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Financial integration, financial turmoil and risk premia in emerging markets

Salem Boubakri* Cécile Couharde† Hélène Raymond ‡

Abstract: The aim of this article is to study the dynamics of financial integration and of the risk premia in emerging markets. Accordingly, we estimate a variant of the International Asset Pricing Model (IAPM) developed by Errunza and Losq (1985) and Carrieri *et al.* (2007), allowing for time-varying stock market integration, in which we include the foreign currency risk. Our sample consists of monthly data for 12 emerging stock markets over the period 1988−2012. We find that the evolution of financial integration is broadly consistent with the *de jure* measure of capital openness, but much less sticky. Moreover, while the financial integration of emerging stock markets displays an upward trend, it has also registered short-term reversals episodes during crises. The upward trend in financial integration does not reduce the local market risk premium component as much as could be expected, as regional crises strengthen the idiosyncratic character of the risk premium. Finally, the recent global crisis has induced a reassessment of the world market risk premium for all emerging countries, highlighting the global nature of the crisis.

JEL Classification: C32, F31, G12

Keywords: *De facto* financial integration, emerging markets, IAPM, risk premium

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1. Introduction

Following the financial liberalization of the 1980s and 1990s, capital flows restrictions have been largely dismantled worldwide (Bekaert *et al.*, 2011), leading to an increased integration of stock markets. However, some capital controls are still effective and several articles provide evidence of partial segmentation of both developed and emerging stock markets. According to Karolyi and Stulz (2003), in the context of partial segmentation or imperfect financial integration, equity flows that take place either in or out of a country are limited because of explicit constraints or because of barriers to international investment. Recently, Karolyi and Wu (2014) have showed that the liberalization of financial markets around the world has increased market accessibility for global investors, but many regulatory restrictions constitute indirect barriers to investing in oversea markets.

An extensive literature based on an empirical asset pricing approach[1] investigates the impact of such barriers to international investment.[2] Work in this area can be classified in two categories. The first one examines the impact of those barriers on expected returns, on the risk premium and on the degree of financial integration. The second one tests the impact of removing barriers to international investment on the development and integration of local markets (see table 1 in the Appendix for a detailed survey).[3]

Among the first strand of literature, Carrieri *et al.* (2007) analyse the determinants of market integration in emerging stock markets through an empirical variant of the theoretical model of international asset pricing (IAPM) developed by Errunza and Losq (1985). Using monthly data from January 1977 to December 2000 for eight emerging markets (Argentina, Brazil, Chile, India, Korea, Mexico, Taiwan and Thailand), they show that none of the countries examined appears to be completely segmented and that both financial development and market liberalization have a positive impact on financial inte-

1. See for example, Black, 1974; Stulz, 1981; Errunza and Losq 1985, 1989; Eun and Janakiramanan,1986; Rogoff, 1996; Cooper and Kaplanis, 2000; De Jong and De Roon, 2005; Chaieb and Errunza, 2007. All of these studies provide an excellent survey on the main properties of the theoretical asset pricing model.

2. See Stulz (1981) for a general model of barriers to international investment.

3. See Karolyi and Stulz (2003) for a survey on the literature on testing international asset pricing models.

gration. Their study is of special interest, as they develop a new empirical approach to investigate the time-varying integration of stock markets. In particular, the measure they derive from their model has the advantage to be less variable and easier to interpret than the one proposed by Bekaert and Harvey (1995), which is allowed to only vary between two extreme regimes: perfect integration and strict segmentation.[4]

However, in their article, Carrieri *et al.* (2007) take into account only two sources of risk, related to local and global financial markets. But, given the size of deviations to Purchasing Power Parity (PPP), especially in emerging countries markets, the currency risk may also play an important part in the total risk premium of their stock markets. Some empirical studies have therefore taken into account the currency risk − such as Jorion (1991), Dumas and Solnik (1995), Bailey and Chung (1995), De Santis and Gerard (1998) and Hardouvelis *et al.* (2006) − and evidence its importance in the assessment of the total risk premium. In the context of deviations to PPP, the total risk premium on emerging stock markets must therefore include three components: a first one related to the global market risk, a second one related to the compensation for risk due to local market characteristics, and a third one deriving from unanticipated fluctuations in exchange rates.

In this article, we extend the approach of Carrieri *et al.* (2007) by combining the influences of global and local stock markets with a foreign exchange risk in the evaluation of risk premia. Besides allowing for a currency risk premium component in the total risk premium of emerging stock markets, our study includes three other contributions. Firstly, we jointly analyze the measure of capital account openness provided by the Chinn-Ito index (Chinn and Ito, 2008) and the opening process of equity markets, together with changes in the degree of financial integration derived from the estimation of our model of international asset pricing. Indeed, according to the general perception, countries should have become increasingly integrated through the progress of financial liberalization. But this progress may not be continuous, as emerging countries have also been hit by local or global crises. Those shocks may bring some temporary halts to or ac-

4. Bekaert *et al.* (2011) develop an alternative measure of financial segmentation based on industry-level earnings yield differentials relative to world levels. It is not focussed on emerging countries and measures jointly financial and economic integration. As it seeks to be model free it does not provide information on the different components of the risk premium.

celerations in the process of financial integration. Secondly, we check if developments in emerging markets over recent decades have induced changes in the importance and the dynamics of each component of the total risk premium, by distinguishing their various subcomponents. Finally, by using recent data, we are able to analyze and compare the behavior of these various risk premium components and of the financial integration process during the crises that have occurred during the 90's on emerging markets and during the recent global crisis.

Our results show firstly that the degree of financial integration is characterized by an upward trend in a number of emerging countries. This upward trend may be related to the *de jure* liberalization trend, as well as to the cross listing of emerging countries stocks (through ADRs in the US) and the increasing availability of country funds. Secondly, financial crises tend to disrupt the progress in financial integration, a result that is consistent with the finding of Bekaert *et al.* (2011) for developed markets. This appears to be especially true for Argentina, for which the recovery from its 1999-2002 crisis has been difficult. It is also true for the Asian crisis and for the last global crisis. Finally, we also report evidence that financial crises are characterized by shifts in the determinants of the total risk premium. Indeed, while the idiosyncratic character of the risk premium may become important in the wake of regional crises, it has been outweighed by its world component during the recent global crisis.

The rest of the paper is organized as follows. Section 2 presents the model and the estimation method. Section 3 describes the data and the summary statistics. Section 4 examines the evolution of financial integration on emerging stocks markets along with their respective process of capital account openness. Section 5 provides results from country-by-country regressions, discusses the evolution of the various components of the total risk premium and contains further analyses such as robustness checks. Section 6 concludes.

2. The empirical model

Our empirical asset pricing model relies on the theoretical framework developed by Errunza and Losq (1985). The main interest of this model is that it allows for time−varying financial integration: financial markets are allowed to switch smoothly and reversibly from being fully segmented to being fully integrated. A time−varying measure of *de facto* financial integration can be calculated, based on this asset-pricing model that links the expected equity returns to local and global risk factors and the prices of risks.

However, given the deviations of real exchange rates to purchasing power parity (PPP), especially in the case of emerging markets, it is reasonable to assume that any investment in a foreign asset can be driven not only by the performance of the foreign asset, but also by the performance of the domestic currency relative to the foreign currency. The foreign currency risk associated with an international investment is then an important element in the overall portfolio risk in emerging markets and, as shown by Carrieri *et al.* (2006), this risk must be priced separately from other specific risks. Therefore the model we rely on, while being close to the one used by Carrieri *et al.* (2007), is more general, as it includes the currency risk component in addition to the global and local market risks.

In order to derive the time−varying series of *de facto* financial integration and of the different risk premia, we estimate a conditional version of the model − where predetermined information is allowed to affect the expected returns, covariances, variances, and the integration measure − by using econometric procedures similar to those applied by Errunza *et al.* (1999) and Carrieri *et al.* (2007).

The expected mean excess return on the country i's market index in period t is linked to the three risk factors mentioned above and to their respective prices, according to the following specification:

$$E_{t-1}(R_{i,t}) = \lambda^m_{t-1} cov_{t-1}(R_{i,t}, R_{m,t}) + \lambda^s_{t-1} cov_{t-1}(R_{i,t}, R_{s,t}) + \lambda^i_{t-1} var_{t-1}(R_{i,t}/R_{e,t}) \quad (1)$$

Where $E_{t-1}(R_{i,t})$ is the expected excess return on the local stock market index of country i, given information up to time $t-1$; $R_{m,t}$ is the excess return on the world stock market index; $R_{s,t}$ is the currency return; $R_{e,t}$ is the vector of returns on "eligible" securities, which can be bought by global as well as by local investors, and includes securities such as stocks of country i cross listed on foreign markets, country funds allowing to invest indirectly in country i, industry indices, etc; λ^m_{t-1} is the price of world market risk and is common across all assets; λ^i_{t-1} and λ^s_{t-1} denote respectively the time-varying prices of domestic risk and of currency risk; cov_{t-1} is the conditional covariance operator and var_{t-1} is the conditional variance operator.

In equation (1), when the financial integration of country i is perfect, the local risk premium vanishes: $var\,(R_i/R_e) = 0$, i.e. the local return index is perfectly correlated with some combination of eligible securities returns. In the opposite case of total segmentation, the local stock return is uncorrelated with the world stock return and the global risk premium component vanishes, whereas the local risk premium is strictly positive, with $var\,(R_i/R_e) = var\,(R_i) > 0$. In practice, most emerging stock markets are characterized by an intermediate degree of financial integration between these two polar cases. Even the most stringent capital controls in country i do not preclude some correlation between its local stocks and internationally eligible assets. Industry effects, as well as the cross listing of local stocks and the existence of country funds amongst eligible assets allow international investors to invest in portfolios of eligible assets that are correlated with the return index of country i.

Errunza and Losq (1985) show that the local risk factor of country i can be rewritten as:

$$var_{t-1}\,(R_{i,t}/R_{e,t}) = var_{t-1}\,(R_{i,t})\left(1-\rho^2_{i,DIV,t}\right) \tag{2}$$

Where $\rho_{i,DIV}$ is the correlation coefficient between the return of the diversification portfolio (R_{DIV}) and the emerging market index return (R_i).

The diversification portfolio is defined by the combination of eligible securities which ensures that its return is the most correlated with the return of the local portfolio (R_i).

The return on this diversification portfolio can then be defined as:

$$R_{DIV,t} = A' R_{e,t}$$

Where A' is the vector of weights of eligible securities that maximizes the correlation between $R_{i,t}$ and $R_{DIV,t}$.

The higher the correlation between R_{DIV} and R_i, the more investing in the diversification portfolio enables international investors to gain exposure to the local stock market of country i. When the correlation between R_{DIV} and R_i is equal to one, the financial integration of the emerging market i is considered as perfect. On the opposite, when the correlation is zero, segmentation is total. In most cases financial integration is imperfect, but not nil; therefore the variations in the local stock return R_i are neither independent from R_{DIV}, nor entirely explained by R_{DIV}.

Taking into account that $var_{t-1}\left(R_{i,t}/R_{e,t}\right) = var_{t-1}\left(R_{i,t}\right)\left(1-\rho^2_{i,DIV,t}\right)$, model (1) can be rewritten for estimation, for each country i as follows:

$$R_{i,t} = \lambda^m_{t-1} h_{i,m,t} + \lambda^s_{t-1} h_{i,s,t} + \lambda^i_{t-1} h_{i,t}\left(1 - \frac{h^2_{i,DIV,t}}{h_{i,t} h_{DIV,t}}\right) + \epsilon_{i,t} \tag{3a}$$

$$R_{m,t} = \lambda^m_{t-1} h_{m,t} + \epsilon_{m,t} \tag{3b}$$

$$R_{DIV,t} = \lambda^m_{t-1} h_{DIV,m,t} + \epsilon_{DIV,t} \tag{3c}$$

$$R_{s,t} = \lambda^m_{t-1} h_{m,s,t} + \lambda^s_{t-1} h_{s,t} + \epsilon_{s,t} \tag{3d}$$

Where $h_{i,j,t}$ is the conditional covariance between assets i and j (with $j = m, s, DIV$), i.e. it denotes the non-diagonal elements of the 4×4 variance-covariance matrix H_t of the assets in the system; $h_{i,t}$ is the conditional variance of the country's market index; $h_{DIV,t}$ is the conditional variance of the country's diversification portfolio and $h_{m,t}$ is the conditional variance of the world market index. $var_t\left(R_{i,t}/R_{e,t}\right)$ is here expressed as $var_t\left(R_{i,t}\right)\left(1-\rho^2_{i,DIV,t}\right) = h_{i,t}\left(1-\left(h^2_{i,DIV,t}/h_{i,t}h_{DIV,t}\right)\right)$. The vector of error terms is assumed to be distributed as $\epsilon_t = \left(\epsilon_{i,t}, \epsilon_{m,t}, \epsilon_{s,t}, \epsilon_{DIV,t}/X_{t-1}\right) \sim N\left(0, H_t\right)$.

The matrix H_t is modelled as a multivariate GARCH process, assuming a conditional Gaussian distribution. The use of a GARCH approach is usually considered as an appropriate solution for modelling the conditional variances and covariances for stock market series.[5] But the number of parameters to be estimated in matrix H_t is high and increases rapidly with the number of variables. Several constrained specifications have therefore been proposed to estimate the variance-covariance matrix H_t, the two most popular being the CCC (Constant Conditional Correlation) model proposed by Bollerslev (1990) and the BEKK (Baba-Engle-Kraft-Kroner) approach defined in Engle and Kroner (1995). However, these approaches assume a constant correlation between assets which does not appear to hold in practice. The DCC (Dynamic Conditional Correlation) approach, proposed by Engle (2002) and Tse and Tsui (2002), allows to model in a more realistic way both the variances and conditional correlations of several series. Besides, Cappiello *et al.* (2006) have incorporated a mechanism of asymmetry in the DCC model. This amended model allows both for fluctuations in the conditional correlations and covariances and for the conditional correlations to react differently according to the sign of shocks.[6] We therefore opt for an DCC−GARCH to estimate the conditional variance-covariance matrix H_t.

The previous system, formed by equations (3a) to (3d), incorporates the prices of risks related to the world market (λ^m_{t-1}), to the exchange rate (λ^s_{t-1}) and to the local market (λ^i_{t-1}). As the prices of those different risks change through time, their dynamics remains to be specified. Following the literature (Bekaert and Harvey, 1995; Hardouvelis *et al.*, 2006, among others), we express those prices as a function of a set of information variables:

$$\lambda^m_{t-1} = exp\left(\delta'_m X_{t-1}\right) \tag{4a}$$

$$\lambda^i_{t-1} = exp\left(\gamma'_i Z^i_{t-1}\right) \tag{4b}$$

$$\lambda^s_{t-1} = \left(\delta'_s X_{t-1}\right) \tag{4c}$$

5. The GARCH model allows components of the variance-covariance matrix to vary over time depending on products of shocks ϵ_t observed in the past values of H_t. It is thus suited to study the risks of a portfolio and to capture the dynamic relationships between various financial assets.

6. Engle (2002) provides a detailed presentation of this approach.

Where X_{t-1} denotes all the information on global variables available at time $t-1$ and δ'_m represents the weights associated with these variables in equation (4a); Z^i_{t-1} is the vector of local information variables observable on the market i and γ'_i represents the weights associated with these variables. In contrast to the prices of country specific and world market risks, the price of currency risk can theoretically take positive or negative values; therefore it is assumed to vary as a linear function of X_{t-1}, with δ'_s the weights associated with these instrumental variables.

The parameters are estimated by quasi-maximum likelihood (QML) in order to avoid the problems due to the non normality in excess returns. Given the specificities of our model (a large number of parameters, nonlinear properties...) and a common price of world market risk, we follow the literature (Hardouvelis *et al.*, 2006 and Carrieri *et al.*, 2007 among others) and estimate the model in two steps. In the first stage we estimate the world market return from equation (3b). This step allows us to obtain the estimated value for the price of world market risk (λ^m_{t-1}). In the second stage, equations (3a), (3c) and (3d) are estimated country−by−country, conditioning on the estimates of the price of world market risk (λ^m_{t-1}) from the first stage. This second step allows us to retrieve the price of the local risk (λ^i_{t-1}), the price of the currency premium (λ^s_{t-1}), the total risk premium and its three components for each country i.

3. Data and summary statistics

Our study focuses on twelve emerging countries that belong to the Asian region and Latin America: China, Hong-Kong, India, Indonesia, Korea, Malaysia, Singapore, Thailand, Argentina, Brazil, Chile and Mexico. The choice of these twelve countries is motivated by two considerations. On the one hand, they are among the most important emerging economies.[7] On the other hand, they have undergone some financial liberalization and, therefore, have relatively developed equity markets. As our analysis focuses on equity markets we report in table 1 the official dates of the opening of the Equity

7. The Economist still classifies Hong Kong and Singapore as Emerging Economies, whereas the IMF considers that they are Advanced Economies.

market for each country. These dates are based on Bekaert *et al.* (2003) and Phylaktis and Ravazzolo (2002). For China, such information is not available and numerous restrictions on the transactions of foreign and domestic investors remain, despite some gradual moves toward financial liberalization. In particular, one important move was the launch of the Qualified Foreign Institutional Investor (QFII) program in December 2002 − further enlarged in 2011 and 2012 − that allows foreign investors to buy and sell yuan-denominated shares in China's mainland stock exchanges. According to the 2008 IMF classification and the *de facto* classification of Reinhart and Rogoff (2004), the twelve countries under study are distinguished by a variety of exchange rate regimes, ranging (column 2 and 3, table 1) from a currency board (Hong-Kong) to nearly floating exchange rates (Brazil).

Our dataset includes three groups of data: (i) data on domestic and on the world market

Table 1. *Exchange rate regimes and liberalization of equity markets*

Country	**IMF classification 2008.04**	**De facto ER regime 2008/2010**	**Equity Market Opening**
China	Crawling Peg (US$)	Peg to US$	NA
Hong Kong	Currency Board	Currency Board	January 1973
India	Managed floating	Crawling band (US$)	November 1992
Indonesia	Managed floating	Crawling band (US$)	September 1989
Korea	Floating	Managed floating	January 1992
Malaysia	Managed floating	Band around US$	December 1988
Singapore	Managed floating	Moving band (US$)	June 1978
Thailand	Managed floating	Moving band (US$)	September 1987
Argentina	Peg to US$	Crawling band (US$)	November 1989
Brazil	Floating	Managed floating	May 1991
Chile	Floating	Band around US$	January 1992
Mexico	Floating	Managed floating	May 1989

Note: De facto exchange rate regime data series are based on the classification developed by Reinhart and Rogoff (2004), and updated by Reinhart et al. (2011). The classification is constant over 2008-2010, except for Argentina, which switched from a crawling band to a de facto crawling peg to the U.S. dollar in 2009.

index returns, (ii) data on bilateral real exchange rates expressed *vis-à-vis* the U.S. dollar, (iii) data on macroeconomic and financial variables, likely to explain the various prices of risks and used to construct the diversification portfolio (see section 2). The data are

monthly and cover the period from February 1988 to December 2012, except for China (December 1993 to November 2008) and India (February 1988 to July 2008).

For domestic monthly returns, we use the Emerging Markets Global indices (EMG) extracted from Morgan Stanley Capital International (MSCI), except for China and India. For the latter two countries, monthly returns are computed from the total return on IFCG indices, obtained from the Standard and Poors (S&P)/IFC database.[8] The world market portfolio is proxied by the MSCI value-weighted world index from Morgan Stanley Capital International. Stock market returns are defined as $R_{i,t} = ln\left(P_{i,t}/P_{i,t-1}\right)$ where $P_{i,t}$ is the stock market index at time t. The monthly excess return of each index is calculated using the one−month Eurodollar rate as a proxy of the risk free rate. The currency risk is approximated through change in the currencies' real exchange rate *vis-à-vis* the U.S. dollar.[9] The series of real exchange rates are extracted from the International Financial Statistics (IFS) of the International Monetary Fund and Financial Statistics of the Federal Reserve Board. Unit root tests show that all series of excess stock returns and variations in real exchange rates are stationary.[10]

Information variables are used in order to estimate the prices of the different risk factors. Following Bekaert and Harvey (1995) and Hardouvelis *et al.* (2006) among others, the price of the global market risk and the price of risk associated with unexpected fluctuations of real exchange rates are explained by the following factors: the first lag of the global market dividend yield in excess of the 1−month Eurodollar deposit rate, the first lag of the change in the term spread, the first lag of the default spread and the first lag of return on a 1−month U.S treasury certificate. All these information variables are taken from Datastream. Regarding the price of risk of local market for each emerging market,

8. As explained by Bekaert *et al.* (1998), two main sources of emerging market benchmarks exist: the International Finance Corporation Global (IFC) and the Morgan Stanley Capital International (MSCI). If we retain the Global indices of each source (IFCG) and (EMG), we find little difference in their behavior. The correlation between the two indices is greater than 0.91 for all countries under study except for China and India (0.41−0.45). The MSCI source presents the longest series (for IFC, data are not available after 2008), therefore, we choose to focus on the MSCI. Only for China and India, we retain IFCG indices which provide a better study of the impact of capital market liberalization on the returns.

9. Measuring the real exchange rate risk allows to account for changes both in the inflation differential and in the nominal currency value.

10. Results are available upon request from the authors.

the following set of information variables has been selected: the first lag of excess equity returns, the local dividend yields and the first lag of the variation of real exchange rate.[11]

Following Carrieri *et al.* (2007), we estimate the return of the diversification portfolio by regressing the returns of the local portfolio on the returns of the set of eligible securities. This set of eligible securities available to international investors includes for each country i the Morgan Stanley Capital International (MSCI) world index, 34 MSCI global industry indices, a country fund (CF) for country i and American Depositary Receipts (ADRs) for stocks of country i cross listed in the US market. The composition of the industry portfolios is identical to the ones selected by Carrieri *et al.* (2007). As Errunza *et al.* (1999), for countries with multiple CFs, we select the one with the longest history. The set of ADRs varies for each of the countries in our dataset. In the case of Argentina, Brazil, Chile and Mexico, which have a large number of ADRs, we select up to five ADRs per country based on their listing date in order to preserve degrees of freedom in our regression, following Carrieri *et al.* (2007). A complete list of the set of eligible securities is reported in Table A2 in appendix. The fitted values of the local stock return (R_i) derived from its regression on the aforementioned set of eligible assets yields the return of the portfolio of eligible assets (R_{DIV}) which is most correlated with R_i.[12]

Summary statistics for U.S. dollar returns are presented in Table 2 for the period February 1988 to December 2012. The statistics reported in Panel A present the main characteristics of equities from emerging capital markets and from the global market over the period considered. They characterize distinguishing features of emerging market returns fairly clearly. Firstly, average returns are in most cases much greater for the emerging than the global markets. Only China, Indonesia and Thailand have an average return below the world average. Secondly, the volatility of emerging stock returns is also higher than the world market's one. The most volatile market is the Brazilian one, which also displays the highest mean return. Thirdly, the returns of most of the emerging markets

11. For the motivation of this selection see for example, Bekaert and Harvey, 1995; Gerard *et al.*, 2003; Hardouvelis *et al.*, 2006.

12. Regressions are based on the full sample of available monthly data on market returns. The returns of the CFs and ADRs are set to zero for the period prior to their inception.

under study are highly non-normal, as evidenced by the literature on emerging equity markets.[13] Indeed, over the period, ten of the twelve countries exhibit high levels of kurtosis. The standard test (the Bera-Jarque test) rejects the hypothesis of normality in most of the countries at the 99% level of confidence. Argentina and India are the only emerging markets to exhibit normal returns. Finally, emerging market are characterised by partially predictable returns: the returns appear to be auto-correlated and in most cases the squared series also display a high auto-correlation. The statistics reported in Panel B provide for each emerging country i the correlation coefficients between: (i) the return on the local stock index and the world return ($\rho_{i,m}$), (ii) the return on the local stock index and the return on the diversification portfolio ($\rho_{i,DIV}$), (iii) the return on the diversification portfolio and the world return ($\rho_{DIV,m}$). As expected, the world market return is correlated with the diversification portfolio and the correlation between the diversification portfolio and the local portfolio is always much higher than the correlation between the world portfolio and the local portfolio. Hence measuring financial integration by directly using correlations with the world stock market can be misleading. The example of India illustrates this point: indeed, the correlation between the world return and the return on the Indian Stock market is only 0.261 (i.e. the second lowest correlation after the one of China), but the correlation between the Indian Stock return and the return on the corresponding diversification portfolio is around 0.603, close to the levels of Argentina and Indonesia. Therefore the degree of *de facto* financial integration of the Indian Stock market is much more higher than it appears at first sight. However, these average correlations may hide significant time variations in the degree of financial integration of each of the 12 emerging stock markets under study. We therefore turn in the next section to the estimation results of the time−varying index of financial integration.

13. See for instance the analysis of Bekaert *et al.* (1998) that shows substantial deviations from normality of emerging equity returns.

Table 2. *Summary statistics for stock returns, February 1988 to December 2012*

	World	Argentina	Brazil	Chile	China	Hong Kong
Panel A: Descriptive statistics for U.S. dollar monthly returns						
Mean	0.501	0.870	1.618	1.325	0.485	0.964
Std. Dev.	4.653	11.302	12.151	7.363	8.878	7.690
Skewness	-0.479**	0.103	0.104	-0.045	0.291	0.246
Kurtosis	1.526**	0.554	0.818**	0.911**	1.423**	1.903**
B−J	40.482**	4.354	8.887*	10.459**	17.723**	48.172**
Q(12)	8.103	13.651	2.546	10.711	45.622**	22.999*
$Q^2(12)$	7.955*	15.437**	2.736	12.832**	21.572**	18.656**
Panel B: Correlation coefficients						
$\rho_{i,m}$	−	0.449	0.531	0.504	0.233	0.667
$\rho_{i,DIV}$	−	0.649	0.759	0.780	0.501	0.833
$\rho_{DIV,m}$	−	0.631	0.652	0.591	0.538	0.753

	India	Indonesia	Korea	Malaysia	Mexico	Singapore	Thailand
Panel A: Descriptive statistics for U.S. dollar monthly returns							
Mean	1.231	0.470	0.635	0.665	1.721	0.836	0.460
Std. Dev.	8.714	11.044	10.128	7.794	9.119	7.198	9.966
Skewness	0.181	-0.392**	0.294*	-0.442**	-0.423**	0.061	-0.264
Kurtosis	0.025	1.575**	1.722**	3.103**	1.371**	2.458**	1.365**
B−J	1.353	38.564**	41.220**	129.727**	32.349**	75.511**	26.692**
Q(12)	24.553*	28.927**	24.116*	49.527**	13.625	16.395	28.335**
$Q^2(12)$	26.014**	25.339**	21.036**	34.527**	13.071**	16.286**	22.518**
Panel B: Correlation coefficients							
$\rho_{i,m}$	0.261	0.471	0.618	0.510	0.598	0.737	0.537
$\rho_{i,DIV}$	0.603	0.667	0.765	0.749	0.869	0.868	0.716
$\rho_{DIV,m}$	0.420	0.633	0.776	0.652	0.651	0.821	0.629

Note: Table 2 reports descriptive monthly statistics for emerging markets and world market returns for the sample period from February 1988 to December 2012, except for China and India where the data cover the period, respectively, from December 1993 to November 2008, and from February 1988 to July 2008. The (monthly) arithmetic mean and standard deviation are in percentage. The test for the Kurtosis coefficient has been normalized to zero, B−J is the Bera−Jarque test for normality, Q(12) refers to Ljung-Box statistics for serial correlation based on 12 lags and $Q^2(12)$ are Ljung−Box statistics for squared returns. The levels of significance are 1% (**), 5% (*).

4. Financial integration of emerging stock markets

From equation (2), the following integration index may be derived and estimated (Carrieri *et al.*, 2007):

$$\Pi_{i,t} = 1 - \frac{var_t\left(R_{i,t}/R_{e,t}\right)}{var_t\left(R_{i,t}\right)} = \rho^2_{i,DIV,t} \tag{5}$$

Where $\rho_{i,DIV}$ is the correlation coefficient between the return of the diversification portfolio (R_{DIV}) and the emerging market index return (R_i).

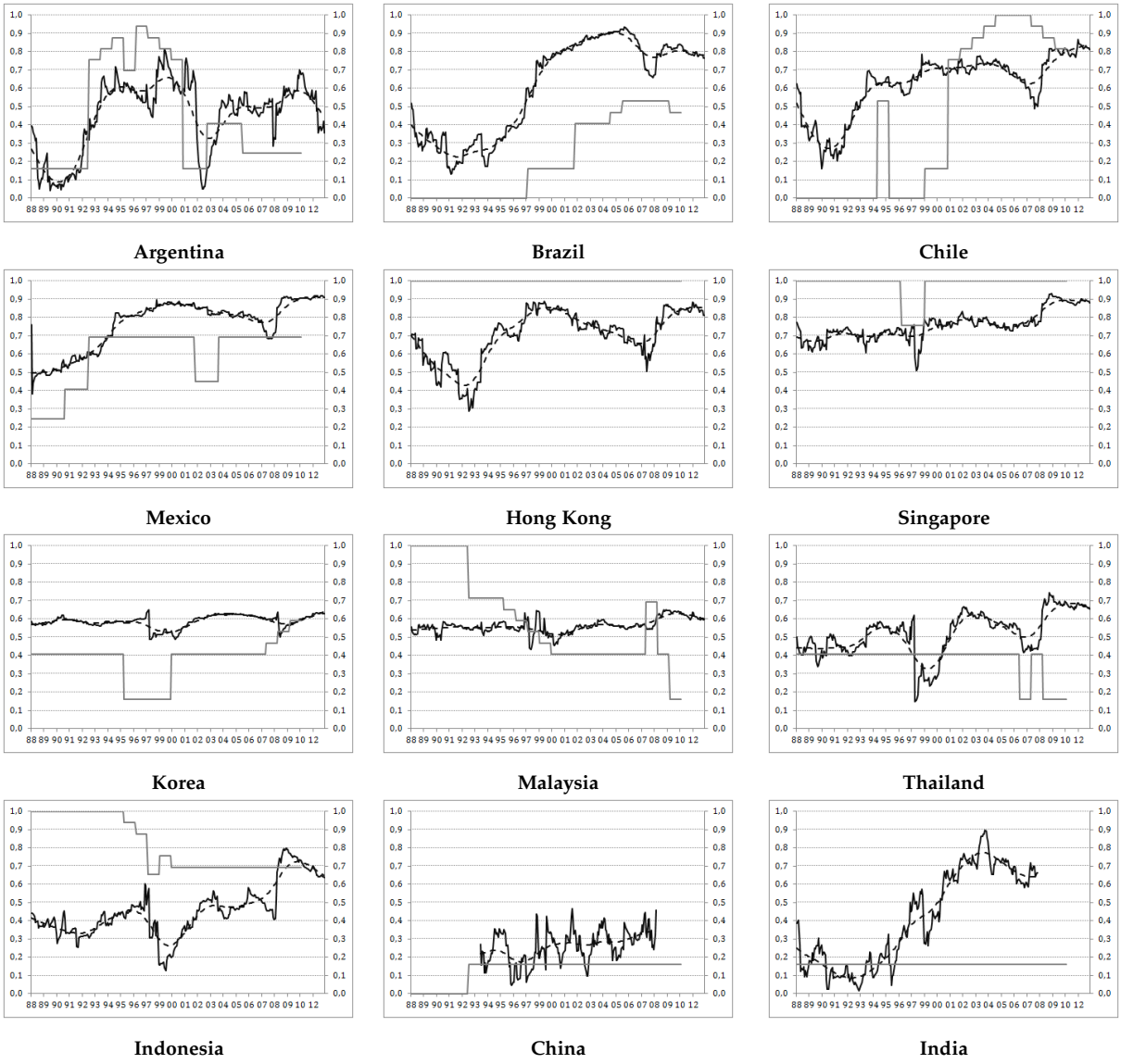
This time-varying financial integration index (Π) captures the degree to which the return on the market portfolio of ineligible securities is affected by the eligible securities in the market. By definition, this index can fluctuate between zero and one, where zero (one) indicates that the stock market i is highly segmented (fully integrated).

Figure 1 displays the evolution of this time-varying financial integration index (Π), and for the sake of comparison the Chinn−Ito index (Chinn and Ito, 2008) of capital account openness (Kaopen) for each country. For a general overview, we focus on two patterns. Firstly, we examine trends and reversals in the time-varying financial integration index. We then apply the Hodrick-Prescott filter (HP) and display the resulting filtered series on the same figures. Secondly, we compare these series with the Chinn-Ito index of capital account openness (Kaopen) to check whether the removal of capital controls explains the increase in financial integration. Indeed, the Chinn-Ito Kaopen index measures the process of financial liberalization, through the reduction or the removal of capital account restrictions.[14] However, regulatory liberalizations must be distinguished from financial integration. For example, capital account restrictions may not be binding, as investors may be able to access national markets in other ways (Bekaert and Harvey, 2002). In contrast, the index of financial integration (Π), as it takes into account substitute assets such as CFs and ADRs, reflects more the actual access of foreign (domestic) investors to local (foreign) capital markets. It thereby measures the process of *de facto* financial integration, whereas the Chinn-Ito index rather captures the progress in *de jure* financial integration.

Regarding Latin American markets, the rising trend of *de facto* and *de jure* financial integration in Brazil, Chile and Mexico contrasts with developments in Argentina. In the

14. The Chinn−Ito index of capital account openness relies on information on controls on cross-border financial transactions from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. It is available for 181 countries from 1970 to 2010.

Figure 1. *The de facto integration index and the Chinn-Ito index of capital account openness*



Note : The black and grey lines report respectively the evolution of the de facto integration index (Π*) and of the Chinn−Ito index (Kaopen).*

former countries (Brazil, Chile and Mexico) two phases of evolution can be noted. The first one covers the beginning of the period (from 1988 to 1992−94), where the markets are essentially segmented, with an average index Π of 0.27 for Brazil, of 0.34 for Chile and of 0.53 for Mexico. The second phase, beginning after 1992−94, is marked by a significant increase in the integration index, explained by the progress in financial liber-

alization and by the introduction of ADRs listings on the NYSE.[15] During this second phase the three countries are characterized by a high average integration index: 0.78 for Brazil after 1996, 0.69 for Chile after 1994 and 0.83 for Mexico after 1994. At the end of the period Mexico has the most integrated stock market among the four Latin countries and among all the 12 countries under study. Despite the outbreak of the Mexican Peso crisis at the end of 1994, the Mexican Stock market preserves its relatively high degree of *de jure* and *de facto* integration: the *de jure* index of capital openness (Kaopen) remains at a high level, whereas the *de facto* integration index (Π) only decreases very slightly at the end of 1994 and stays above its filtered level. This resilience can be explained by the assistance Mexico received from international institutions and by the high contribution of U.S investor participation in Mexican stocks.[16] In 1988-1994 the Brazilian stock market suffered from the hyperinflation experienced by Brazil, as evidenced by the downward trend of the filtered integration index (HP (Π)) and by the decrease of the observed integration index (Π) below its filtered level in 1991/1992 and in 1994. On the opposite, the Brazilian crisis of 1998/1999, the devaluation and the depegging of the Brazilian Real from the US$ only caused a limited and short lived drop in the *de facto* integration index of the Brazilian Stock market. The global crisis of $2007-2009$ has had more systematic and marked effects than the local crises of Mexico in 1994/1995 or of Brazil in 1998/1999: the degrees of financial integration of Brazil, Chile and Mexico all declined well below their filtered levels during 2007/2008. However, the *de facto* financial integration of these three countries recovered in 2009 and stayed at levels around 0.8 or above until the end of the studied period. For Brazil it contrasts with the drop in 2010 of its *de jure* Kaopen index, when Brazil responded to the "international currency war"[17] by increased restrictions on its cross borders capital flows.

15. We note that for the Brazilian market, the first exchange−traded ADRs are Breskem S.A. and Fibria Cellulose, which have started trading in 1995, for Chile it began in 1992 with the listing of Compania Cervecerias Unidas, and for Mexico in 1992 with the listing of Empresas S.A.

16. The United States, with international organizations, lent 50 billion U.S. dollars in Mexico, one week after the onset of the crisis, of which 18 billion through the International Monetary Fund.

17. Despite this military term, coined by Brazil's finance minister, Guido Mantega, in September 2010 these restrictions do not seem to have affected much the actual access of international investors to (equivalent of) Brazilian stocks.

The relatively low integration of the Argentinean market at the beginning of our sample period confirms the findings of Carrieri *et al.* (2007). However, the rise in the capital account openness (Kaopen), together with the introduction of the Argentina Fund on the New York Stock Exchange (NYSE) in October 1991 and the ADR listings of Argentinean stocks in 1993-94, seem to have had a sizable positive impact on Argentina's financial integration. Indeed, the integration index exhibits a large jump and reaches 0.72 in April 1995 (against 0.35 at the beginning of the period). From 1995 to the end of 2001, the integration process remains relatively high (with a de facto index of 0.65 on average). The dramatic fall in the integration index (Π) of the Argentinean market in January 2002 (0.19 in April 2002, and 0.10 in July against 0.67 in December 2001) reflects the severity of the economic crisis that hit Argentina at that time. To fight the bank runs and the capital flight, the Argentinean government took measures that resulted in a sharp drop in the *de jure* capital account openness (Kaopen) in 2001 and 2002. Besides, the default on the public debt in December 2001, as well as the end of the currency board and of the peg on the US$ in January 2002 contributed to the disruption of the Argentinean Stock market. It is only in 2010 that Argentina regains an integration index close to its pre-crisis level. Until the end of the studied period, the recovery of Argentina's integration index seems fragile and its stock market remains largely segmented. The global crisis that began in 2007 with the subprime and worsened in September 2008 has had a particularly large adverse effect on the degree of financial integration of Argentina.

The dynamics of financial integration seems also heterogeneous amongst Asian countries, but here again there is an upward trend of the *de facto* measure during the sample period for some of the countries. India's *de facto* financial integration is characterized by the most pronounced upward trend, with a dramatic improvement from a level fluctuating from 0.05 to 0.4 at the beginning of the period to levels around 0.7 at the end of the period. As the Kaopen index remains flat, *de jure* reforms regarding capital account openness do not seem to have played any significant part in this evolution, but the introduction of ADRs listings on NYSE in $1999-2000$ probably helped to improve the *de facto* financial integration of the Indian Stock market. For Indonesia the contrast between the *de jure* and the *de facto* indexes of financial integration is even more striking: despite a decrease

in the *de jure* degree of capital openness, overall financial integration improves from 0.4 in 1988 to 0.7 in 2011/2012. These results illustrate the gap that can occur between the two processes of financial liberalization and financial integration: the reversal in the liberalization process or a low level of capital account openness does not always impede *de facto* financial integration, as shown by the Indonesian and Indian cases. Hong Kong also registers a large rise in its *de facto* financial integration index (Π) after 1993, whereas, starting from an already high level of financial integration in 1988, Singapore displays only a slightly upward trend over the period 1988-2012. The stock markets of Singapore and Hong-Kong appear, indeed, as the most integrated Asian markets, with integration indexes fluctuating around 0.7 and above, from the mid-1990s onwards for Hong-Kong and over the whole period for Singapore. The high levels of financial integration in both countries coincide with a fully liberalized capital account. In Thailand and China the upward trend of financial integration is less marked than in Singapore, starting from a much low level, around 0.4 for Thailand and 0.2 for China. These stock markets therefore remain largely segmented. The *de facto* integration indexes of Malaysia and Korea display a remarkable stability: around 0.6 for Korea, slightly below for Malaysia. It contrasts with the variations of their *de jure* indexes of capital openness.

The Asian crisis that began in July 1997 had a negative effect on the financial integration indexes of Korea, Singapore, Malaysia, Thailand and Indonesia. Among these five countries, Indonesia and Thailand have been the most impacted. In December 1998, their *de facto* integration indexes (Π) plummeted from 0.39 to 0.16 for Indonesia and from 0.54 to 0.28 for Thailand. Except for Korea, Indonesia and Singapore this evolution cannot be partly explained by increased restrictions in the *de jure* capital account openness, as the Asian crisis does not lead, in those countries, to a fall in the Kaopen index.[18] This disconnection between the two indexes in many Asian countries during the $1997-1998$ crisis, illustrates once again the usefulness of the estimation of the *de facto* index of financial integration to monitor more closely the adverse impact of crises on financial integration.

18. The case of Malaysia is a bit different from those of Korea, Indonesia and Singapore, as the decrease in its capital account openness (Kaopen) seems to result more from a gradual move towards increased restrictions of capital flows pursued throughout the 1990s, than from a one shot drop caused by the 1997-1998 Asian crisis.

During the global crisis, if all the Asian countries under study have seen their *de facto* financial integration indexes in a first stage adversely hit by the crisis that began in 2007, some of them have thereafter registered an improvement of their *de facto* financial integration. This appears to be the case for Indonesia and Thailand and, to a lesser extent, for Singapore and Malaysia. This apparent paradox may be related to two factors. First, as the crisis spread to these emerging markets their co-movements increased with those of internationally investable stocks. Second, in the context of a global crisis some efforts were probably made by these countries to attract foreign investors. Interestingly, except for Thailand and Malaysia, no drop in the Kaopen index has been recorded during the global crisis: most of the Asian countries under study have preserved the openness of their capital account during the global crisis and Korea even managed to achieve a gradual increase.

From the results above we can conclude that no emerging market is fully integrated or segmented. Moreover, crises tend to disrupt the progress in financial integration, though to varying degrees according to the severity of the crisis. Interestingly, moves towards restriction of capital flows do not always entail a decrease in *de facto* financial integration.

As financial integration is not complete in emerging markets, the sources of risk and then the rewards to risk can be different. In the following section, we examine how the dynamics of the risk premium in each country has been affected by all of its three components: the global market premium, the local market premium, and the currency risk premium.

5. Risk premia dynamics and robustness tests

5.1. Country-by-country estimation results

This sub-section reports the estimation results and diagnostic tests of equations (3a) to (4c) as discussed in section 2.

We first estimate the equation of the world market return to obtain the price of world market risk (λ^m_{t-1}). The average of the estimated world price of risk (4.97) is substantially

higher compared to previous studies (for example, 1.57 in Carrieri *et al.*, 2007), which may be due to the impact of the global crisis. According to a robust Wald test, the hypothesis that the world price of risk is constant is rejected ($p-$value of 0.001).

In a second step we estimate for each country i equations (3a), (3c) and (3d), with the price of world market risk constrained to its previously estimated value. This second step allows us to retrieve the price of the local risk (λ^i_{t-1}), the price of the currency premium (λ^s_{t-1}), the total risk premium and its three components for each country i.

Panel A of Table 3 reports the results of these estimations. For each country, we use a robust Wald test of the null hypothesis that the prices of the local and currency risks are constant and we report the p-values associated to the test. Our results show that the null hypothesis of a constant price of the local market risk is rejected in 6 cases, supporting our choice to allow for a time- varying specification of this price. The hypothesis that the currency risk price varies over time is supported only for three countries of our sample (Indonesia, Korea, and Mexico).

Panel B of Table 3 relates to some diagnostic tests on the estimated residuals of the GARCH processes. The non-normality in the data is reduced in all cases except for Brazil, for which it remains substantially high. We find no residual serial correlation in the standardized residuals. To explore the time-varying volatility in the data series, we conduct the diagnostic test statistics proposed by Engle and Ng (1993) also reported in Panel B. The Engle-Ng test statistic shows evidence of significant positive asymmetry only for two countries (Korea and Thailand).

Finally, panel C of Table 3 shows the averages of the three components of the total risk premium for each emerging stock market: the local market premium ($\overline{LRP}$), the global market premium ($\overline{WRP}$), and the currency risk premium ($\overline{CRP}$) due to the unexpected fluctuations of real exchange rates of each country *vis-à-vis* the U.S. dollar. Overall, we find that the average risk premia linked to world ($\overline{WRP}$) and local ($\overline{LRP}$) equity markets are significantly positive for all the countries of our sample, supporting the idea of an intermediate degree of financial integration in emerging markets. Panel C of Table 3 also indicates that the average currency risk premium ($\overline{CRP}$) is significant for 8 markets

Table 3. *Estimation results of the IAPM model*

Monthly returns of the stock market index in each emerging country and the world MSCI return are from MSCI, except India and China, for which data are from IFCG. The series of real exchange rates are extracted from the IFS. All data are expressed relative to the dollar US$. There are 299 observations from February 1988 to December 2012, except for China (December 1993 to November 2008) and India (February 1988 to July 2008). The model is estimated by Quasi-Maximum Likelihood in two steps.

The Panel C of Table 3 contains the weight of each risk premium in the formation of the total premium. The results in this table derive from the estimation of the following equations:

$R_{i,t} = \lambda^m_{t-1} h_{i,m,t} + \lambda^s_{t-1} h_{i,s,t} + \lambda^i_{t-1} h_{i,t} \left(1 - \frac{h^2_{i,DIV,t}}{h_{i,t} h_{DIV,t}}\right) + \epsilon_{i,t}$

$R_{m,t} = \lambda^m_{t-1} h_{m,t} + \epsilon_{m,t}$

$R_{DIV,t} = \lambda^m_{t-1} h_{DIV,m,t} + \epsilon_{DIV,t}$

$R_{s,t} = \lambda^m_{t-1} h_{m,s,t} + \lambda^s_{t-1} h_{s,t} + \epsilon_{s,t}$

Where $R_{i,t}$ is the excess return on the local stock market index of country i; $h_{i,j,t}$ is the conditional covariance between asset i and j (with $j = m, s, DIV$), and $h_{i,t}$ is the conditional variance for asset i; λ^m_{t-1}, λ^s_{t-1} and λ^i_{t-1} are the time-varying prices of global risk, currency risk and local risk, $\epsilon_t = (\epsilon_{i,t}, \epsilon_{m,t}, \epsilon_{i,t}, \epsilon_{DIV,t} / X_{t-1}) \sim N(0, H_t)$ and H_t is modelled as a multivariate GARCH process, assuming a conditional Gaussian distribution.

Panel A: Specification tests

Panel A reports $p-$values of the robust Wald test. The null hypothesis is that the prices of the local risk and of the currency risk are constant. By definition, low $p-$values reject the null hypothesis.

H_0	**Argentina**	**Brazil**	**Chile**	**Mexico**	**Hong Kong**	**Singapore**
$\Delta\lambda^i_{t-1}$	0.858	0.065	0.000	0.650	0.116	0.001
$\Delta\lambda^s_{t-1}$	0.902	0.447	0.622	0.000	0.427	0.303
H_0	**Korea**	**Thailand**	**Malaysia**	**Indonesia**	**China**	**India**
$\Delta\lambda^i_{t-1}$	0.464	0.221	0.000	0.000	0.013	0.922
$\Delta\lambda^s_{t-1}$	0.000	0.258	0.764	0.009	0.738	0.453

Panel B: Diagnostic for the estimated residuals of the GARCH process

The test for the Kurtosis coefficient has been normalized to zero, B−J is the Bera-Jarque test for normality based on excess skewness and Kurtosis, Q is the Ljung-Box test for autocorrelation of order 12 for the residuals, Asym$^-$ and Asym$^+$ are, respectively, the Engle-Ng negative size bias and positive size bias test on the squared residuals. $^*(^{**})$ indicates significance at the 5% (1%) level.

	Argentina	**Brazil**	**Chile**	**Mexico**	**Hong Kong**	**Singapore**
Skewness	-1.26**	-2.35**	-1.62**	-1.43**	-2.15**	-0.88**
Kurtosis	2.48**	12.04	3.97**	5.55**	7.32**	0.06
B−J	48.15**	654.3**	88.91**	92.75**	207.6**	7.11*
Q(12)	17.28	10.71	9.70	4.71	9.61	18.03
Asym$^-$	-0.19	0.22	-0.18	0.35	-0.12	0.01
Asym$^+$	-0.20	-0.21	0.41	-0.22	-0.11	-0.29

	Korea	Thailand	Malaysia	Indonesia	China	India
Skewness	-0.71*	-2.66**	-1.94**	-1.11**	-1.75**	-0.95**
Kurtosis	0.79	8.76**	7.31**	1.11*	4.52**	1.24*
B−J	8.66*	324.9**	217.3**	21.25*	71.01**	17.09**
Q(12)	10.85	9.71	7.25	14.23	10.68	12.31
Asym$^-$	0.24	-0.07	0.25	0.29	-0.26	0.02
Asym$^+$	-0.43*	-0.45*	-0.29	-0.06	0.54	0.01

Panel C: Estimation of risk premia

$\overline{WRP}$, $\overline{CRP}$ and $\overline{LRP}$ are, respectively, the average global market risk premium, based on the mean of $\lambda^m_{t-1}h_{i,m,t}$; the average currency risk premium, based on the mean of $\lambda^s_{t-1}h_{i,s,t}$; the average local-market risk premium, based on the mean of $\lambda^i_{t-1}h_{i,t}\left(1-h^2_{i,DIV,t}/h_{i,t}h_{DIV,t}\right)$.

	Argentina	Brazil	Chile	Mexico	Hong Kong	Singapore
$\overline{WRP}$	0.33**	0.38**	0.32**	0.29**	0.42**	0.42**
$\overline{CRP}$	0.05**	0.22**	0.24**	0.38**	0.01	0.14**
$\overline{LRP}$	0.62**	0.39**	0.44**	0.33**	0.58**	0.44**
	Korea	**Thailand**	**Malaysia**	**Indonesia**	**China**	**India**
$\overline{WRP}$	0.67**	0.22**	0.38**	0.33**	0.15**	0.25**
$\overline{CRP}$	-0.46	0.14**	0.30**	0.17*	0.11	0.05
$\overline{LRP}$	0.79*	0.64**	0.31**	0.49**	0.74**	0.70**

among the 12 studied. In particular this risk premium is significant for the four countries of Latin America (Argentina, Brazil, Chile and Mexico) and for four Asian countries (Indonesia, Malaysia, Singapore and Thailand). This result corroborates the importance of accounting for foreign exchange risk in emerging markets asset pricing. This risk can be explained by the volatility of the real exchange rates of these emerging countries, as well as by the connection between the foreign exchange market and the stock markets. Indeed, as suggested by Phylaktis and Ravazzolo (2004), the exchange rate affects the stock market through its impact on economic activity and the current and future cash flows of companies, while the stock market impacts the exchange rate through its effect on wealth and the demand for assets. Unsurprisingly, for countries participating in an exchange rate system with a hard peg like China and Hong-Kong, the average currency risk premium is not significant.

However, the statistics by country on the mean values of the various risk premia can be misleading and are not sufficient, as the risk premia can register important variation through time. Hence, in the following section, we analyze the time series of the various

risk premia, as well as their respective subcomponents.

5.2. Dynamics of the various components of the total risk premium

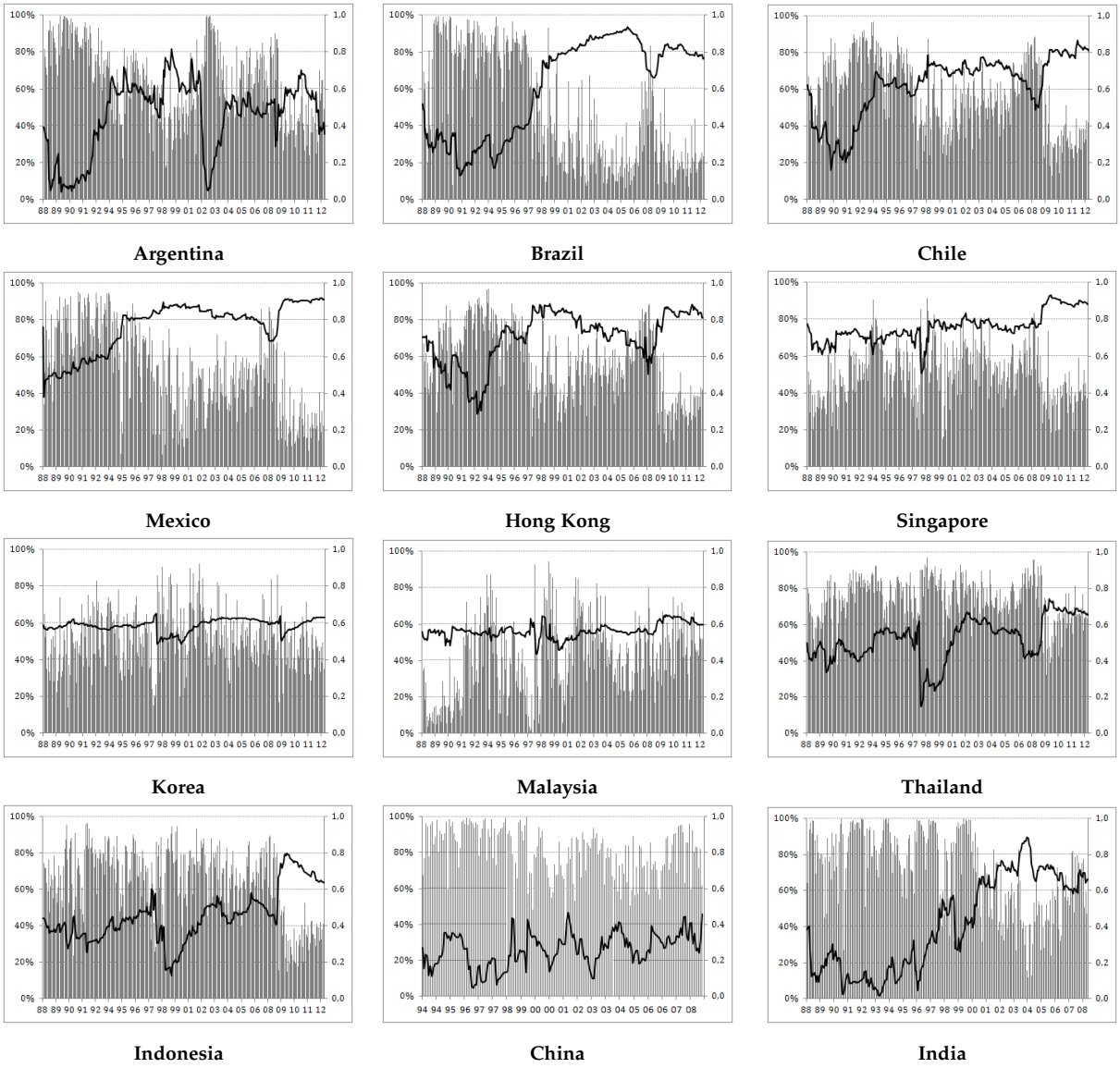
In Figure 2, we plot for each emerging stock market the time series of the weight of the local market risk premium (in % of the local and world markets risk premia) along with the *de facto* integration index.

Figure 2 clearly shows that the local risk premium continues to be an important part of the risk premium, despite an increased degree of financial integration over the long term depicted in the previous section. Moreover, we observe that in most of the countries studied the general collapse in the level of integration during financial crises is accompanied by a surge in the local risk premium. This pattern tends to suggest that emerging markets are more segmented in times of financial turmoil and more integrated in times of financial stability, which is consistent with the idea that investors pay more attention to domestic risk during crisis periods. In order to investigate more deeply this issue, we report in figures A.1 and A.2 in Appendix the evolution of the different constituents of the local market risk premium, together with the *de facto* integration index and the volatility of the global market. From those figures, we can see that the local market's volatility is mostly higher than the global market's one and increases − as can be expected − during episodes of local and global crises. Moreover, the price of the local market risk tends to follow the dynamics of the local market volatility, thus reinforcing the upwards effect on the local risk premium during episodes of financial turbulence, when the financial integration process is often disrupted.[19] This result suggests that financial integration exerts an ambiguous effect on the local risk premium component. On the one hand, the upward trend of financial integration is expected to eliminate through diversification some of the local risk and thereby reduces the local component of the total risk premium. But, on the other hand, the speeding up of financial liberalization and financial development that has boosted the process of financial integration seems also to have spurred some episodes of

19. The perfect example was the Argentinean crisis of 2001-2002, when the local market reached a peak of volatility and simultaneously registered a collapse in its *de facto* financial integration index, resulting in a surge in the local component of the risk premium.

crisis in emerging countries (Kaminsky and Reinhart, 1999), thereby driving the local market volatility and the local price of risk up, which in turn has resulted in an increase in the local component of the total risk premium. The beginning of the global crisis has

Figure 2. *Share of the local market risk premia de facto financial integration*



Note: The solid black line represents the de facto integration index (right scale) and the grey surface, the share in % of the local risk premium in the total of the local and world risk premia (left scale).

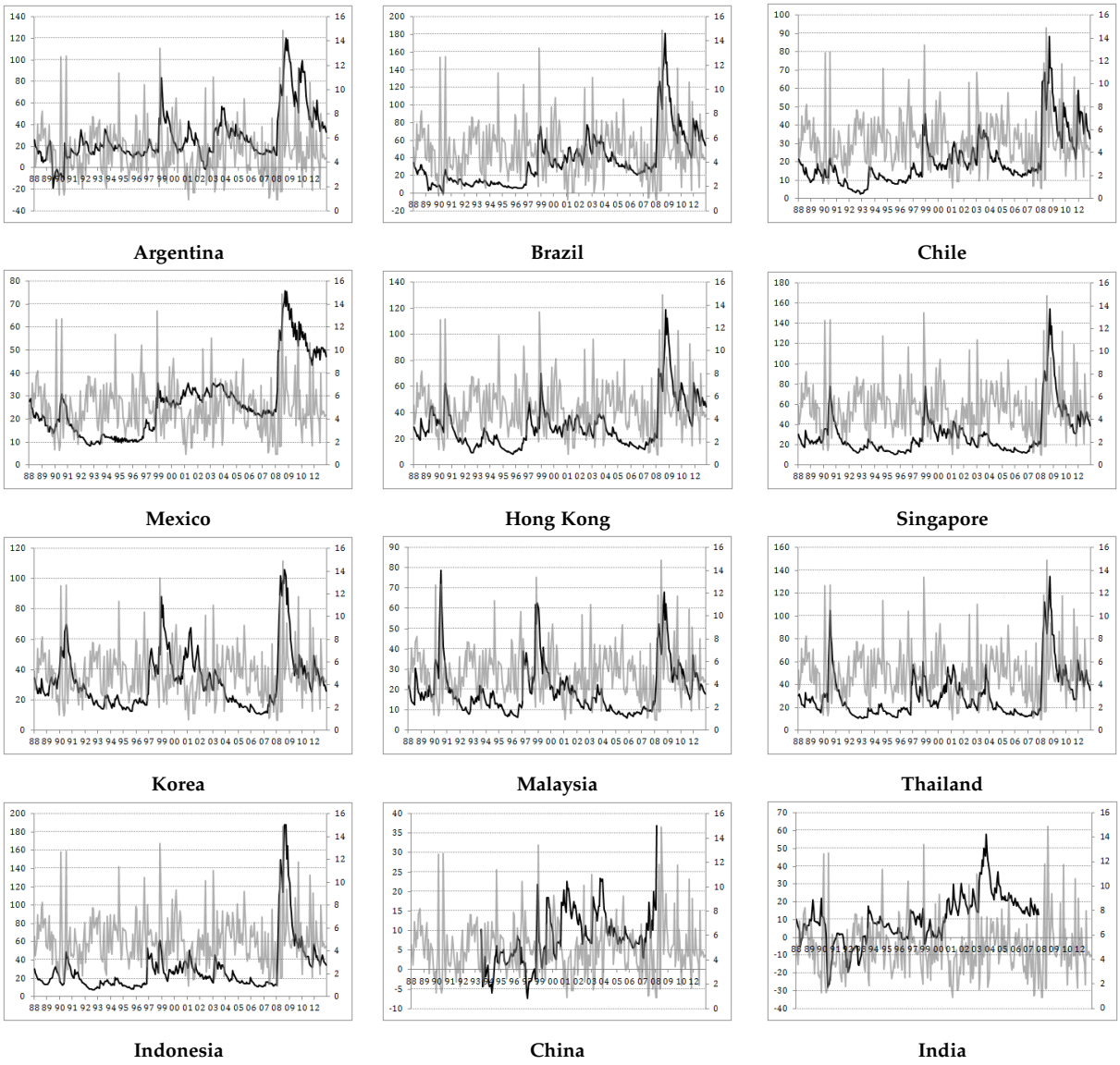
been generally marked by a decrease in the financial integration process, but this decline has been short lived. Moreover, in many emerging markets, the relative importance of the local risk premium has declined after the major breakdown associated with the global crisis. While the volatility of the local market has remained high, it seems that the local

component of the risk premium has been outweighed by its world component. This shift in the relative shares of the risk premia components could be explained by a re-pricing of risk by investors in the wake of the global crisis. Indeed, we can conjecture that investors have reassessed the importance of global risk, in a context of a high and unavoidable exposure to global economic instability and financial contagion. This re-pricing of risk is evidenced by the pattern of the different components of the global market premium reported in figure 3. The conditional covariances between the world market index and the different local market indexes have broadly followed similar patterns: they have been mostly relatively stable, until the recent financial crisis when they have significantly increased with the price of the world market risk. This surge during the global crisis tends to confirm that, for all countries, the global risk premium has represented a large proportion of the total risk premium during the recent financial crisis, evidencing the global nature of the turmoil.

As is obvious from the results of section 5.1 investors also require a premium in emerging stock markets for bearing currency risk. Indeed, during their financial integration process, emerging countries have also been characterized by a high level of economic instability and by currency crises. Regional economic instability and financial contagion threats have then made the assessment of currency risk an important element in the overall portfolio decision. In order to evaluate the importance of currency risk in the total risk premium, we plot in figure 4 the evolution of the currency risk and of the total risk premia.

The dynamics of the currency risk premium and of the total risk premium clearly exhibit the same pattern: they significantly increase in times of local and global crisis. For instance, in Argentina, the two risk premia rose over 1988/1989, a period of hyperinflation and successive devaluations, then the currency risk premium stabilized at a very low level during the years of currency board ($1991-2002$), before rising again with the total risk premium during the Argentinean crisis of 2002. The 1998/1999 economic crisis of Brazil, followed by the devaluation and the un-pegging of the Brazilian real of the US$, also translates in a surge of both the currency and the total risk premia. In the same way

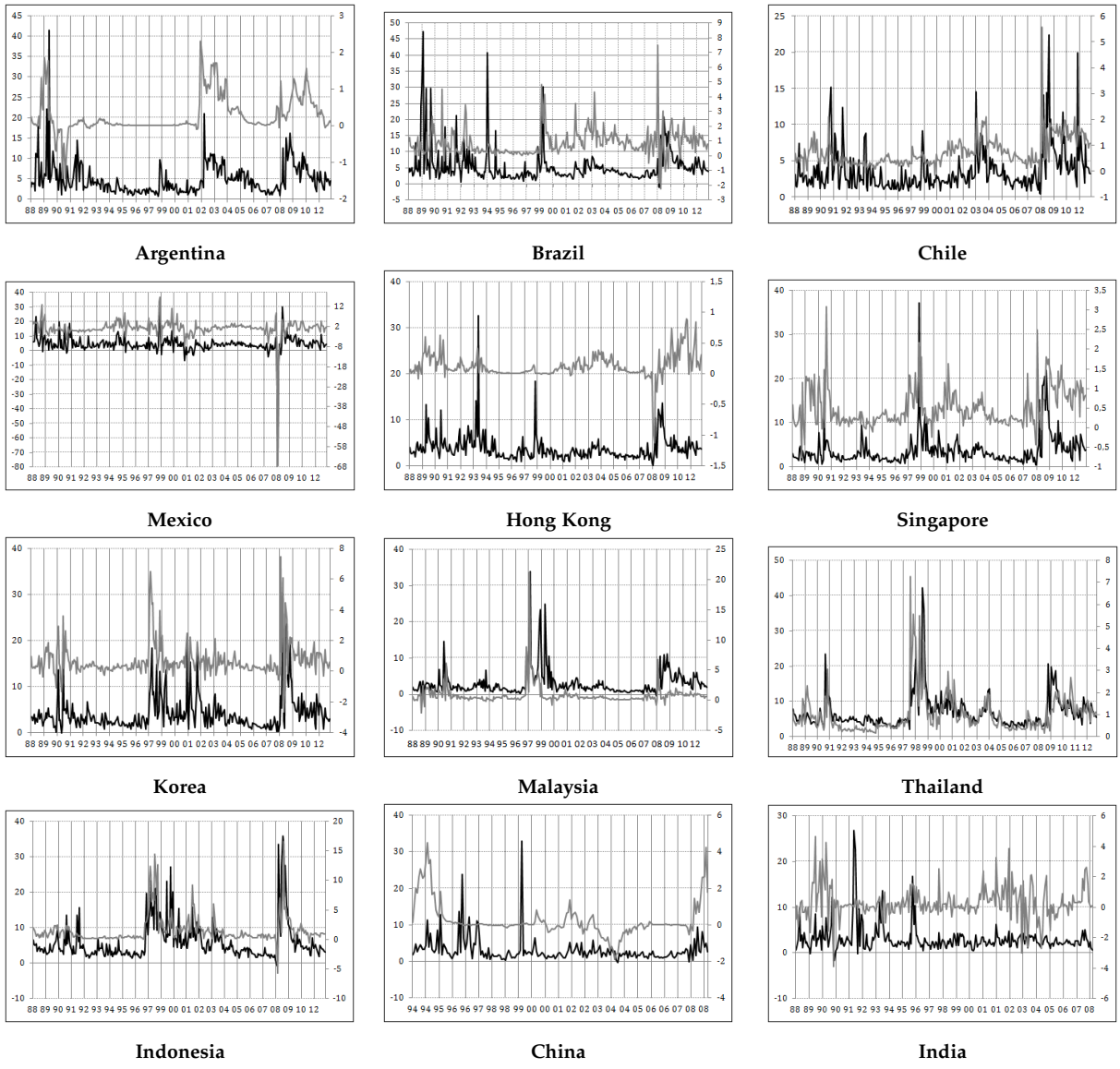
Figure 3. *Components of the world market risk premium*



Note: the black line represents the evolution of the conditional covariance between the world market index and the local market index for each emerging market (right scale); the grey line, the common price of the world market risk premium (left scale).

Indonesia, Korea, Malaysia, Singapore and Thailand all experience significant rises in their currency and total risk premia during the Asian crisis that began in summer 1997. It contrasts with the case of Hong Kong, which seems partially protected by its credible currency board: its currency risk premium didn't rise significantly during the Asian crisis. However, Hong Kong was not totally spared by the ripples of the Asian crisis: its total risk premium surged in 1998, a year of harsh recession for Hong Kong's econ-

Figure 4. *Dynamics of the currency risk premium and of the total risk premium*



Note: The solid black line represents the total risk premium (left scale); the solid grey line, the currency risk premium (right scale).

omy. Also, the two risk premia have tended to surge during the recent financial crisis in most emerging countries. The surge of the currency risk premium during regional financial turmoil episodes is mainly explained by peaks reached by exchange rate's volatility, which coincide with local crises that have usually been coupled with currency crises. The exchange rate's volatility has also increased during the recent financial crisis, as well as the price of the currency risk which has tended to rise in the wake of the collapse of Lehman Brothers in October 2008 (see figure A.3. in the Appendix).

5.3. Robustness tests: partial-segmentation model versus global model

As our results and their interpretation rely on the estimation of an international asset-pricing model, we check if they are not simply linked to our estimation methodology and in particular to the hypothesis of a partial financial integration. Accordingly, we test the empirical model assuming a perfect integration and perform the IAPM model comparison tests between this global model (i.e. perfect integration) and the partial segmentation model for two different empirical specifications of the currency risk.

The evaluation criteria relies on the Kan *et al.* (2013) model comparison test (KRS test), based on the increases in the generalized least square (GLS) CSR R^2s and on the associated $p-$values.[20] This test indicates that a model with a significantly higher sample cross-sectional R^2s will perform better than the other one.

Table 4 summarizes the pairwise tests of equality of the GLS cross-sectional R^2s of the global and partial-segmentation models. The left side refers to the version of the IAPM model that ignores the currency risk, while the right side corresponds to the version of the IAPM model that includes the currency risk. We report the GLS cross-sectional R^2s (ρ^2 in the table), as well as the difference between the sample cross-sectional R^2s of the models ($\Delta\rho^2$ in the table) and the associated $p-$values. The test relies on the null hypothesis that the difference between the GLS cross-sectional R^2s is null, i.e. that the two models perform very similarly. The $p-$values are computed under the assumption that the models are potentially misspecified.

Results clearly show that the global model is outperformed by the partial-segmentation model for all samples. When the currency risk is ignored, the average increase in the GLS cross-sectional R^2s between the partial segmentation model and the global model ranges from 4.2% for Thailand to 48.7% for Chile. The increase is significant for both Latin American countries and Asian countries, when considered separately. Indeed, the KRS test rejects the null hypothesis at the 1% level. This result also holds when the cur-

20. The two-pass cross-sectional regression (CSR) methodology developed by Black *et al.* (1972) and Fama and Macbeth (1973) is used for estimating risk premia and testing pricing models. Statistical inference with this method is typically conducted under the assumption that the models are correctly specified, i.e. expected returns are exactly linear in asset betas. For more details, see Kan *et al.* (2013).

Table 4. *KRS specification tests*

The regressions are based on the IAPM without currency risk (results displayed in the left side of the table) and on the IAPM with currency risk (results displayed in the right side of the table) in order to explain the assets' excess returns. Four classes of models are investigated:

Global IAPM model without currency risk: $R_{i,t} = \alpha_{i,t} + \lambda^m_{t-1} h_{i,m,t} + \epsilon_{i,t}$

Partial segmentation IAPM model without currency risk:

$$R_{i,t} = \alpha_{i,t} + \lambda^m_{t-1} h_{i,m,t} + \lambda^i_{t-1} h_{i,t} \left(1 - \frac{h^2_{i,DIV,t}}{h_{i,t} h_{DIV,t}}\right) + \epsilon_{i,t}$$

Global IAPM model with currency risk: $R_{i,t} = \alpha_{i,t} + \lambda^m_{t-1} h_{i,m,t} + \lambda^s_{t-1} h_{i,s,t} + \epsilon_{i,t}$

Partial segmentation IAPM model with currency risk:

$$R_{i,t} = \alpha_{i,t} + \lambda^m_{t-1} h_{i,m,t} + \lambda^s_{t-1} h_{i,s,t} + \lambda^i_{t-1} h_{i,t} \left(1 - \frac{h^2_{i,DIV,t}}{h_{i,t} h_{DIV,t}}\right) + \epsilon_{i,t}$$

	IAPM without currency risk				**IAPM with currency risk**			
Test Assets	**Perfect integration**	**Partial segmentation**			**Perfect integration**	**Partial segmentation**		
	ρ^2	ρ^2	$\Delta\rho^2$	$p-$value	ρ^2	ρ^2	$\Delta\rho^2$	$p-$value
Argentina	0.068	0.387	0.319	(0.000)	0.065	0.393	0.328	(0.000)
Brazil	0.063	0.392	0.329	(0.000)	0.064	0.390	0.326	(0.000)
Chile	0.089	0.576	0.487	(0.000)	0.087	0.575	0.488	(0.000)
Mexico	0.124	0.403	0.279	(0.000)	0.153	0.427	0.274	(0.000)
China	0.012	0.478	0.466	(0.000)	0.103	0.567	0.464	(0.000)
Hong Kong	0.087	0.360	0.273	(0.000)	0.086	0.359	0.274	(0.000)
India	0.026	0.447	0.421	(0.000)	0.026	0.446	0.420	(0.000)
Indonesia	0.072	0.283	0.211	(0.000)	0.099	0.355	0.256	(0.000)
Korea	0.098	0.292	0.194	(0.000)	0.098	0.308	0.210	(0.000)
Malaysia	0.049	0.196	0.147	(0.000)	0.096	0.255	0.159	(0.000)
Singapore	0.145	0.404	0.259	(0.000)	0.146	0.403	0.257	(0.000)
Thailande	0.038	0.08	0.042	(0.000)	0.047	0.133	0.086	(0.000)

rency risk is added: the partial segmentation model again provides better performances than the purely-global model in all of the 12 countries.

6. Conclusion

Shifts in policies such the relaxation of foreign exchange controls, the adoption of more flexible exchange rate regimes and/or equity markets liberalization have facilitated emerging markets integration within the global capital market. However the correlation between *de jure* and *de facto* measures of financial integration is far from perfect. Moreover,

emerging countries have also been characterized by a high level of economic instability, reflected in repeated financial crises over the past two decades. Regional economic instability and financial contagion threats can produce some short term (or medium term) reversals in the process financial integration. They can also contribute directly to shifts in risk premia.

Accordingly, to study the dynamics of financial integration and of the risk premia, we have estimated a variant of the International Asset Pricing Model (IAPM), developed by Errunza and Losq (1985) and Carrieri *et al.* (2007), for 12 emerging stock markets over the period 1988−2012. This empirical model offers two advantages: it allows to derive a measure of financial integration that is less variable and easier to interpret than the one by Bekaert and Harvey (1995), and it includes the currency risk component in addition to the global and local market risks.

Our results support the hypothesis of a significant currency risk premia related to emerging market assets. We also find the risk premia and the degree of financial integration to be time-varying. Finally, our model relying on partial financial integration provides better performances than a perfect financial integration model for all of the 12 emerging countries.

We also provide several results on the process of financial integration and of the risk premia in emerging markets. First, no emerging market is fully integrated at any moment in time. However, there are wide ranges in the degree of integration. Second, in all countries the *de facto* integration is larger in 2012 as compared to 1988, except for Korea and Malaysia where the index appears remarkably stable. With the exception of these two cases, a structural increase in the stock market *de facto* integration can clearly be observed over the period. It corresponds not only to the graduate liberalization of capital markets in most countries, but also to the development of internationally eligible securities (ADRs and CFs), which allows foreign investors to increasingly include in their portfolios assets that behave very similarly to those listed on the local emerging stock markets. Third, financial turmoil episodes have induced short term reversals in the integration process and contributed to a shift in the different components of the total risk premium. Indeed,

it seems that during regional crises, the risk premium has been mainly driven by its local and currency-risk components. On the one hand, financial liberalization and the development of the range of investible financial assets have increased financial integration and thereby reduced the local components of emerging stock market risk premia. But on the other hand, financial development in emerging countries has increased the scope for contagion and has contributed to episodes of high local volatility causing a rise in the local risk premium component. By contrast, the global component of the risk premium has significantly increased in the wake of the recent crisis, highlighting the global nature of the financial turmoil.

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Appendix

Table A.1. *Literature review*

I. Capital controls and barriers to international investment: impact on financial integration and risk premium	
Authors	**Main findings**
Black (1974)	Barriers take the form of proportional tax
	Obstacles to investment reduce the return for short and long positions
Stulz (1981)	Barriers can be represented as taxes on the absolute value of an investor's holding of risky foreign assets
	Hold as long as barriers to international investment make it costly for a domestic investor to hold the same foreign security simultaneously long and short
Errunza and Losq (1985)	Outright ownership restrictions
Eun and Janakiramanan (1986)	Risk premium determined by the severity of the constraint and the "pure" foreign market risk
	For foreign securities that cannot be held freely by foreign investors, there are two ruling prices, a higher one for domestic investors, and a lower for foreign investors
Stulz and Wasserfallen (1995)	Price discrimination and ownership restrictions
Domowitz et al. (1997)	Demand curves for domestic securities from foreign investors are downward sloping
II. Removing of barriers to international investment, international diversification and financial development	
Bekaert and Harvey (1995)	Market expected return depends both on its volatility and on its world beta
	Degree of integration changes over time and market is partially segmented
	Some countries became less integrated over time
Bekaert and Harvey (2000)	Opening a country's market to foreign investors has a relatively small impact on the risk premium of that market
Henry (2000)	The small decrease in risk premium may be explained by the home-bias
Errunza, Hogan and Hung (1999)	The investors can obtain most of the benefits from in international diversification by investing in assets that trade only abroad
Karolyi (2004)	Capital market liberalization and influence of ADRs on the integration, development of markets and on the gains from international diversification
	Growth and expansion of the ADRs markets in emerging markets are significantly positively associated with growing market integration over time
	Growth of the ADRs does not facilitate development of local markets

Carrieri *et al.* (2007)	Impact of substitute assets (industry portfolios, ADRs and CFs) on the development and integration of local markets While local risk is still a relevant component in the formation of the risk premium, none of the countries appear to be completely segmented The effect of financial development and market liberalization have a positive impact on market integration

Table A.2. *List of eligible securities*

The set of eligible securities includes 4 MSCI global industry portfolios, 12 Country Funds (CFs), 40 American Depositary Receipts (ADRs) and the MSCI world index. This set of eligible securities is used to compute the diversification portfolio (DIV) for each country.

Panel A: Global Industry Indices

Aerospace and defense	Electronic Equipment Manufacturers
Automobiles	Energy Equipment and services
Banks	Food Products
Beverages	Gas utilities
Chemicals	Health care equipment and support
Communications Equipment	Hotels Restaurants and Leisure
Computers and Peripherals	Household durables
Constructions Materials	Household Products
Financial services	Information Technology services
Telecommunication services	Insurance
Electric utilities	Machinery
Electronic Equi. Instruments and Components	Transportation (Road and rail)
Media	Metals and Mining
Oil Gas and consumable fuels	Paper and Forestry Products
Real Estate	Textiles Apparel and Luxury goods
Tobacco	Transportation (Marine)
Panel A: Global Industry Indices	Trading Companies and distribubtion
Transportation (Airlines)	

Panel B: Country Funds (CFs)

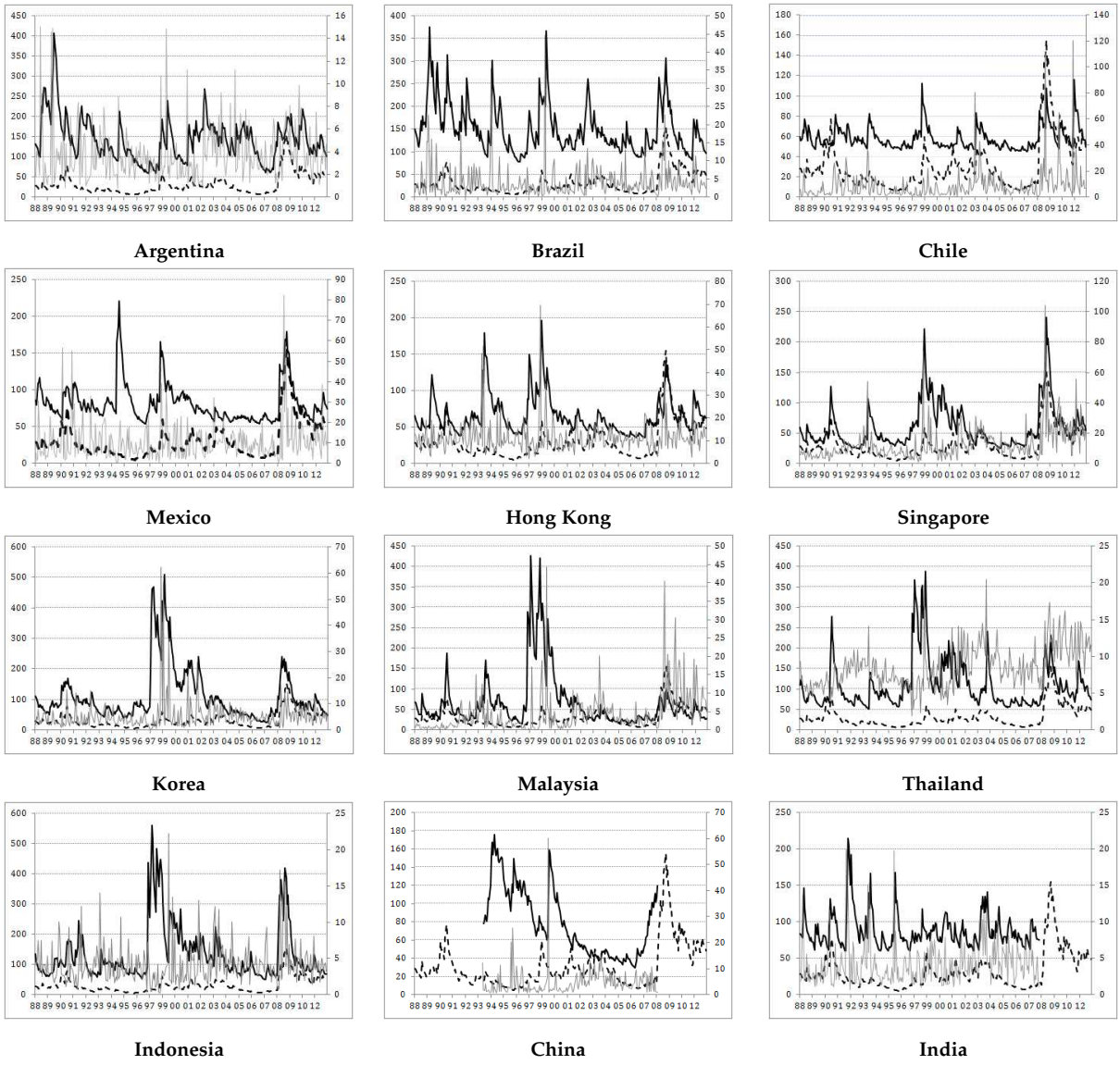
Country Fund	**Start date**	**Country Fund**	**Start date**
Argentina Fund	10/91	Brazil Fund	3/88
Chile Fund	9/89	China Fund	7/92
India Fund	2/94	Indonesia Fund	3/90
Korea Fund	8/84	Malaysia Fund	5/87
Mexico Fund	6/81	Singapore Fund	7/90
Thailand Fund	2/88	Mexico Fund	6/81

Panel C: ADRs

Argentina	**Start date**	**Brazil**	**Start date**
BBVA Banco Frances	12/93	Net services de Communicacao	11/96
CRESUD Sacifya	10/97	Braskem SA	2/95
Telecom Argn.B	1/95	Companhia Brasl. Distb.	7/96
TSPA. Gas Del Sur	12/94	Fibria Celulose	1/95
YPF	7/93	Tefonica Brasil	12/98

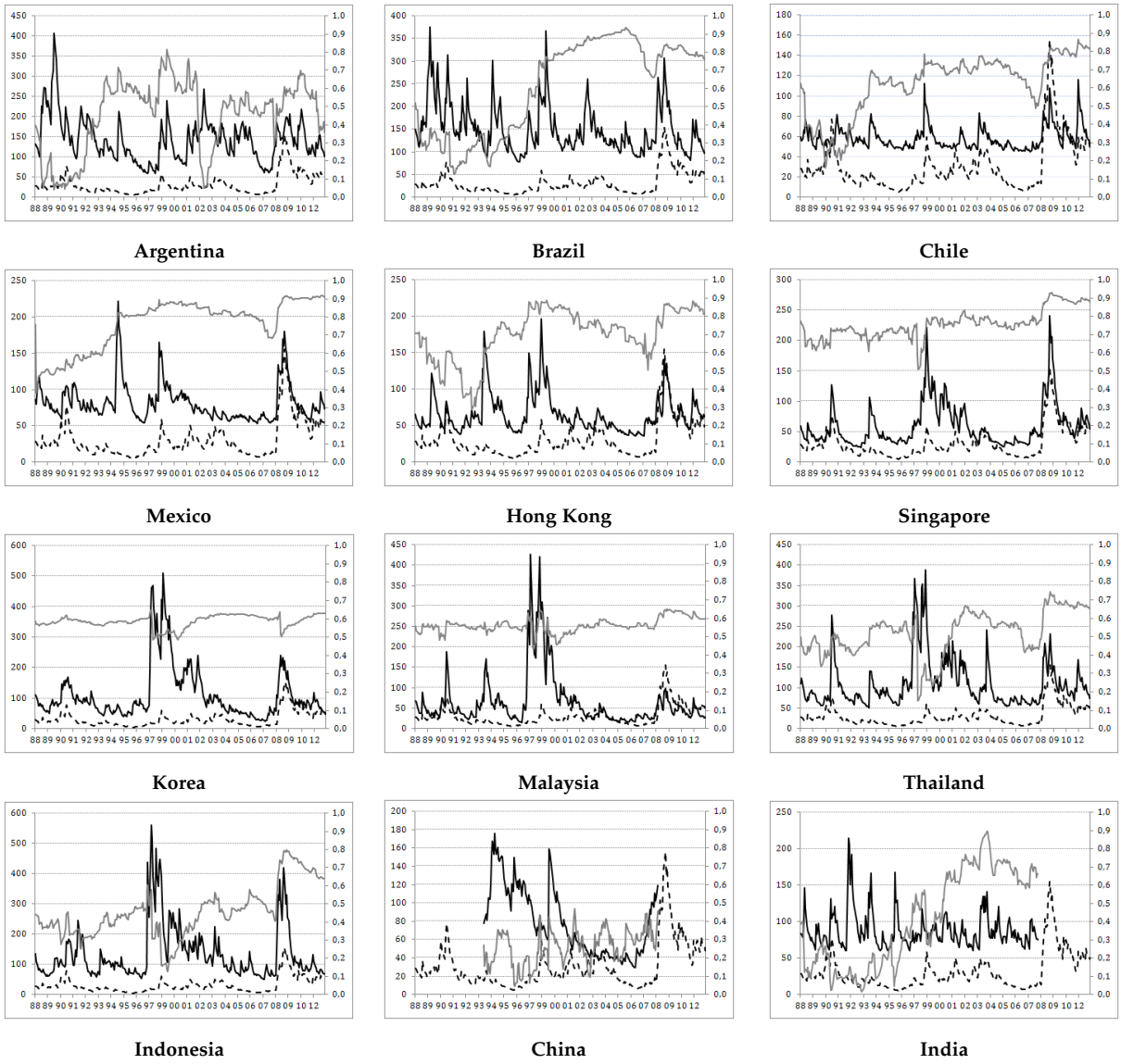
Chile	**Start date**	**Mexico**	**Start date**
VINA Concha	11/94	Empresas S.A.	6/92
SQM SPN.	10/93	Grupo Casa Saba	1/94
Enersis S.A.	11/93	Grupo Televisa	1/94
Empresa S.A.	8/94	Grupo Somec	7/93
Compania Cervecerias Unidas	10/92	GRF. Inbursa	10/96
India	**Start date**	**China**	**Start date**
Infosys.	4/99	Huaneng Pwr.	11/94
ICICI BK.	4/00	Sinopec Shai. Petrochem.	8/93
TATA communications	9/00	Guangshen RY.	6/96
DR. Reddy's Labs.	5/01	Chin. ETN. AIRL.	3/97
HDFC Bank	8/01		
Korea	**Start date**	**Indonesia**	**Start date**
Korea Elec. Pwr.	11/94	PT Indosat.	11/94
SK Telecom	7/96	Telekomunikasi Indo.	12/95
Posco	11/94		
Financial GP.	11/01		

Figure A.1. *Components of the local market risk premium and volatility of the global market*



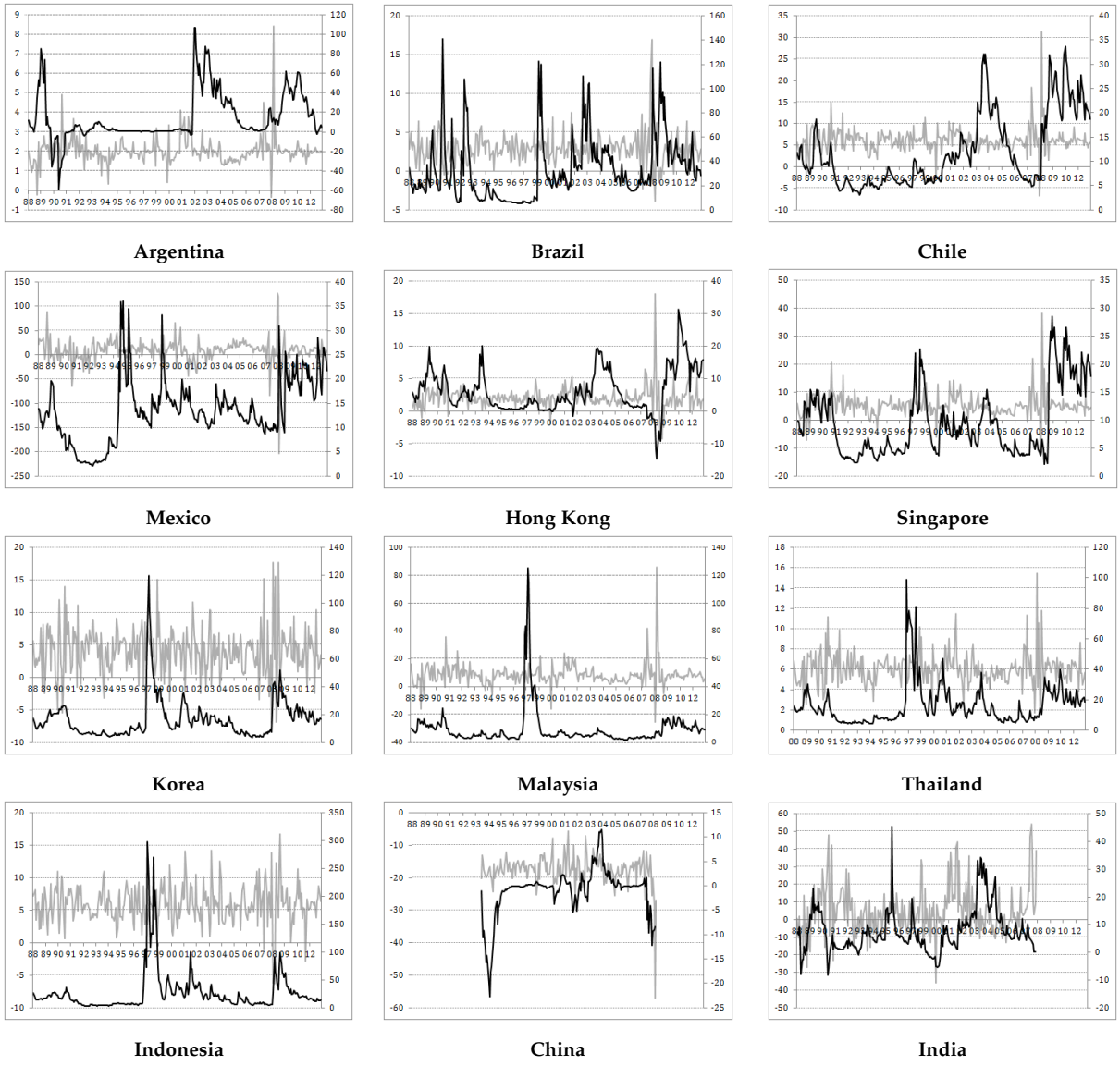
Note: The solid and dotted black lines represent the volatility of respectively the local market and the global market (left scale); the grey line depicts the price of the local market risk (right scale).

Figure A.2. *Volatility of local and global markets and financial integration process*



Note: The solid and dotted black lines represent the volatility of respectively the local market and the global market (left scale); the grey line depicts the de facto integration index (right scale).

Figure A.3. *Components of the currency risk premium*



Note: The solid black represents the conditional covariance between the currency index and the local market index (right scale); the grey line, the price of the currency risk premium (left scale).