China Shenzhen B	0.019	0.064	0.573	0.002	0.708	0.018	0.946	0.322	0.099	-0.170	0.152
Hong Kong SAR	0.393	0.034	0.167	0.001	0.835	0.707	0.000	0.509	0.000	-0.179	0.587
India	0.043	0.042	0.252	0.000	0.993	0.398	0.028	-0.076	0.562	-0.756	0.031
Indonesia	0.026	0.052	0.379	-0.001	0.769	-0.372	0.021	0.407	0.011	0.010	0.598
Korea	0.157	0.056	0.437	0.000	0.940	-0.012	0.955	0.883	0.000	0.068	0.771
Malaysia	0.090	0.044	0.276	-0.001	0.822	-0.108	0.510	0.553	0.000	-0.329	0.217
Philippines	0.144	0.039	0.219	-0.009	0.011	0.208	0.196	0.244	0.056	-1.838	0.000
Singapore	0.270	0.034	0.167	0.000	0.866	0.311	0.020	0.615	0.000	0.068	0.767
Thailand	0.102	0.050	0.353	-0.005	0.215	-0.013	0.947	0.622	0.000	-0.018	0.218
Mean	*0.114*	*0.043*	*0.280*								
Jan 2001 - Jun 2005											
G-7											
Canada	0.610	0.012	0.033	0.001	0.266	0.198	0.013	0.472	0.000	-0.046	0.551
France	0.906	0.009	0.020	0.000	0.614	-0.045	0.473	1.125	0.000	0.035	0.762
Germany	0.847	0.014	0.047	0.000	0.999	0.153	0.114	1.149	0.000	0.004	0.977
Italy	0.802	0.014	0.044	0.000	0.753	-0.032	0.729	1.084	0.000	0.122	0.425
Japan	0.858	0.011	0.026	-0.001	0.075	-0.293	0.000	1.354	0.000	0.041	0.637
United Kingdom	0.896	0.007	0.012	0.000	0.831	0.027	0.584	0.805	0.000	-0.011	0.739
United States	0.997	0.001	0.000	0.000	0.177	-0.070	0.000	1.074	0.000	0.029	0.053
Mean	*0.837*	*0.012*	*0.119*								
Asia-Pacific ex-Japan											
Australia	0.240	0.013	0.038	0.001	0.163	0.213	0.000	0.158	0.001	0.132	0.673
China Shanghai A	0.013	0.027	0.169	-0.003	0.099	0.000	0.999	0.172	0.067	0.102	0.627
China Shenzhen A	0.015	0.029	0.188	-0.004	0.026	0.008	0.945	0.175	0.077	0.176	0.428
China Shanghai B	-0.001	0.044	0.437	-0.001	0.666	0.206	0.230	0.014	0.927	0.015	0.965
China Shenzhen B	0.026	0.050	0.572	0.001	0.706	0.104	0.596	0.330	0.056	0.174	0.652
Hong Kong SAR	0.472	0.021	0.097	0.000	0.713	0.536	0.000	0.409	0.000	0.239	0.289
India	0.162	0.028	0.182	0.002	0.231	0.328	0.003	0.304	0.002	0.104	0.762
Indonesia	0.021	0.030	0.210	0.004	0.041	-0.272	0.013	0.286	0.007	-0.005	0.975
Korea	0.287	0.033	0.250	0.003	0.118	0.094	0.450	0.918	0.000	0.009	0.967
Malaysia	0.111	0.020	0.088	0.001	0.564	0.077	0.317	0.235	0.001	0.216	0.386
Philippines	0.031	0.029	0.198	0.000	0.878	0.026	0.817	0.207	0.043	0.292	0.269
Singapore	0.424	0.020	0.090	0.001	0.647	0.366	0.000	0.472	0.000	-0.043	0.760
Thailand	0.117	0.030	0.201	0.003	0.107	-0.029	0.797	0.502	0.000	0.118	0.411
Mean	*0.373*	*0.028*	*0.221*								
Jul 2005 - Dec 2007											
G-7											
Canada	0.586	0.011	0.016	0.001	0.345	0.038	0.687	0.777	0.000	-0.052	0.470
France	0.884	0.007	0.006	0.000	0.942	-0.059	0.527	1.090	0.000	-0.015	0.873
Germany	0.838	0.009	0.009	0.002	0.008	-0.188	0.108	1.212	0.000	-0.099	0.432
Italy	0.798	0.008	0.008	0.000	0.560	0.212	0.049	0.677	0.000	0.070	0.662
Japan	0.852	0.010	0.011	-0.001	0.239	-0.197	0.010	1.012	0.000	0.064	0.710
United Kingdom	0.893	0.006	0.004	-0.001	0.136	-0.016	0.831	0.918	0.000	0.004	0.966
United States	0.990	0.002	0.000	0.000	0.416	-0.198	0.000	1.149	0.000	-0.029	0.014
Mean	*0.834*	*0.007*	*0.008*								
Asia-Pacific ex-Japan											
Australia	0.490	0.012	0.019	0.002	0.161	-0.160	0.111	0.750	0.000	-0.068	0.717
China Shanghai A	0.089	0.034	0.143	0.014	0.000	-0.213	0.480	0.580	0.011	-0.676	0.084
China Shenzhen A	0.055	0.038	0.186	0.016	0.000	-0.501	0.145	0.629	0.016	-0.910	0.042
China Shanghai B	0.019	0.055	0.389	0.014	0.013	-0.210	0.671	0.558	0.135	-0.699	0.277
China Shenzhen B	0.108	0.041	0.215	0.009	0.030	-0.452	0.222	0.927	0.001	-0.400	0.403
Hong Kong SAR	0.562	0.017	0.036	0.002	0.159	0.273	0.072	0.666	0.000	-0.105	0.126
India	0.245	0.026	0.089	0.005	0.062	0.615	0.012	0.316	0.076	0.253	0.279
Indonesia	0.198	0.029	0.106	0.004	0.184	-0.403	0.136	0.889	0.000	0.367	0.341
Korea	0.597	0.018	0.042	0.002	0.275	0.100	0.525	1.057	0.000	-0.059	0.784
Malaysia	0.303	0.016	0.032	0.002	0.134	0.237	0.099	0.362	0.001	0.061	0.752
Philippines	0.351	0.024	0.072	0.005	0.035	0.043	0.844	0.794	0.000	-0.324	0.197
Singapore	0.596	0.014	0.024	0.001	0.644	0.422	0.001	0.541	0.000	0.247	0.248
Thailand	0.217	0.023	0.067	0.001	0.695	-0.315	0.092	0.723	0.000	-0.461	0.136
Mean	*0.295*	*0.027*	*0.109*								
Jan 2008 - Nov 2012											
G-7											
Canada	0.772	0.015	0.059	0.000	0.920	0.272	0.001	0.640	0.000	-0.102	0.015
France	0.916	0.011	0.033	-0.001	0.480	-0.197	0.004	1.205	0.000	-0.046	0.494
Germany	0.876	0.014	0.049	0.001	0.377	0.006	0.943	1.022	0.000	-0.122	0.006
Italy	0.800	0.020	0.101	-0.002	0.110	-0.491	0.000	1.491	0.000	-0.070	0.479
Japan	0.880	0.013	0.040	0.000	0.882	-0.117	0.017	1.007	0.000	-0.065	0.051
United Kingdom	0.893	0.011	0.029	0.000	0.640	0.063	0.327	0.842	0.000	0.043	0.443
United States	0.993	0.003	0.002	0.000	0.564	-0.227	0.000	1.183	0.000	0.016	0.039
Mean	*0.876*	*0.012*	*0.045*								
Asia-Pacific ex-Japan											
Australia	0.499	0.021	0.109	0.000	0.853	0.813	0.000	0.345	0.000	-0.221	0.027
China Shanghai A	0.188	0.035	0.304	-0.003	0.134	-0.581	0.000	1.008	0.000	0.219	0.285
China Shenzhen A	0.131	0.043	0.461	-0.002	0.506	-0.702	0.000	1.085	0.000	0.113	0.654
China Shanghai B	0.156	0.043	0.459	-0.002	0.444	-0.699	0.000	1.151	0.000	0.154	0.540
China Shenzhen B	0.258	0.035	0.303	0.000	0.963	-0.610	0.000	1.162	0.000	0.266	0.193
Hong Kong SAR	0.795	0.017	0.075	0.000	0.983	0.025	0.708	1.057	0.000	0.201	0.015
India	0.380	0.030	0.226	-0.001	0.532	0.247	0.036	0.622	0.000	0.355	0.029
Indonesia	0.261	0.031	0.248	0.002	0.245	0.075	0.542	0.620	0.000	0.081	0.566
Korea	0.289	0.030	0.224	0.000	0.981	0.166	0.154	0.745	0.000	0.200	0.147
Malaysia	0.387	0.015	0.059	0.001	0.430	-0.096	0.109	0.514	0.000	0.351	0.003
Philippines	0.379	0.026	0.165	0.002	0.179	0.046	0.645	0.687	0.000	0.217	0.279
Singapore	0.685	0.019	0.088	0.001	0.500	0.196	0.008	0.841	0.000	0.234	0.073
Thailand	0.442	0.025	0.157	0.002	0.222	0.077	0.426	0.667	0.000	0.408	0.001
Mean	*0.373*	*0.028*	*0.221*								

Sources: Bloomberg; I/B/E/S via Datastream; and authors' calculations.

B. The Role of Regulation

The existing empirical evidence points to the importance institutional factors in the pricing of stocks. In this context, Hsieh and Nieh (2010) argues that there remains room for greater improvement in Asian countries, in areas such as regulation, corporate governance, products and market infrastructure before greater international financial integration is possible towards realizing potential benefits of scale, capacity and liquidity.

We first test for the relationship between the overall strength of regulation and the extent of idiosyncratic influences on stock pricing. We use the International Organization of Securities Commissions' (IOSCO) *Objectives and Principles of Securities Regulation* (IOSCO, 2003) assessments, conducted during the IMF's Financial Sector Assessment Program (FSAP) missions to the countries in our sample, as a proxy for the strength of securities regulation. Given the infrequency of IOSCO assessments across countries, we regress the standard error of regression from the results of equation (2) on individual countries' average IOSCO ratings (see Box 1) from the corresponding period, between 2000–2012:

$$(3) \qquad s_{e,c,t} = a_{c,0} + a_{c,1} IOSCO_{c,t},$$

where:
$s_{e,c,t}$ is the standard error of regression for country *c* at time *t*; and
$IOSCO_{c,t}$ is the average IOSCO rating for country *c* at time *t*.

The regression results point to a significant relationship between idiosyncratic influences in stock pricing and the implementation of securities regulations in individual countries (Figure 4). The coefficient for the IOSCO explanatory variable is significantly different from zero at the 1 percent level. Our findings imply that countries with better implementation of securities regulations are associated with stock markets that are less subject to idiosyncratic influences. This suggests that some of the "noise" associated with the regression results for the emerging Asian markets may be attributable to institutional factors, consistent with previous evidence.

The empirical evidence also shows that the quality of regulation affects risk perceptions and consequently the cost of financing over the longer term. We group the stock market performance of the Asia-Pacific ex-Japan and G-7 countries in our sample that have undergone FSAPS into four roughly equal-sized buckets: Group 1 comprises the countries with the strongest record of implementation of securities regulations (i.e., those with highest average IOSCO ratings) up to Group 4, which consists of those with the weakest practices in regulating securities markets. Unsurprisingly, our findings confirm that weak regulation tend to be associated more volatile markets and higher required equity cost of capital, as represented by the actual return (Figure 5). As a group, the Asia-Pacific ex-Japan stock markets tend to have higher IOSCO ratings (i.e., weaker implementation of regulations) relative to their G-7 peers.

A closer examination of the nine IOSCO assessments for the Asia-Pacific ex-Japan countries over the 2001-11 period shows that much remain to be done in terms of strengthening securities regulation and their implementation. The IOSCO principles under the 2003 methodology are grouped into eight categories, specifically, principles: relating to the regulator; for self-regulation; for the enforcement of securities regulation, for cooperation in regulation, for issuers, for collective investment schemes, for market intervention; and for the secondary market. While "good practice" securities regulations, as defined under the 2003 IOSCO methodology, had been implemented or broadly implemented in many countries, a wide range had also been assessed as being either partially implemented or not implemented depending on the country (Figure 6). The assessments reveal that most countries typically require improvements in a few areas, with the biggest weaknesses evident in the areas of operational independence and accountability (Principle 2) and the effective and credible use of powers and implementation of an effective compliance program (Principle 10).

Box 1. Deriving a Measure of Effective Securities Regulation

IOSCO is the leading international grouping of securities market regulators with a membership comprising regulatory bodies from over 100 jurisdictions that have day-to-day responsibility for securities regulation and administration of securities laws. The IOSCO *Objectives and Principles of Securities Regulation* ("Principles") set out a broad general framework for the regulation of securities Their core aims are to protect investors, ensure that markets are fair, efficient and transparent, and reduce systemic risk.
including the regulation of:

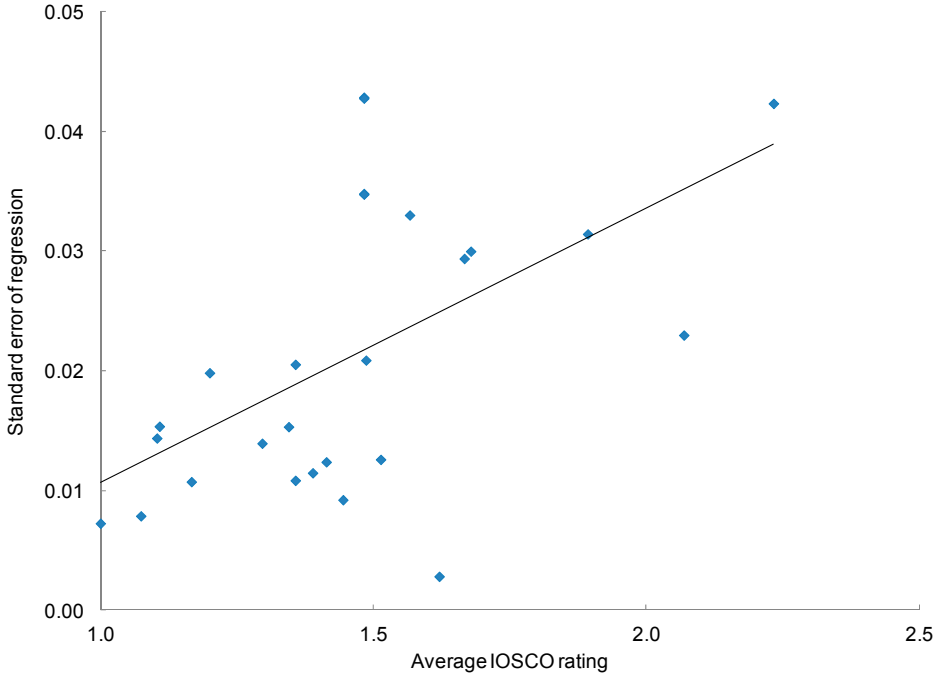
(i) securities markets;
(ii) the intermediaries that operate in those markets;
(iii) the issuers of securities;
(iv) the entities offering investors analytical or evaluative services such as credit rating agencies; and
(v) the sale of interests in, and the management and operation of, collective investment schemes.

The Methodology for assessing implementation of the IOSCO Principles is designed to provide IOSCO's interpretation and to give guidance on the conduct of a self- or third-party assessment of the level of Principles implementation. Two methodologies have been used to date—the first was introduced in 2003 and subsequently replaced by the new one in 2011. The FSAP detailed assessments of implementation of individual IOSCO Principles assigns ratings, with these Principles adjudged by independent experts to be either "Implemented," "Broadly Implemented," "Partially Implemented" or "Not Implemented." The rating scale was changed in May 2002, when the "Broadly Implemented" category was added. For this particular analysis, we assign a number to each rating, as follows:

Implemented = 1 Broadly Implemented = 2
Partially Implemented = 3 Not Implemented = 4

For each country, the corresponding numerical rating for each IOSCO principle in a particular assessment is aggregated and then averaged to arrive at the rating that is used in regression (3).

Figure 4. Regression Results: Idiosyncratic Influences on Stock Markets and the Effectiveness of Securities Regulation, March 1998 – November 2012



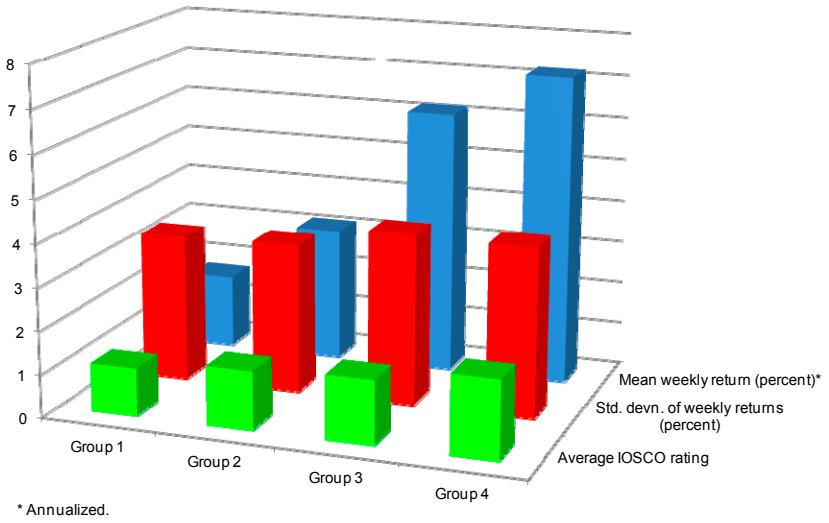
$$s_{e,c,t} = -0.012 + 0.023 \cdot IOSCO_{c,t}$$
(p=0.25) (p=0.00)

Adjusted R^2 0.279 Standard error 0.010

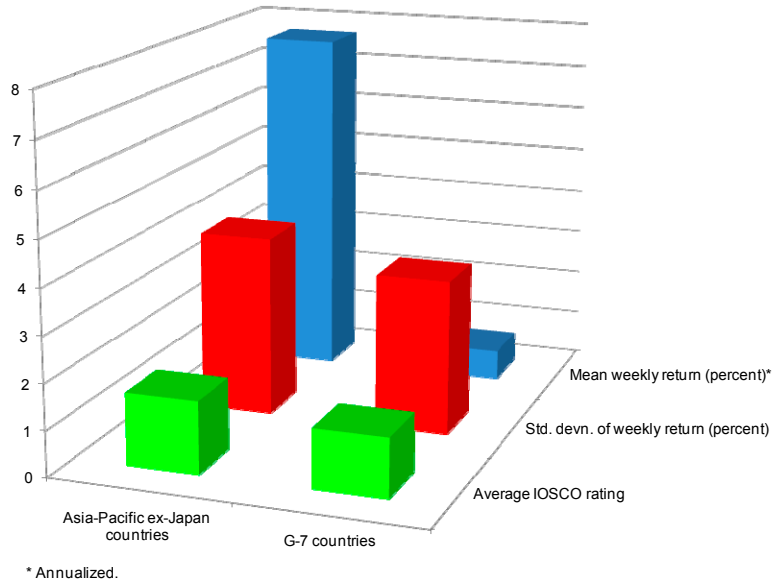
Sources: Bloomberg; I/B/E/S via Datastream; IMF; and authors' calculations.

Figure 5. Asia-Pacific ex-Japan and the G-7 Countries: Securities Regulation and the Risk-Return Trade-off, March 1998 – November 2012

(a) Grouped by Strength of IOSCO Rating

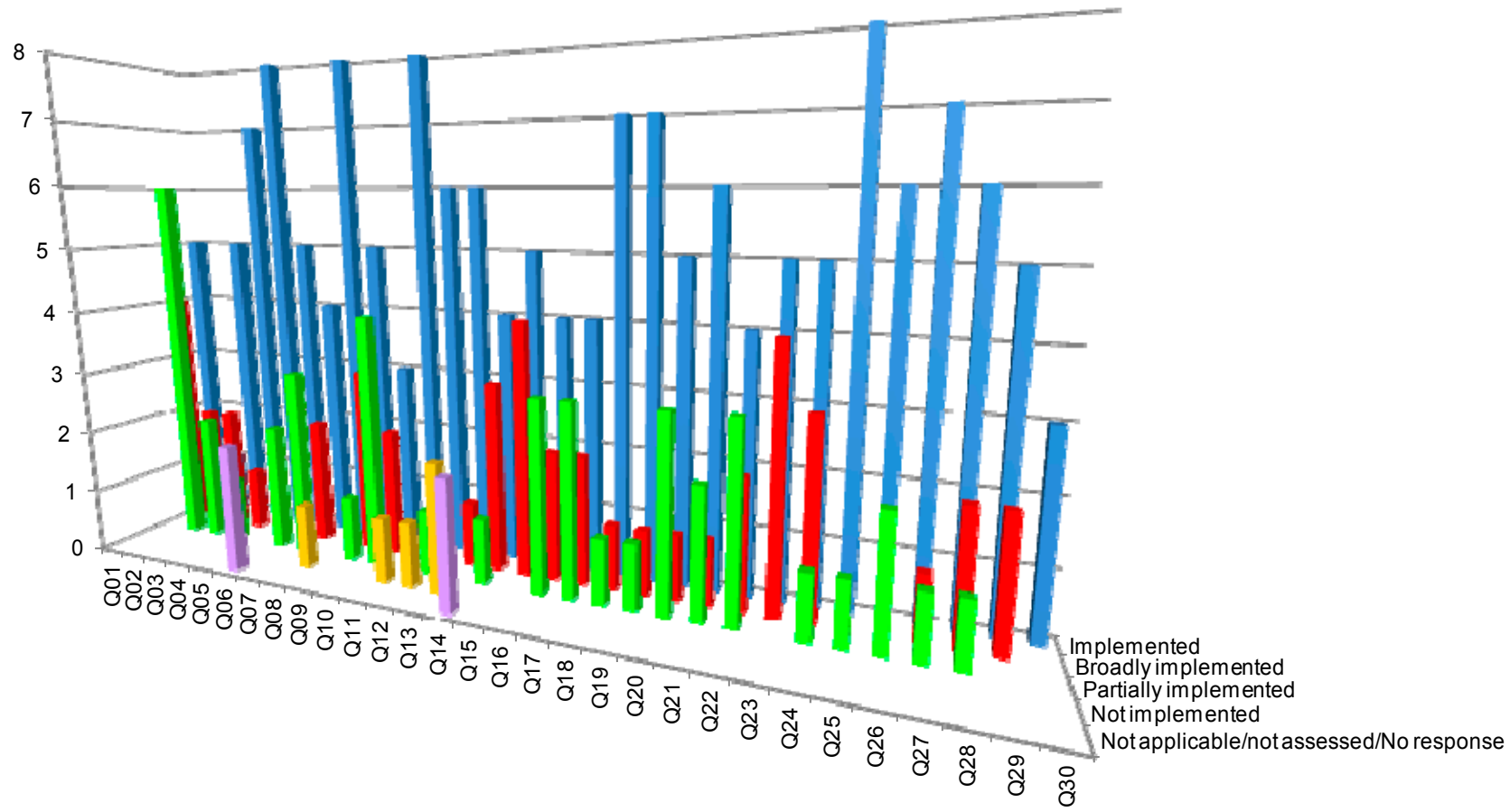


(b) Grouped by Country Category



Sources: Bloomberg; I/B/E/S via Datastream; IMF; and authors' calculations.

Figure 6. Asia-Pacific ex-Japan Countries: Distribution of IOSCO Ratings, 2001–11 [1/]



Source: IMF.

1/ Nine assessments applying the 2003 IOSCO methodology were undertaken during this period.

V. CONCLUSION

In Asia, local stock markets play a key role in financing corporate, and thus economic, activity. Unfortunately some of Asia's stock markets have the reputation of being more speculative in nature, rather than trading on fundamentals. Going forward, investors must be able to be able to credibly price their investment in the region's stock markets if their asset allocation is to remain stable or to continue to grow.

Our study assesses the extent to which Asia's stock pricing is based on idiosyncratic factors, rather than on systematic risk factors or economic and corporate fundamentals. We design a model using international asset pricing and economic theory, incorporating also evidence from accounting literature. International factors common to the universe of assets such as global and regional market risks, the local business cycle and the financial performance of the corporate sector, are applied to extract the "noise" component in stock prices. The G-7 countries are used as benchmarks.

Overall, our findings are consistent with the existing literature on the pricing of Asian stock markets. In general, the region's stock returns have tended to be higher than those of their G-7 counterparts but have also been more volatile. International systemic risk factors and local fundamentals, such as expected corporate earnings, have substantially less explanatory power when it comes to Asian stock prices compared to the G-7 markets. The results point to the existence of greater idiosyncratic influences in the region.

In other aspects, there are greater commonalities between the emerging and advanced country markets. Regional factors are consistently the most influential pricing variable, which corroborates the research on international market integration. Local developments, such as forecast earnings, had been relatively less useful as an explanatory variable but have become more important—for both Asian and G-7 markets during the current GFC—possibly because investors seek more expert guidance during volatile periods. Foreign investor allocation decisions also significantly influence the volatility and returns in both the Asia-Pacific and G-7 markets.

We demonstrate the role that policy could play in ensuring that "noise" is reduced in stock pricing. While we acknowledge that the apparent importance of idiosyncratic influences on Asian markets could also be attributable to specific local fundamental factors that our model may not have adequately captured, our empirical analysis suggests the existence of a significant relationship between the strength of regulation of securities markets and the extent of noise trading in stock markets. This suggests that improvements in local institutions, such as the regulation of securities markets, could enhance the role of Asian stock markets as an attractive investment destination and thus as a reliable source of funding for corporate and economic activity in the region.

APPENDIX I. DATASET AND SAMPLE PERIODS

Sample periods are determined in part by data availability (Appendix Table 1). The full period under examination is March 1998 to November 2012. Subsets of countries and variables are applied as available (Appendix Table 2). They comprise:

- **Dataset 1** consisting of all independent variables for the full set of countries
  - July 2005 – December 2007 ("peacetime").
  - January 2008 – November 2012 (GFC).
- **Dataset 2** consisting of all independent variables for a subset of countries (Canada, Germany, United Kingdom, United States, Australia, Hong Kong)
  - March 1998 – December 2000 (AFC). Although the AFC began with the devaluation of the Thai baht in July 1997, the data for all variables are only available for some countries from March 1998.
  - January 2001 – December 2007 ("peacetime"), broken down into
    - January 2001 – June 2005 (following the bursting of the technology bubble in 2000 and including the September 11, 2001 terrorist attack), and
    - July 2005 to December 2007 (the boom period leading up to the GFC).
  - January 2008 – November 2012 (GFC).
- **Dataset 3** consisting of a subset of independent variables (world returns, regional returns, forecast EPS) for the full set of countries
  - March 1998 – December 2000 (AFC).
  - January 2001 – December 2007 ("peacetime"), broken down into
    - January 2001 – June 2005, and
    - July 2005 to December 2007.
  - January 2008 – November 2012 (GFC).
- Relevant exchange rates for each country for the full sample period to calculate the necessary conversions to local currencies.

Appendix Table 1. Asia-Pacific ex-Japan and the G-7 Countries: Market Data Series and Sources

Country	Domestic Stock Market (Default in local currency except for China B stockmarkets)				World Factor (Default in U.S. dollars)			Regional Factor (Default in U.S. dollars)			Country Factor (Default in local currency)						Corporate Factor (Default in local currency unless indicated otherwise)					Exchange Rate		
	Domestic Stock Market Index	BBG Ticker (Index, PX_LAST)	Starting Date of Series	Weighting	World Stock Market Index	BBG Ticker (Index, PX_LAST)	Starting Date of Series	Regional Stock Market Index	BBG Ticker (Index, PX_LAST)	Starting Date of Series	Short-term Government Bond	BBG Ticker (Index, PX_LAST)	Starting Date of Series	Long-term Government Bond	BBG Ticker (Index, PX_LAST)	Starting Date of Series	Profitability	BBG Ticker (Index, TRAIL_12M _EPS)	Starting Date of Series	I/B/E/S_EPS	Starting Date of Series	Spot	BBG Ticker (Curncy, PX_LAST)	Starting Date of Series
G-7																								
Canada	S&P/Toronto Stock Exchange Composite	SPTSX	01/01/1919	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Americas	MXAM	12/31/1987	1-year	GCAN12M	07/07/1997	10-year	GCAN10YR	06/21/1989	EPS	SPTSX	06/30/1993	MSCINC	07/01/1987	Canadian dollar	CAD	01/04/1971
France	CAC 40	CAC	07/09/1987	Modified capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Europe	MSEUE18	12/31/1987	1-year	GBTF1YR	06/15/1989	10-year	GFRN10	01/02/1990	EPS	CAC	06/01/2001	MSCIEF	07/01/1987	Euro	EUR	01/02/1975
																						French franc	FRF	01/04/1971
Germany	DAX	DAX	10/01/1959	Free float	MSCI AC World	MXWD	12/31/1987	MSCI AC Europe	MSEUE18	12/31/1987	1-year	GDBR1	01/01/1995	10-year	GDBR10	01/03/1989	EPS	DAX	05/02/1997	MSCIED	07/01/1987	Euro	EUR	01/01/1999
																						Deutsche mark	DEM	01/04/1971
Italy 1/	FTSE MIB	FTSEMIB	01/02/1998	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Europe	MSEUE18	12/31/1987	1-year	GBOTG12M	09/05/1994	10-year	GBTPGR10	05/07/1993	EPS	FTSEMIB	07/30/2003	MSCIEI	07/01/1987	Euro	EUR	01/02/1975
	MIB-30	MIB30															EPS	MIB30	07/30/2003			Italian lira	ITL	01/02/1986
Japan	Nikkei 225	NKY	01/05/1970	Price	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GJGB1	03/31/1995	10-year	GJGB10	10/22/1987	EPS	NKY	04/03/2000	MSCIFJ	07/01/1987	Japanese yen	JPY	01/04/1971
United Kingdom	FTSE-100 Index	UKX	01/03/1984	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Europe	MSEUE18	12/31/1987	1-year	GUKG1	01/04/1994	10-year	GUKG10	01/03/1989	EPS	UKX	05/04/1993	MSCIEX	07/01/1987	Pound sterling	GBP	01/04/1971
United States	S&P 500 Index	SPX	12/30/1927	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Americas	MXAM	12/31/1987	1-year	USGG12M	07/15/1959	10-year	USGG10YR	01/02/1962	EPS	SPX	01/29/1954	MSCINA	07/01/1987	U.S. dollar	...	...
Asia-Pacific ex-Japan																								
Australia 2/	S&P/ASX 200	AS51	05/29/1992	Float-adjusted capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Paciic	MXAP	12/31/1987	1-year	GACGB1	10/04/1983	10-year	GACGB10	07/31/1969	EPS	AS51	04/03/2000	MSCIAA	07/01/1987	Australian dollar	AUD	01/04/1971
	Australian All-Ordinaries	AS30	12/31/1957	Float-adjusted capitalization													EPS	AS30	06/01/1993					
China	Shanghai A-Share	SHASHR	01/02/1992	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GCNY1YR	06/22/2005	10-year	GCNY10YR	06/06/2005	EPS	SHASHR	01/02/1997	MSCIFC	11/01/1995	Renminbi	CNY	01/02/1981
	Shenzhen A-Share	SZASHR	10/05/1992	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GCNY1YR	06/22/2005	10-year	GCNY10YR	06/06/2005	EPS	SZASHR	01/02/1997	MSCIFC	11/01/1995	Renminbi	CNY	01/02/1981
	Shanghai B-Share	SHBSHR	02/21/1992	Number of shares issued	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GCNY1YR	06/22/2005	10-year	GCNY10YR	06/06/2005	EPS	SHBSHR	02/17/1997	MSCIFC	11/01/1995	U.S. dollar	CNY	01/02/1981
	Shenzhen B-Share	SZBSHR	10/05/1992	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GCNY1YR	06/22/2005	10-year	GCNY10YR	06/06/2005	EPS	SZBSHR	06/02/1997	MSCIFC	11/01/1995	U.S. dollar	CNY	01/02/1981
Hong Kong	Hang Seng Index	HSI	07/31/1964	Free-float capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	HKGG1Y	03/06/1998	10-year	HKGG10Y	03/17/1998	EPS	HSI	09/01/1993	MSCIFH	07/01/1987	Hong Kong dollar	HKD	04/01/1974
Korea	Kospi Index	KOSPI	01/04/1980	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Paciic	MXAP	12/31/1987	1-year	GVSK1YR	08/07/2000	10-year	GVSK10YR	12/19/2000	EPS	KOSPI	01/02/2002	MSCIFK	02/01/1988	Korean won	KRW	04/13/1981
India	BSE India Sensex	SENSEX	04/03/1979	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Paciic	MXAP	12/31/1987	1-year	GIND1YR	01/01/2001	10-year	GIND10YR	11/25/1998	EPS	SENSEX	01/03/2000	MSCIFI	07/01/1987	Indian rupee	INR	01/03/1973
Indonesia	Jakarta Stock Exchange Composite	JCI	04/04/1983	Modified capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GIDN1YR	05/22/2003	10-year	GIDN10YR	07/22/2003	EPS	JCI	09/25/2001	MSCIFL	06/01/1990	Indonesian rupiah	IDR	11/05/1991
Malaysia	Kuala Lumpur Composite Index	FBMKLCI	01/03/1977	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Paciic	MXAP	12/31/1987	1-year	MGIY1Y	06/21/2005	10-year	MGIY10Y	06/21/2005	EPS	FBMKLCI	05/03/1993	MSCIFM	07/01/1987	Malaysian ringgit	MYR	01/04/1971
Philippines	Philippines Stock Exchange PSEi	PCOMP	01/02/1987	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	PDSF1YR	10/07/1998	10-year	PDSF10YR	10/07/1998	EPS	PCOMP	01/06/2000	MSCIFP	01/01/1988	Philippines peso	PHP	11/05/1991
Singapore 3/	FTSE Straits Times	FSSTI	08/31/1999	Full capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Paciic	MXAP	12/31/1987	1-year	MASB12M	01/02/1998	10-year	MASB10Y	06/29/1998	EPS	FSSTI	01/10/2008	MSCIFS	07/01/1987	Singapore dollar	SGD	01/05/1981
	Straits Times	STIOLD	01/04/1985														EPS	STIOLD	01/02/2002					
Thailand	Stock Exchange of Thailand SET	SET	07/02/1987	Capitalization	MSCI AC World	MXWD	12/31/1987	MSCI AC Asia-Pacific	MXAP	12/31/1987	1-year	GVTL1YR	08/07/2000	10-year	GVTL10YR	08/07/2000	EPS	SET	01/02/2002	MSCIFT	01/01/1988	Thai baht	THB	01/05/1981

Sources: Bloomberg; and I/B/E/S via Datastream.

1/ Benchmark switched to MIB-30 in September 2004.
2/ Benchmark switched to S&P/ASX 200 in April 2000.
3/ Benchmark switched to Straits Times Index in January 2008.

Appendix Table 2. Asia-Pacific ex-Japan and the G-7 Countries: Regression Data Set and Sub-sets

	Asian Crisis					"Peacetime"										Global Financial Crisis				
	Mar 1998 - Dec 2000					Jan 2001 - Jun 2005					Jul 2005 to Dec 2007					Jan 2008 - Nov 2012				
Country	World	Region	Business Cycle	Expected Earnings	Actual Earnings	World	Region	Business Cycle	Expected Earnings	Actual Earnings	World	Region	Business Cycle	Expected Earnings	Actual Earnings	World	Region	Business Cycle	Expected Earnings	Actual Earnings
$r_{C,t}$	$r_{W,t}$	$r_{R,t}$	$y_{C,t}$	$e^{f}_{c,t}$	$e^{a}_{c,t}$	$r_{W,t}$	$r_{R,t}$	$y_{C,t}$	$e^{f}_{c,t}$	$e^{a}_{c,t}$	$r_{W,t}$	$r_{R,t}$	$y_{C,t}$	$e^{f}_{c,t}$	$e^{a}_{c,t}$	$r_{W,t}$	$r_{R,t}$	$y_{C,t}$	$e^{f}_{c,t}$	$e^{a}_{c,t}$
G-7																				
Canada	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Italy	✓	✓	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Japan	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
United Kingdom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
United States	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Asia-Pacific ex-Japan																				
Australia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China Shenzhen A	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China Shanghai B	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
China Shenzhen B	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Hong Kong SAR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
India	✓	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Indonesia	✓	✓	×	✓	×	✓	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Korea	✓	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Malaysia	✓	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Philippines	✓	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Singapore	✓	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thailand	✓	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Sources; Bloomberg; and I/B/E/S via Datastream.

Note:

✓ indicates that data are available for the full period.

× indicates that data for this variable are unavailable for part of or the full period.

Appendix Table 3. Stock Markets around the World: Means and Standard Deviations of Returns, March 1998 – November 2012
(In U.S. dollars, percent)

Region	Country	Index	Weekly Index Returns													
			Full Sample Period		"Peacetime"		Sub-sample Period		Asian Crisis		"Peacetime"				Global Financial Crisis	
			Mar 1998 - Nov 2012		Jan 2001 - Dec 2007		Jul 2005 - Nov 2012		Mar 1998 - Dec 2000		Jan 2001 - Jun 2005		Jul 2005 - Dec 2007		Jan 2008 - Nov 2012	
			Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
World 1/		MSCI AC World	0.03	2.62	0.09	2.02	0.03	2.97	0.08	2.28	-0.01	2.16	0.28	1.74	-0.10	3.43
Americas		MSCI AC Americas	0.03	2.74	0.05	2.12	0.04	2.93	0.11	2.82	-0.03	2.36	0.21	1.62	-0.04	3.41
	Canada	S&P/Toronto Stock Exchange Composite	0.11	3.43	0.24	2.33	0.10	3.93	0.09	3.55	0.13	2.33	0.42	2.34	-0.07	4.53
	United States	S&P 500	0.03	2.69	0.03	2.13	0.03	2.83	0.13	2.80	-0.04	2.39	0.16	1.56	-0.03	3.29
Asia-Pacific		MSCI AC Asia-Pacific	0.05	2.83	0.15	2.41	0.05	2.90	0.04	3.18	0.05	2.47	0.30	2.31	-0.11	3.15
	Australia	S&P/ASX 200 1/ Australian All-Ordinaries	0.11	3.49	0.31	2.49	0.08	4.24	-0.04	2.61	0.26	2.42	0.40	2.62	-0.08	4.87
	China Shanghai A	Shanghai A-Share	0.14	3.82	0.25	3.42	0.36	4.43	0.39	3.29	-0.38	2.88	1.39	3.97	-0.17	4.57
	China Shenzhen A	Shenzhen A-Share	0.14	3.82	0.25	3.42	0.36	4.43	0.39	3.29	-0.38	2.88	1.39	3.97	-0.17	4.57
	China Shanghai B	Shanghai B-Share	0.18	5.13	0.39	4.89	0.31	5.02	0.33	6.43	-0.13	4.36	1.31	5.61	-0.21	4.62
	China Shenzhen B	Shenzhen B-Share	0.27	4.82	0.48	4.84	0.33	4.17	0.25	5.96	0.20	5.05	0.99	4.40	-0.01	4.02
	Hong Kong	Hang Seng	0.08	3.50	0.16	2.75	0.10	3.48	0.18	4.42	-0.02	2.83	0.50	2.58	-0.10	3.85
	India	BSE India SENSEX	0.16	4.01	0.49	3.29	0.18	4.26	-0.09	4.45	0.28	3.25	0.87	3.35	-0.17	4.63
	Indonesia	Jakarta Stock Exchange Composite	0.28	5.04	0.51	3.95	0.35	4.34	-0.14	7.70	0.41	3.94	0.69	3.97	0.17	4.51
	Japan	Nikkei 225	-0.02	3.22	0.03	2.94	0.01	2.87	-0.05	3.99	-0.05	3.24	0.19	2.33	-0.08	3.11
	Korea	KOSPI	0.20	5.04	0.44	3.96	0.14	4.59	0.08	6.92	0.38	4.34	0.55	3.20	-0.07	5.15
	Malaysia	Kuala Lumpur Composite	0.13	3.07	0.24	2.11	0.21	2.41	-0.08	5.22	0.12	2.07	0.47	2.16	0.08	2.53
	Philippines	Philippines Stock Exchange PSEi	0.10	3.80	0.30	3.24	0.34	3.60	-0.48	5.05	0.07	3.15	0.70	3.37	0.16	3.70
	Singapore	FTSE Straits Times 2/	0.12	3.43	0.21	2.61	0.14	3.37	0.10	4.49	0.08	2.71	0.45	2.41	-0.01	3.77
	Thailand	Stock Exchange of Thailand SET	0.16	4.10	0.39	3.26	0.24	3.47	-0.49	6.15	0.43	3.38	0.32	3.06	0.19	3.67
Europe		MSCI AC Europe	0.01	3.16	0.13	2.37	-0.01	3.70	0.06	2.47	-0.01	2.50	0.36	2.08	-0.19	4.29
	France	CAC 40	0.01	3.58	0.11	2.70	-0.05	4.14	0.24	2.94	-0.04	2.88	0.37	2.34	-0.26	4.80
	Germany	DAX	0.07	3.85	0.18	3.21	0.12	4.15	0.09	3.49	-0.04	3.56	0.58	2.43	-0.12	4.79
	Italy	FTSE MIB 3/	-0.08	3.90	0.10	2.71	-0.19	4.53	0.11	3.35	-0.01	3.01	0.29	2.06	-0.43	5.36
	United Kingdom	FTSE-100	-0.01	3.05	0.09	2.19	-0.01	3.63	-0.05	2.45	0.00	2.25	0.25	2.07	-0.15	4.21
Average of individual stock markets																
	Sample countries		0.11	3.88	0.26	3.20	0.15	3.91	0.05	4.66	0.07	3.23	0.61	3.13	-0.08	4.24
	Americas		0.07	3.09	0.13	2.23	0.07	3.42	0.11	3.20	0.04	2.36	0.29	1.99	-0.05	3.95
	Asia-Pacific incl. Japan		0.14	4.08	0.32	3.44	0.22	3.92	0.02	5.18	0.10	3.41	0.72	3.46	-0.04	4.11
	Asia-Pacific ex-Japan		0.16	4.11	0.34	3.47	0.23	3.99	0.03	5.26	0.11	3.42	0.76	3.53	-0.04	4.18
	Europe		0.00	3.61	0.12	2.72	-0.03	4.12	0.10	3.08	-0.03	2.95	0.38	2.23	-0.24	4.80
	G-7		0.01	3.41	0.11	2.62	0.00	3.77	0.08	3.25	-0.01	2.84	0.33	2.18	-0.16	4.36

Sources: Bloomberg; and authors' calculations.

1/ All sample countries in this study are included in the MSCI AC World Index.

Figure 7. Asia-Pacific ex-Japan and the G-7 Stock Markets: Correlation of Local with World and Regional Returns, March 1998 – November 2012 (In U.S. dollars)

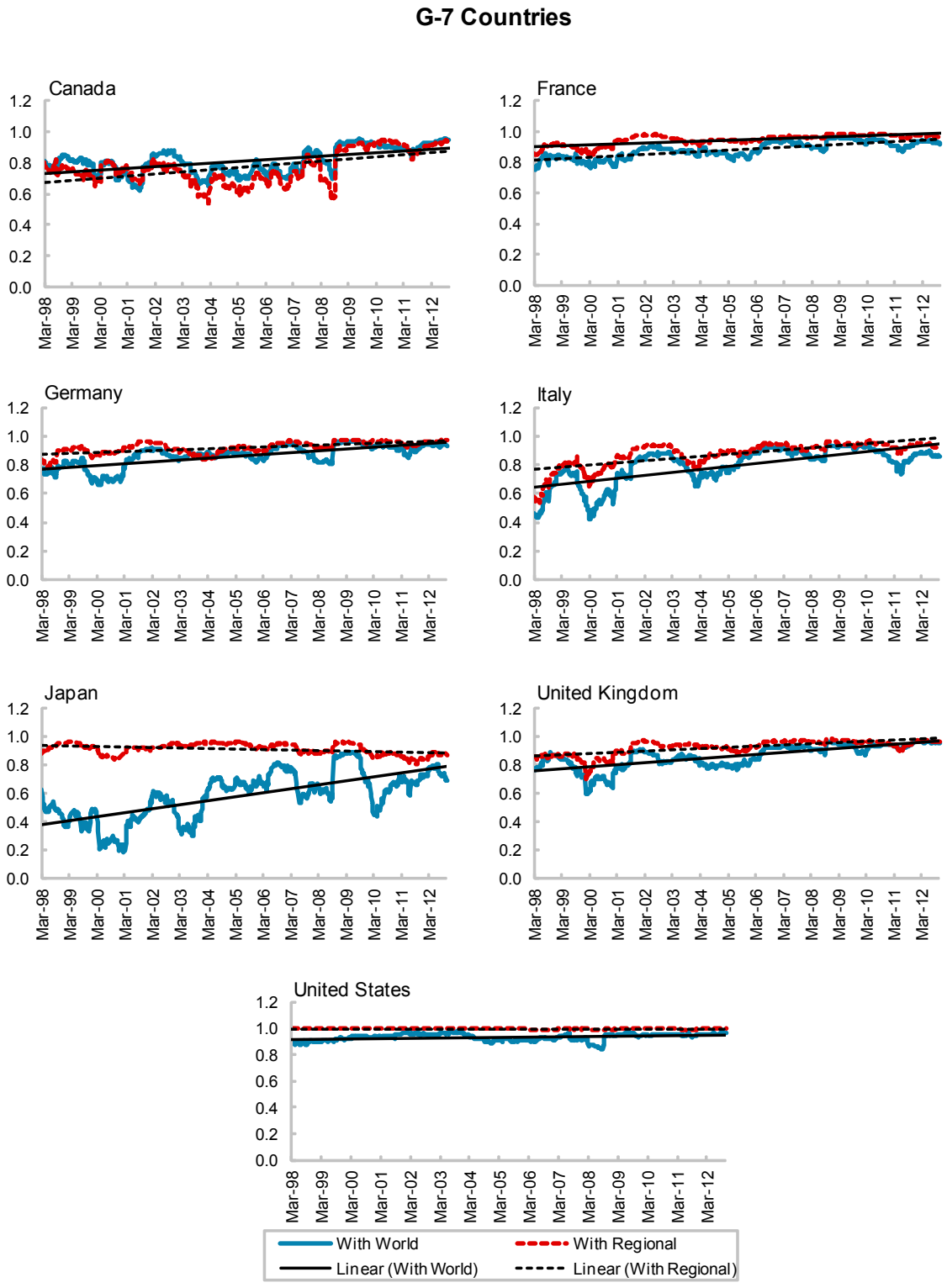


Figure 7. Asia-Pacific ex-Japan and the G-7 Stock Markets: Correlation of Local with World and Regional Returns, March 1998 – November 2012 (In U.S. dollars) (continued)

Australia, China and Hong Kong SAR

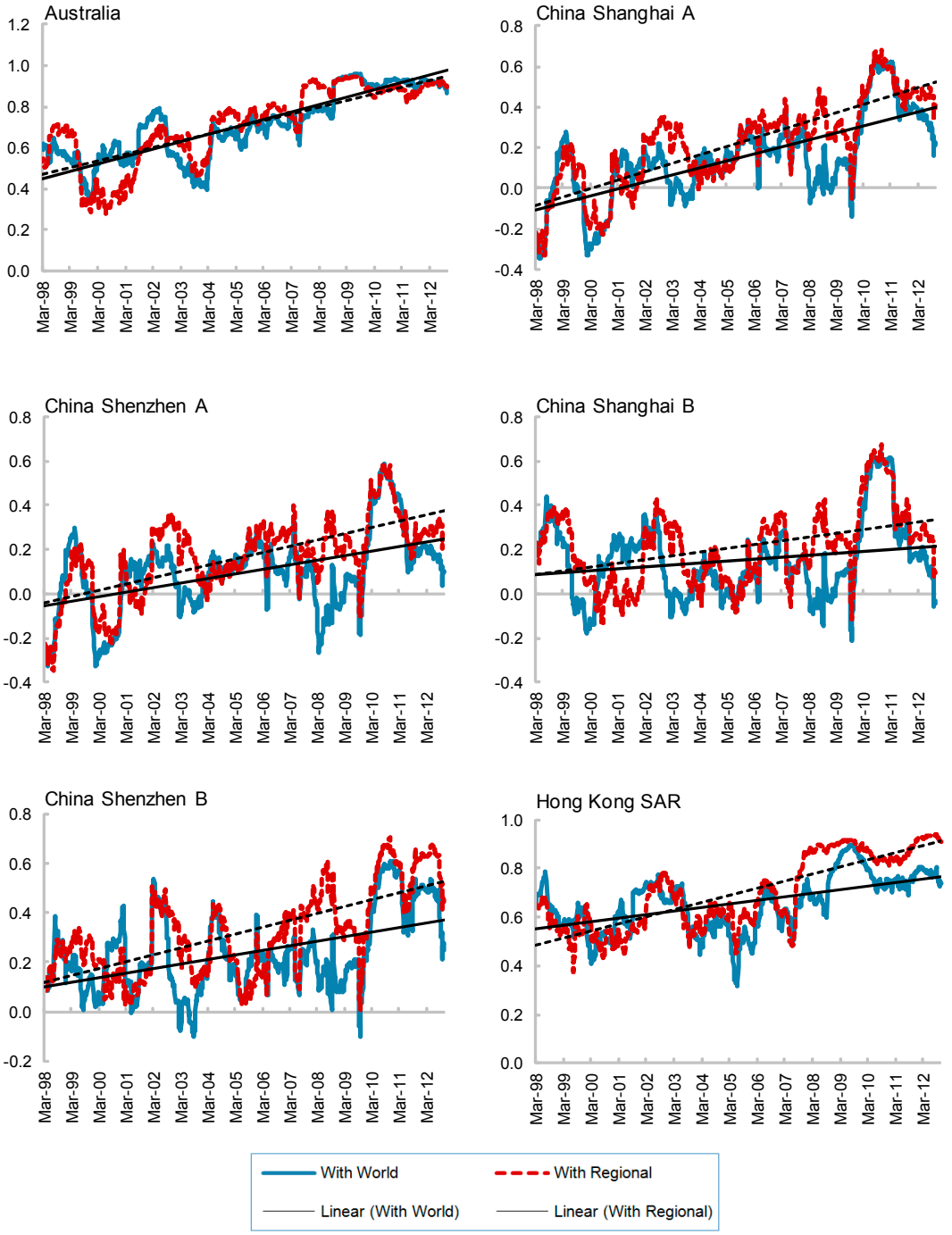
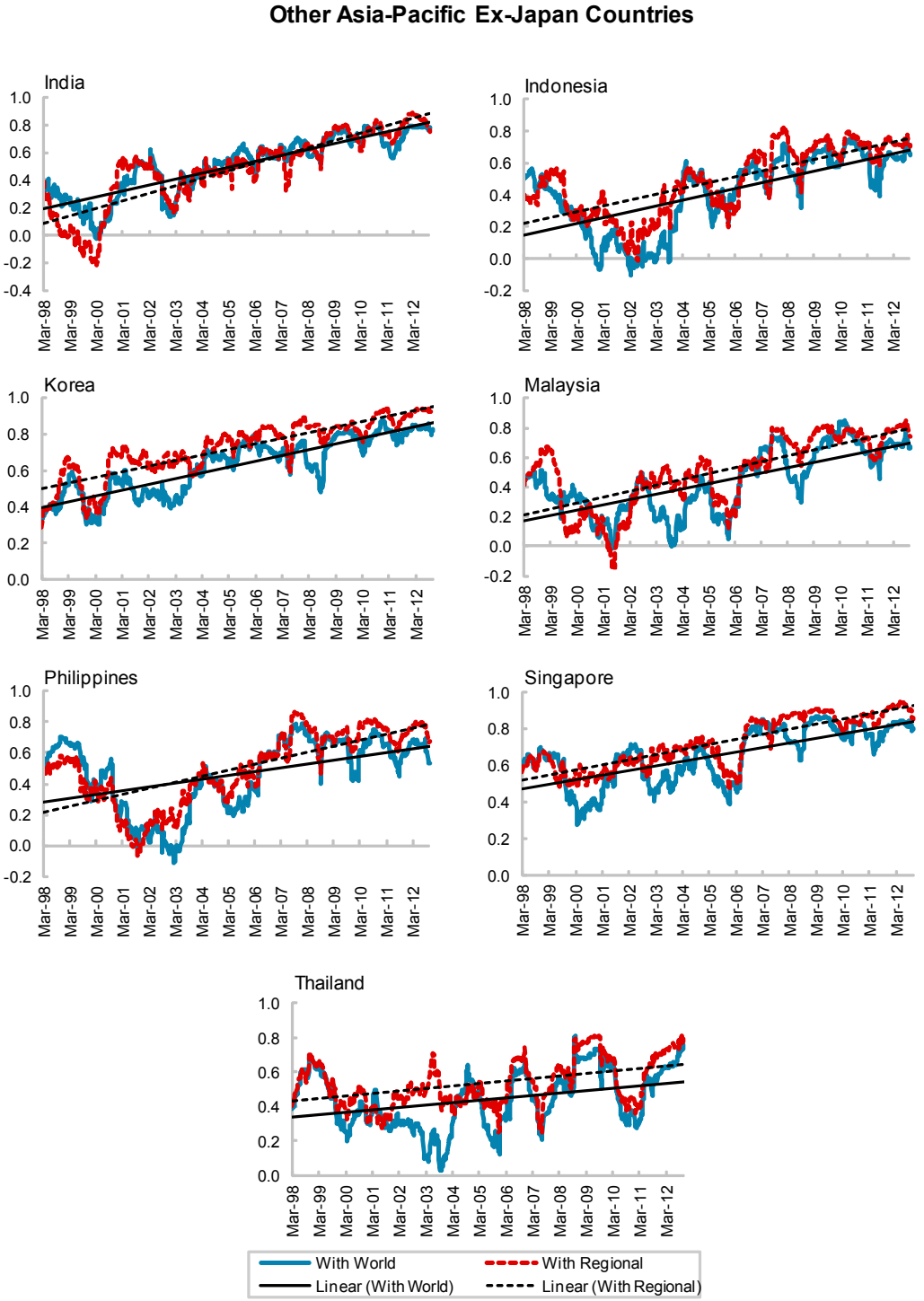


Figure 7. Asia-Pacific ex-Japan and the G-7 Stock Markets: Correlation of Local with World and Regional Returns, March 1998 – November 2012 (In U.S. dollars) (continued)



Sources: Bloomberg; and authors' calculations.

APPENDIX III. THE IMPACT OF FOREIGN INVESTORS ON LOCAL STOCK MARKETS

We run four separate regressions to determine the potential importance of foreign investment in the pricing of stock markets. Foreign investment are omitted as explanatory variables in our main stock market pricing models as the data are only available on an annual basis. The impact of foreign holdings and net flows on stock market volatility and returns are considered individually:

(4) $$Var_{c,t} = b_{c,0} + b_{c,1,}Holdings_{c,t},$$

(5) $$Var_{c,t} = b_{c,2} + b_{c,3,}Flows_{c,t},$$

(6) $$R_{c,t} = b_{c,4} + b_{c,5,}Holdings_{c,t},$$

(7) $$R_{c,t} = b_{c,6} + b_{c,7,}Flows_{c,t},$$

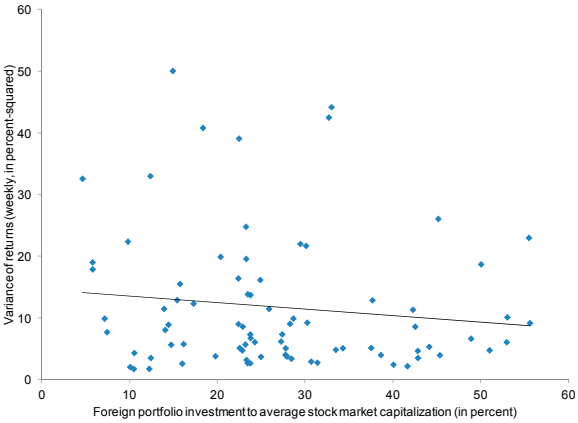
where:
$Var_{c,t}$ represents the variance of the weekly stock market return (U.S. dollars) over a one-year period for country *c* in year *t*;
$Holdings_{c,t}$ represents the share of foreign investment in the stock market of country *c* in year *t*;
$Flows_{c,t}$ represents the share of net portfolio flows into or out of the stock market of country *c* in year *t*;
$R_{c,t}$ represents the average weekly stock market return (U.S. dollars) for country *c* in year *t*.

The summary results from regressions (4) and (5) are presented in Figure 8 and those from regressions (6) and (7) are shown in Figure 9.

Figure 8. Stock Markets around the World: Foreign Investment and Volatility, 2001–12
(In U.S. dollars)

(b) Holdings, 2001–12

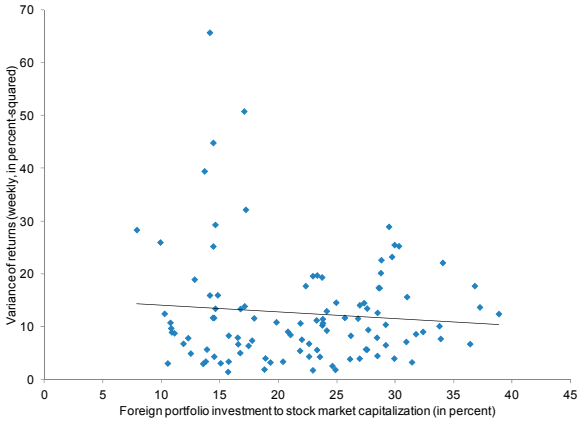
G-7



$$Var_{c,t} = 14.583 - 0.105 \cdot Holdings_{c,t}$$
(p=0.00) (p=0.27)

Adjusted R^2 0.003 Standard error 10.871

Asia-Pacific ex-Japan

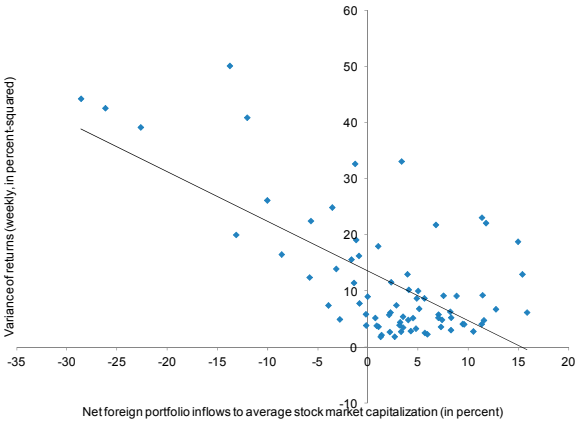


$$Var_{c,t} = 15.393 - 0.128 \cdot Holdings_{c,t}$$
(p=0.00) (p=0.36)

Adjusted R^2 –0.001 Standard error 10.5

(b) Net Flows, 2002–12

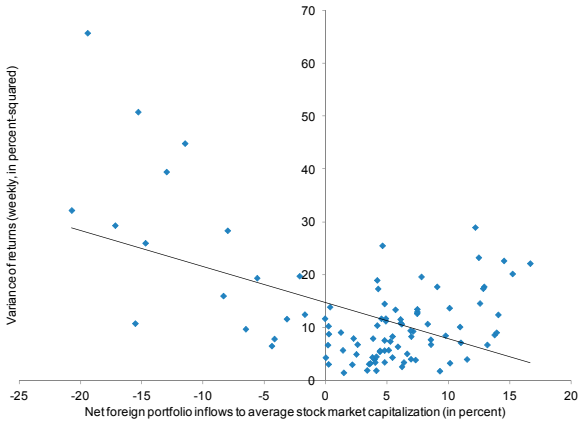
G-7



$$Var_{c,t} = 13.594 - 0.886 \cdot Flows_{c,t}$$
(p=0.00) (p=0.00)

Adjusted R^2 0.436 Standard error 8.463

Asia-Pacific ex-Japan



$$Var_{c,t} = 14.688 - 0.682 \cdot Flows_{c,t}$$
(p=0.00) (p=0.00)

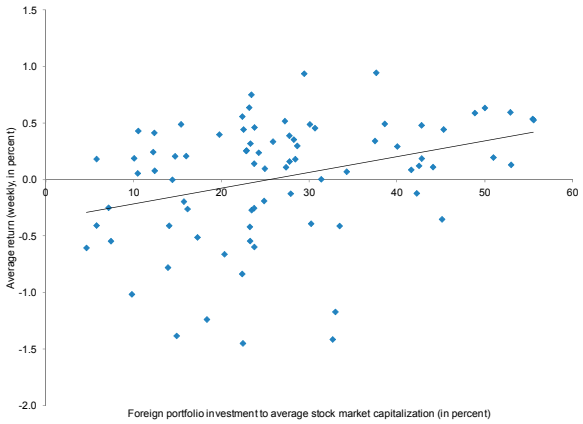
Adjusted R^2 0.237 Standard error 9.343

Sources: Bloomberg; IMF; WFE; and authors' calculations.

Figure 9. Stock Markets around the World: Foreign Investment and Returns, 2001–12
(In U.S. dollars)

(a) Holdings, 2001–12

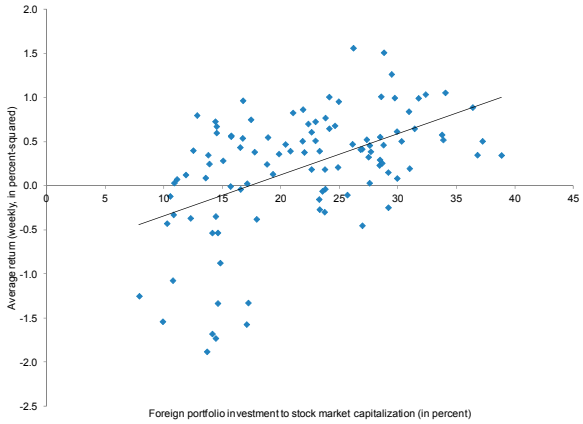
G-7



$$R_{c,t} = -0.355 + 0.014 \cdot Holdings_{c,t}$$
(p=0.01) (p=0.00)

Adjusted R^2 0.099 Standard error 0.512

Asia-Pacific ex-Japan

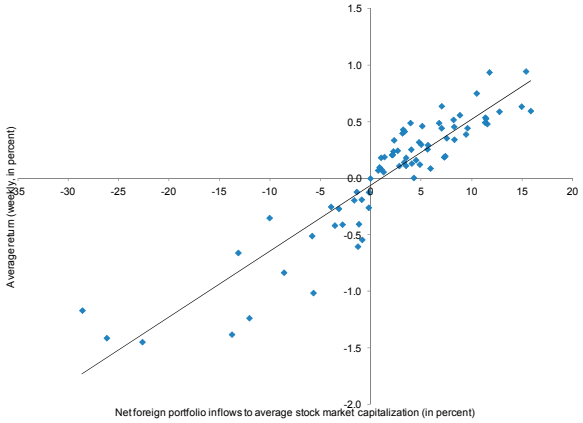


$$R_{c,t} = -0.808 + 0.047 \cdot Holdings_{c,t}$$
(p=0.00) (p=0.00)

Adjusted R^2 0.243 Standard error 0.596

(b) Net Flows, 2002–12

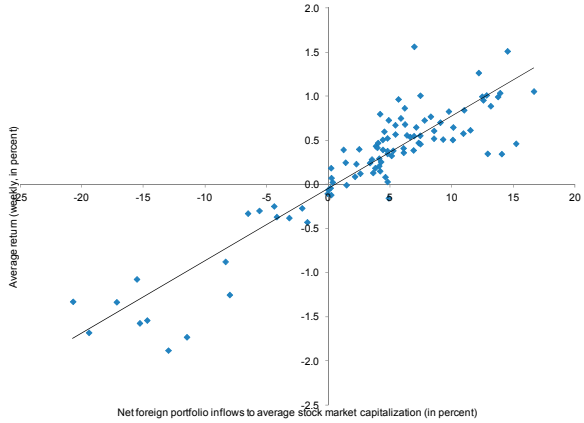
G-7



$$R_{c,t} = -0.060 + 0.058 \cdot Flows_{c,t}$$
(p=0.02) (p=0.00)

Adjusted R^2 0.843 Standard error 0.213

Asia-Pacific ex-Japan



$$R_{c,t} = -0.046 + 0.082 \cdot Flows_{c,t}$$
(p=0.16) (p=0.00)

Adjusted R^2 0.831 Standard error 0.286

Sources: Bloomberg; IMF; WFE; and authors' calculations.

APPENDIX IV. MODEL DESIGN

Ross' (1976) arbitrage pricing theory (APT) is an appropriate and more flexible alternative to the Capital Asset Pricing Model (CAPM). It is consistent with the intuition behind the CAPM but with the following appealing features (see Roll and Ross, 1980):

- It is a linear return generating process and requires no utility assumptions except for monotonicity and concavity.
- It is not restricted to a single period and will hold in multi-period cases as well.
- It allows more than just one generating factor.
- No particular portfolio plays a role in the APT, although it is consistent with all prescriptions for portfolio diversification.
- It does not require that all of the universe of available assets be included in the measured market portfolio.
- It does not require that the market portfolio be mean-variance efficient.

The rationale underpinning the APT model is that there are a small number of risks that are common to most assets, for which investors require risk premia. Equilibrium is characterized by a linear relationship between an asset's expected return at time *t* and the return's response amplitudes on the common (explanatory) factors, such that:

$$(4) \qquad r_{i,t} = \mu_{i,t} + b_{i,1}\delta_{1,t} + \cdots + b_{i,k}\delta_{k,t},$$

$$i = 1, \cdots, n,$$

where:
$\mu_{i,t}$ is the expected return on the i^{th} asset at time *t*, such that $\mu_{i,t} = E_{t-1}(r_{i,t})$;
the next *k* terms are of the form $b_{i,k}\delta_{k,t}$ where $\delta_{k,t}$ denotes the mean zero k^{th} factor common to the returns of all assets under consideration at time *t*, which captures the systematic components of risk in the model; and
$b_{i,k}$ quantifies the *sensitivity* of asset *i*'s returns to the movements in the common factor $\delta_{k,t}$ at time *t*.

The expected return in (4) could be expressed more generally as:

$$(5) \qquad \mu_{i,t} = E_{t-1}(r_{i,t}) = \alpha_i + \lambda_{0,t} + b_{i,1}\lambda_{1,t} + \cdots + b_{i,k}\lambda_{k,t},$$

where:
α_i represents the *pricing error*, i.e., the deviation of expected return from the prediction of the multifactor asset pricing model;

$\lambda_{0,t}$ is the return on a riskless asset; and
$\lambda_{k,t}$ is the risk premium on the k^{th} source of risk.

To avoid arbitrage opportunities, α_i must equal zero for all *i* in equation (5), so that:

(6) $\mu_{i,t} \approx \lambda_{0,t} + b_{i,1}\lambda_{1,t} + \cdots + b_{i,k}\lambda_{k,t}.$

Solnik's (1983) derivation of the international arbitrage pricing theory (IAPT) shows that in integrated international capital markets, where assets in various national markets are traded as though their prices are determined in a unified market, an arbitrage portfolio that is riskless in a particular currency would also be riskless in any other currency. However, he posits that a likely structure might be the combination of international factors common to all or specific types of assets, plus national factors affecting only domestic assets. Moreoever, he notes that to be viable and useful, the number of common factors in an IAPT must be small compared to the number of assets—if the number of factors is too larger, the testability and operationality of the IAPT would be greatly reduced.

In this context, the expression for asset returns in (4) assumes that there are only *k* worldwide factors that influence all asset returns. This specification is generalized to include uncertainty that is asset specific or diversifiable, such that:

(7) $\tilde{r}_{i,t} = \mu_{i,t} + b_{i1}\tilde{\delta}_{1,t} + \cdots + b_{i,k}\tilde{\delta}_{k,t} + \tilde{\epsilon}_{i,t},$

where $\tilde{\epsilon}_{i,t}$ is the noise term—an unsystematic risk component, idiosyncratic to the i^{th} asset at time *t*, reflecting the random influence of information that is unrelated to other assets, such that $E\{\tilde{\epsilon}_{i,t,}|\tilde{\delta}_{k,t}\} = 0$, and that $\tilde{\epsilon}_{i,t}$ is independent of $\tilde{\epsilon}_{j,t}$ for all *i* and *j*. If market segmentation exists, the asset's ex post return in (4) could deviate from its expected return because of shocks from the common factors *and* (local) asset-specific shocks. In other words, if local factors in one or more countries in the test sample are priced locally but not priced in other countries, and only the world factors and not the local factors are included in the model, then full cross-market arbitrage may not be possible, preventing the price of risk from equating across markets. The pricing error for a country's assets, α_i, in (5) would thus be non-zero (see Korajczyk, 1996 for a detailed exposition).

The existing empirical evidence suggests that stock markets remain largely segmented, notwithstanding perceptions of their increasing integration as discussed above. Segmentation tends to be much larger for emerging markets than for developed markets (Korajczyk, 1996). A number of emerging markets are found to exhibit time-varying integration (Bakaert and Harvey, 1995); more specifically, the degree of integration of Asia's stock markets with major countries is found to change over time, especially around financial crises (Yang and others, 2003). Meanwhile, Bakaert and others (2005) show increased regional integration within Asia, especially during the Asian financial crisis (AFC) period, as well as within Europe. Separately, Wang (2011) finds that volatility in Asian markets is primarily driven by

local factors, rather than by external factors such as those of other Asian markets, the United Kingdom or United States; local factors also have the greater volatility impact in emerging markets relative to developed markets.

Dependent variable

We construct the pricing of the dependent variable—the local stock market return for country *c*, $R_{c,t}$—based on the assumption that stock markets are not fully integrated. Returns are modeled as a function of systematic world and regional factors, as well as local and asset specific factors. They are necessarily denominated in local currency terms given that local factors cannot be arbitraged away if markets are not fully integrated, such that:

(8) $R_{c,t} = f(\text{world},\ \text{region},\ \text{local},\ \text{asset}).$

The dependent variable itself is calculated as:

(9) $R_{c,t} \equiv ln\left(\frac{index_{c,t}}{index_{c,t-1}}\right),$

where $index_{c,t}$ is the stock market index for country *c* at time *t* in local currency and $index_{c,t-1}$ is the corresponding index one week prior.

Independent variables

International developments

The increasing integration of capital markets across countries suggests that the assets in a particular country's stock market that is open to international investors would be sensitive to global and regional news. We employ returns on benchmark stock price indices to represent global and regional factors. This premise is consistent with Chen, Roll and Ross (1986) who argue that stock markets are better able to capture all available information available—and also reflect innovations in macro variables—compared to macro time series, which are subject to smoothing and averaging over particular holding periods. Specifically, we use:

(i) *The Morgan Stanley Capital International (MSCI) All Country (AC) World Index (WI), which consists of 45 constituent countries, as a proxy for the* ***global stock market*** *(Appendix Box 1).* This would be consistent with existing empirical evidence showing this index to be representative of a "world" portfolio (Cumby and Glen, 1990; Harvey, 1991; Harvey and Zhou, 1993). Given that this index is quoted in U.S. dollars, the world stock index return at time *t* is calculated in local currency terms as follows:

(10) $R_{w,t} \equiv ln\left(\frac{index_{w,t}}{index_{w,t-1}}\right) - ln\left(\frac{spot_{c,t}}{spot_{c,t-1}}\right),$

where:
$index_{w,t}$ is the MSCI ACWI at time *t* and $index_{w,t-1}$ is the MSCI ACWI one week prior;
$spot_{c,t}$ is the spot exchange rate for country *c* at time *t* in local currency per U.S. dollar and $spot_{c,t-1}$ is spot exchange rate one week prior.

(ii) *The MSCI regional indices as proxies for the respective* ***regional stock markets****.* For the purposes of this study, the indices used are:

- The Americas: MSCI AC Americas.
- Europe: MSCI AC Europe.
- Asia-Pacific: MSCI AC Asia-Pacific.

Given that all indices are quoted in U.S. dollars except for the MSCI AC Europe, which is quoted in euro (i.e., the local currency for associated countries), the weekly regional stock index return at time *t* is calculated in local currency terms as follows:

$$(11) \quad R_{r,t} \equiv ln\left(\frac{index_{r,t}}{index_{r,t-1}}\right) - ln\left(\frac{spot_{c,t}}{spot_{c,t-1}}\right).$$

where:
$index_{r,t}$ is the relevant MSCI index for region *r* at time *t* and $index_{r,t-1}$ is the corresponding MSCI regional index one week prior;
$spot_{c,t}$ is the spot exchange rate for country *c* at time *t* in local currency per U.S. dollar and $spot_{c,t-1}$ is spot exchange rate one week prior.

Local developments

Stock prices are commonly influenced by expectations of changes in the business cycle in a particular country. We use changes in term structure spreads to represent such expectations of broader domestic real economy developments. The term structure as a predictor of economic activity—such as growth, consumption and investment, and inflation—is well-documented for the various G-7 economies (e.g., Estrella and Hardouvelis, 1991; Estrella and Mishkin, 1997; Bernard and Gerlach, 1998; Nakaota, 2004; Estrella, 2005; Wheelock and Wohar, 2009). The term structure has also been effective in predicting real economic activity in Asia-Pacific countries such as Australia (Alles, 1995; Valadkhani, 2004), China (Lee, 2011), Korea (Paya and Matthews, 2004) and Malaysia (Muhamad Shukri and Abdul Majid, 2011).

For our model, the spread is calculated as the difference between a long-term interest rate (the 10-year government bond yield) and a short term rate (the 1-year government bond yield) in any one country. Thus, the business cycle, represented by the weekly change in the yield curve slope for country *c*, is defined as follows:

$$(12) \quad BC_{c,t} \equiv \frac{spread_{c,t} - spread_{c,t-1}}{|spread_{c,t-1}|},$$

where $spread_{c,t}$ is the term structure spread for country *c* at time *t* and $spread_{c,t-1}$ is the corresponding spread one week prior.

Local corporate sector performance

The relationship between earnings information and stock returns is well-documented. The seminal paper by Ball and Brown (1968) shows that the release of a firm's income number carries some information value for markets, but that most of the information content is captured beforehand through other sources. Consistent with Fama's (1970) semi-strong form efficient market hypothesis, share prices are found to anticipate changes in earnings before they are announced, such as through analysts forecasts, and react rapidly to new information contained in quarterly earnings but market reactions tend to be incomplete (Bernard and Thomas, 1989). Price changes are statistically significant during the time of forecast disclosures—beyond those explained by market movements as a whole—and the adjustments move in the same direction as the changes in naïve expectations embodied in forecasts (Patell, 1976). This is supported by recent studies focusing on Asia's stock markets which find a strong relationship between earnings per share (EPS) and stock prices (Seetharaman and Raj, 2011; Menaje, 2012).

We use total forecast and actual EPS in our model, to capture information changes conveyed through anticipated and realized corporate sector earnings vis-à-vis the return of a particular stock market. The forecast and actual EPS are sourced from Datastream (I/B/E/S) and Bloomberg, respectively, and the changes are calculated in local currency terms such that:

$$(13) \quad EPS^{f}_{c,t} \equiv ln\left(\frac{eps^{f}_{c,t}}{eps^{f}_{c,t-1}}\right),$$

where $eps^{f}_{c,t}$ is the forecast EPS for country *c* at time *t* and $eps^{f}_{c,t-1}$ is the corresponding forecast one week prior, and,

$$(14) \quad EPS^{a}_{c,t} \equiv ln\left(\frac{eps^{a}_{c,t}}{eps^{a}_{c,t-1}}\right)$$

where $eps^{a}_{c,t}$ is the actual EPS for country *c* at time *t* and $eps^{a}_{c,t-1}$ is the corresponding actual EPS one week prior.

Box 2. The MSCI Global Equity Indices

The MSCI Global Equity Indices are global equity benchmarks and as at end-December 2011, serve as the basis for over 500 exchanged traded funds throughout the world. The indices provide exhaustive equity market coverage for over 70 countries in the Developed, Emerging and Frontier Markets, applying a consistent index construction and maintenance methodology. This methodology allows for cross regional comparisons across all market capitalization size, sector and style segments and combinations.

The MSCI Global Equity Indices have been available since 1969. They are recalculated daily around 1830 Eastern Daylight Time (EDT). 1/ Key features of the indices used for the purposes of this analysis are that:

- MSCI All Country Indices include both Developed Markets and Emerging Markets countries across particular regions. The MSCI ACWI Index covers 45 countries (Table).

- The MSCI equity indices are adjusted for free float (as of the close of November 30, 2001). MSCI defines free float as total shares outstanding excluding shares held by strategic investors such as governments, corporations, controlling shareholders, and management, and shares subject to foreign ownership restrictions. Under MSCI's free float-adjustment methodology, a constituent's Inclusion Factor is equal to its estimated free float rounded-up to the closest 5 percent for constituents with free float equal to or exceeding 15 percent (e.g., a constituent security with a free float of 23.2 percent will be included in the index at 25 percent of its total market capitalization).

- MSCI maintains certain Developed Market indices with the suffix "Free. The continued use of the "Free" suffix serves to indicate that these indices have somewhat different histories than their counterpart indices. This is because historically the MSCI Free Indices included adjusted free float calculations to capture investment restrictions once imposed on foreign investors in some countries (Singapore, Switzerland, Sweden, Norway and Finland). Today the MSCI Free Indices have the same constituents and performance as those without the "Free" suffix.

- The coverage in the MSCI Standard Index series is approximately 85 percent of free float-adjusted market capitalization, within each industry group within each country (up from 60 percent of total market capitalization to as of the close of May 31, 2002).

Box Table 1. World and Regional Stock Markets: Representative MSCI Indices and Constituents 2/

World		Region		
		Americas	Asia-Pacific	Europe
MSCI All World Free		MSCI AC Americas	MSCI AC Asia-Pacific	MSCI AC Europe
Australia	Korea	Brazil	Australia	Austria
Austria	Malaysia	Canada	China	Belgium
Belgium	Mexico	Chile	Hong Kong	Czech Republic
Brazil	Morocco	Colombia	India	Denmark
Canada	Netherlands	Mexico	Indonesia	Finland
Chile	New Zealand	Peru	Japan	France
China	Norway	United States	Korea	Germany
Colombia	Peru		Malaysia	Greece
Czech Republic	Philippines		New Zealand	Hungary
Denmark	Poland		Philippines	Ireland
Egypt	Portugal		Singapore	Italy
Finland	Russia		Taiwan	Netherlands
France	Singapore		Thailand	Norway
Germany	South Africa			Poland
Greece	Spain			Portugal
Hong Kong	Sweden			Russia
Hungary	Switzerland			Spain
India	Taiwan			Sweden
Indonesia	Thailand			Switzerland
Ireland	Turkey			Turkey
Israel	United Kingdom			United Kingdom
Italy	United States			
Japan				

Source: MSCI (http://www.msci.com/products/indices/).
1/ EDT is four hours behind Greenwich Mean Time (Coordinated Universal Time) and is observed during daylight saving time for eight months each year in the Eastern Time Zone, i.e., Eastern Standard Time (EST), of North America. It begins on the second Sunday in March, when clocks are advanced from 2:00 a.m. EST to 3:00 a.m. EDT, and ends on the first Sunday in November, when clocks are moved back from 2:00 a.m. EDT to 1:00 a.m. EST.
2/ The representative indices cover approximately 85 percent of free-float adjusted market capitalization.

Appendix Table 4. Preliminary Regression Results: Stock Market Returns, Systematic and Local Factors, July 2005 – November 2012

	Adjusted R2	Standard of Regression	Sum of Squared	Constant		Return on World Portfolio ($r_{WC,t}$)		Return on Regional Portfolio ($r_{RC,t}$)		Change in Structure of Yield Curve ($y_{C,t}$)		Change in Forecast EPS ($e^{f}_{C,t}$)		Change in Actual EPS ($e^{a}_{C,t}$)	
				Coefficient	Level of	Coefficient	Level of	Coefficient	Level of Significance	Coefficient	Level of Significance	Coefficient	Level of	Coefficient	Level of
Jul 2005 - Dec 2007															
G-7															
Canada	0.582	0.011	0.016	0.001	0.399	0.037	0.717	0.785	0.000	0.000	0.414	-0.053	0.472	0.002	0.982
France	0.884	0.007	0.006	0.000	0.908	-0.059	0.531	1.099	0.000	-0.001	0.278	-0.028	0.769	0.033	0.477
Germany	0.838	0.009	0.009	0.002	0.012	-0.194	0.098	1.202	0.000	0.000	0.093	-0.146	0.257	0.025	0.527
Italy	0.795	0.008	0.008	0.000	0.543	0.212	0.051	0.675	0.000	0.000	0.972	0.073	0.653	0.010	0.759
Japan	0.851	0.010	0.011	-0.001	0.258	-0.196	0.010	1.000	0.000	0.018	0.375	0.044	0.804	0.019	0.645
United Kingdom	0.891	0.006	0.004	-0.001	0.149	-0.019	0.808	0.924	0.000	0.000	0.698	0.001	0.990	-0.008	0.603
United States	0.990	0.002	0.000	0.000	0.318	-0.204	0.000	1.158	0.000	-0.002	0.294	-0.030	0.015	0.022	0.278
Mean	*0.833*	*0.007*	*0.008*												
Asia-Pacific ex-Japan															
Australia	0.501	0.012	0.019	0.002	0.147	-0.143	0.151	0.757	0.000	0.001	0.117	-0.063	0.732	-0.097	0.161
China Shanghai A	0.095	0.033	0.140	0.014	0.000	-0.245	0.416	0.580	0.011	0.072	0.152	-0.631	0.109	0.089	0.275
China Shenzhen A	0.059	0.038	0.183	0.016	0.000	-0.514	0.135	0.633	0.015	0.089	0.120	-0.824	0.067	0.028	0.617
China Shanghai B	0.009	0.056	0.387	0.015	0.012	-0.189	0.705	0.541	0.151	0.050	0.671	-0.676	0.296	-0.082	0.521
China Shenzhen B	0.099	0.041	0.214	0.010	0.027	-0.439	0.242	0.912	0.001	0.065	0.458	-0.366	0.451	-0.014	0.850
Hong Kong SAR	0.555	0.017	0.036	0.002	0.150	0.280	0.070	0.667	0.000	-0.001	0.793	-0.108	0.122	-0.017	0.815
India	0.237	0.027	0.088	0.004	0.084	0.613	0.014	0.316	0.079	0.006	0.480	0.253	0.283	0.036	0.674
Indonesia	0.186	0.029	0.105	0.004	0.196	-0.414	0.131	0.892	0.000	-0.001	0.722	0.386	0.328	0.026	0.653
Korea	0.602	0.018	0.041	0.002	0.316	0.089	0.572	1.040	0.000	0.006	0.205	-0.066	0.760	0.182	0.168
Malaysia	0.345	0.015	0.029	0.002	0.183	0.179	0.201	0.388	0.000	-0.003	0.272	0.140	0.460	0.110	0.003
Philippines	0.345	0.024	0.072	0.005	0.036	0.046	0.832	0.791	0.000	-0.013	0.369	-0.326	0.198	-0.008	0.891
Singapore	0.593	0.014	0.024	0.000	0.725	0.425	0.001	0.542	0.000	0.000	0.766	0.213	0.326	0.040	0.554
Thailand	0.207	0.023	0.067	0.001	0.634	-0.304	0.111	0.713	0.000	-0.001	0.595	-0.483	0.130	0.010	0.869
Mean	*0.295*	*0.027*	*0.108*												
Jan 2008 - Nov 2012															
G-7															
Canada	0.773	0.015	0.058	0.000	0.896	0.278	0.001	0.626	0.000	0.004	0.628	-0.102	0.014	-0.075	0.068
France	0.916	0.011	0.033	-0.001	0.404	-0.200	0.004	1.205	0.000	0.001	0.556	-0.042	0.535	-0.037	0.161
Germany	0.875	0.014	0.049	0.001	0.390	0.005	0.951	1.023	0.000	0.000	0.792	-0.121	0.006	0.003	0.735
Italy	0.801	0.020	0.099	-0.002	0.118	-0.458	0.000	1.465	0.000	0.000	0.995	-0.070	0.478	-0.014	0.356
Japan	0.880	0.013	0.039	0.000	0.951	-0.116	0.018	0.998	0.000	0.021	0.227	-0.058	0.087	-0.002	0.748
United Kingdom	0.893	0.011	0.029	0.000	0.636	0.062	0.330	0.840	0.000	0.000	0.725	0.045	0.422	-0.006	0.317
United States	0.993	0.003	0.002	0.000	0.679	-0.223	0.000	1.179	0.000	-0.001	0.127	0.015	0.062	-0.005	0.495
Mean	*0.876*	*0.012*	*0.044*												
Asia-Pacific ex-Japan															
Australia	0.513	0.021	0.106	0.001	0.581	0.787	0.000	0.364	0.000	-0.009	0.003	-0.167	0.095	-0.005	0.778
China Shanghai A	0.201	0.035	0.297	-0.004	0.090	-0.610	0.000	1.040	0.000	0.039	0.017	0.281	0.174	0.019	0.826
China Shenzhen A	0.149	0.042	0.448	-0.002	0.382	-0.743	0.000	1.129	0.000	0.053	0.008	0.202	0.423	0.005	0.917
China Shanghai B	0.150	0.043	0.458	-0.002	0.473	-0.704	0.000	1.153	0.000	-0.016	0.777	0.156	0.547	-0.024	0.689
China Shenzhen B	0.255	0.035	0.302	0.000	0.948	-0.608	0.000	1.164	0.000	0.039	0.393	0.294	0.160	0.003	0.927
Hong Kong SAR	0.794	0.017	0.075	0.000	0.994	0.024	0.719	1.061	0.000	-0.004	0.733	0.203	0.014	-0.012	0.670
India	0.385	0.030	0.221	-0.001	0.607	0.242	0.039	0.626	0.000	0.001	0.182	0.385	0.018	-0.111	0.110
Indonesia	0.263	0.031	0.245	0.002	0.230	0.071	0.565	0.616	0.000	-0.004	0.638	0.125	0.386	-0.048	0.127
Korea	0.288	0.030	0.223	0.000	0.934	0.173	0.139	0.743	0.000	-0.005	0.246	0.193	0.162	-0.004	0.889
Malaysia	0.391	0.015	0.058	0.001	0.421	-0.107	0.074	0.522	0.000	0.004	0.669	0.393	0.001	-0.070	0.065
Philippines	0.401	0.025	0.157	0.003	0.091	0.038	0.699	0.658	0.000	-0.039	0.006	0.259	0.189	-0.121	0.031
Singapore	0.699	0.018	0.077	0.001	0.237	0.177	0.013	0.834	0.000	0.002	0.900	0.241	0.050	-0.009	0.693
Thailand	0.441	0.025	0.156	0.002	0.228	0.075	0.441	0.669	0.000	0.001	0.765	0.416	0.000	-0.032	0.244
Mean	*0.379*	*0.028*	*0.217*												

Sources: Bloomberg; I/B/E/S via Datastream; and authors' calculations.

Appendix Table 5. Preliminary Regression Results: Stock Market Returns, Systematic and Local Factors, March 1998 – November 2012

	Adjusted R2	Standard of	Sum of Residuals	Constant		Return on World Portfolio ($r_{WC,t}$)		Return on Regional Portfolio ($r_{RC,t}$)		Change in Structure of Yield Curve ($y_{C,t}$)		Change in Forecast EPS ($e^{f}_{C,t}$)		Change in Actual EPS ($e^{a}_{C,t}$)	
				Coefficient	Level of	Coefficient	Level of	Coefficient	Level of Significance	Coefficient	Level of Significance	Coefficient	Level of	Coefficient	Level of
Mar 1998 - Dec 2000															
G-7															
Canada	0.546	0.021	0.064	-0.001	0.519	0.011	0.953	0.836	0.000	0.000	0.634	0.397	0.051	-0.006	0.881
Germany	0.780	0.016	0.037	0.000	0.961	-0.299	0.009	1.448	0.000	-0.003	0.510	-0.094	0.587	-0.052	0.193
United Kingdom	0.721	0.013	0.023	-0.001	0.420	0.097	0.291	0.702	0.000	0.000	0.643	0.433	0.157	-0.057	0.125
United States	0.994	0.002	0.001	0.000	0.430	-0.039	0.068	1.021	0.000	0.000	0.919	0.004	0.902	0.003	0.904
Mean	0.760	0.013	0.031												
Asia-Pacific ex-Japan															
Australia	0.318	0.015	0.032	0.001	0.542	0.277	0.000	0.091	0.072	-0.001	0.399	-0.642	0.035	0.077	0.000
Hong Kong SAR	0.386	0.035	0.166	0.001	0.815	0.712	0.000	0.506	0.000	-0.001	0.740	-0.169	0.611	-0.018	0.610
Mean	0.352	0.025	0.099												
Jan 2001 - Jun 2005															
G-7															
Canada	0.608	0.012	0.033	0.001	0.215	0.205	0.010	0.464	0.000	-0.004	0.335	-0.057	0.468	-0.004	0.828
Germany	0.847	0.014	0.047	0.000	0.994	0.159	0.102	1.137	0.000	-0.001	0.935	-0.001	0.992	0.005	0.074
United Kingdom	0.895	0.007	0.012	0.000	0.848	0.027	0.593	0.806	0.000	0.000	0.785	-0.011	0.747	-0.003	0.664
United States	0.997	0.001	0.000	0.000	0.215	-0.070	0.000	1.075	0.000	0.000	0.587	0.030	0.045	-0.008	0.259
Mean	0.837	0.009	0.023												
Asia-Pacific ex-Japan															
Australia	0.239	0.013	0.038	0.001	0.159	0.216	0.000	0.155	0.001	0.002	0.226	0.098	0.753	0.005	0.580
Hong Kong SAR	0.479	0.020	0.094	-0.001	0.552	0.543	0.000	0.404	0.000	0.029	0.159	0.329	0.150	-0.007	0.182
Mean	0.359	0.017	0.066												
Jul 2005 - Dec 2007															
G-7															
Canada	0.582	0.011	0.016	0.001	0.399	0.037	0.717	0.785	0.000	0.000	0.414	-0.053	0.472	0.002	0.982
Germany	0.838	0.009	0.009	0.002	0.012	-0.194	0.098	1.202	0.000	0.000	0.093	-0.146	0.257	0.025	0.527
United Kingdom	0.891	0.006	0.004	-0.001	0.149	-0.019	0.808	0.924	0.000	0.000	0.698	0.001	0.990	-0.008	0.603
United States	0.990	0.002	0.000	0.000	0.318	-0.204	0.000	1.158	0.000	-0.002	0.294	-0.030	0.015	0.022	0.278
Mean	0.825	0.007	0.007												
Asia-Pacific ex-Japan															
Australia	0.501	0.012	0.019	0.002	0.147	-0.143	0.151	0.757	0.000	0.001	0.117	-0.063	0.732	-0.097	0.161
Hong Kong SAR	0.555	0.017	0.036	0.002	0.150	0.280	0.070	0.667	0.000	-0.001	0.793	-0.108	0.122	-0.017	0.815
Mean	0.528	0.015	0.028												
Jan 2008 - Nov 2012															
G-7															
Canada	0.773	0.015	0.058	0.000	0.896	0.278	0.001	0.626	0.000	0.004	0.628	-0.102	0.014	-0.075	0.068
Germany	0.875	0.014	0.049	0.001	0.390	0.005	0.951	1.023	0.000	0.000	0.792	-0.121	0.006	0.003	0.735
United Kingdom	0.893	0.011	0.029	0.000	0.636	0.062	0.330	0.840	0.000	0.000	0.725	0.045	0.422	-0.006	0.317
United States	0.993	0.003	0.002	0.000	0.679	-0.223	0.000	1.179	0.000	-0.001	0.127	0.015	0.062	-0.005	0.495
Mean	0.883	0.011	0.035												
Asia-Pacific ex-Japan															
Australia	0.513	0.021	0.106	0.001	0.581	0.787	0.000	0.364	0.000	-0.009	0.003	-0.167	0.095	-0.005	0.778
Hong Kong SAR	0.794	0.017	0.075	0.000	0.994	0.024	0.719	1.061	0.000	-0.004	0.733	0.203	0.014	-0.012	0.670
Mean	0.653	0.019	0.090												

Sources: Bloomberg; I/B/E/S via Datastream; and authors' calculations.

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