Emerging Stock Market Comovements and Third-Country Effects

Abstract

This paper investigates the effects of financial globalization – in particular cross-border capital flows in financial markets – on pairwise excess stock return comovements in Emerging Asia during 2001-2012. The analysis shows that increased comovements are explained not by bilateral capital flows between Asian countries but by capital flows from the G7 countries. That is, the high correlation of stock returns in Emerging Asia is the result of synchronized capital flows from the G7 countries into Asian financial markets. Despite a recent surge in regional capital flows within Emerging Asia, no stock return "de-coupling" from the G7 countries has taken place.

JEL classification: F3, G1

Keywords: Stock Market; Comovement; Emerging Asia; Synchronization; Financial linkages

1. Introduction

A topic of growing importance in the field of international economics is the impact of financial globalization on the synchronization of business cycles and asset prices. Transmission of financial crises, or crisis contagion, is also directly related to financial globalization through cross-border capital flows. Recent decades have seen a steady rise in the comovement of stock markets, including in Emerging Asia (EA), where the correlation in excess stock returns among EA in the early 2000s was close to zero but reached 0.4 in 2012 (Figure 1).[1] What are the reasons for the greater synchronization in stock market returns in EA? Is it the result of growing regional economic and financial integration among EA countries or increased capital flows between EA and advanced economies? And does it provide evidence of Asian economies' "coupling" with or "decoupling" from the advanced economies?

The aim of this study is to document the evidence of stock market synchronization in EA and examine the sources of stock return comovements. Stock market comovements shown in EA may indicate that there are increasing bilateral capital flows among EA economies. However, even without bilateral capital transactions, stock returns in EA countries can move together if capital simultaneously flows from the advanced economies to EA economies. We call those originating from the advanced countries on synchronization "third-country effects." Identifying the underlying reasons for stock market synchronization in EA countries is important for understanding the nature of synchronization in EA financial markets and to evaluate the impact of regional economic cooperation such as the Chiang Mai initiative and the Asian Bond Markets Initiative (ABMI) (Bekaert and Harvey, 2014).

Unlike previous studies that have mainly relied on price data to extract common factors, this study uses direct measures of cross-border financial flows taken from the IMF's *Coordinated Portfolio Investment Survey* (CPIS). Using these measures, we estimate the effects of bilateral capital flows

[1] The average correlation among G7 countries was still higher at around 0.6 in 2012.

among EA economies versus third-country effects of capital flows from the G7 countries on stock return comovements in EA countries.[2] The impact of shocks to capital flows from advanced economies to the EA countries should differ across countries due to different degrees of integration with global financial markets.[3] We capture these time-varying and country-specific effects of capital flows on stock returns by running static and dynamic panel regression models.[4]

Since we focus on the post-financial liberalization period (2001-2012), during which EA financial markets were likely to be highly integrated with the rest of the world, we can capture the impact of non-institutional changes in economic globalization on stock market synchronization. Most previous research has focused on the impact of institutional liberalization of financial markets such as removal of legal restrictions in international capital flows during a period when financial markets were not completely open.[5] In contrast, most of our sample countries (except for China) had already fully liberalized their international financial markets by the start of our estimation period (Table 1) and therefore, we can capture the impact of cross-border capital flows arising from non-institutional economic reasons.

The baseline empirical analysis focuses on annual observation for the pairs of 10 EA countries (yielding 45 pairwise correlations a year) over the period 2001–2012. In the regressions, we control for cross-sectional dependence, heteroscedasticity, and the possibility of serial correlation. We also control for possible endogeneity arising from the dynamic nature of stock market comovements across countries

[2] Most previous studies use static or dynamic factor models to identify the contribution of national or global common factors to variations in prices. For example, Forbes and Chinn (2004) run regressions of the computed country-specific factor loadings on several indicators of bilateral linkages between each pair of small and large countries. Bekaert et al. (2009) use an asset pricing model and run various estimations with (excess) stock returns of each country on the left hand side and returns on global or developed countries' portfolios on the right hand side.

[3] Bekaert and Harvey (1997) argue that the correlations across national stock markets are directly linked to the degree with which countries are integrated with global capital markets.

[4] There are some preceding studies that have used quantitative data on capital flows such as Flavin et al. (2002), Froot and Ramadorai (2008), and Dellas and Hess (2005). However, these studies use cross-section or pooled regressions that neglect the time-dimension of economic integration in the 2000s and beyond. Beine and Candelon (2011) and Bekaert and Wang (2009) use both time and cross-sectional dimensions simultaneously, but their focus is limited to the effects of the degree of economic liberalization and openness.

[5] See, for example, Bekaert and Harvey (1997, 2000), Bekaert et al. (2002), Dellas and Hess (2005), and Beine and Candelon (2011).

(King et al., 1994; Bekaert et al., 2009).

When third-country effects are not included, the regression results seem to suggest that stock return comovements in EA countries can be explained by bilateral portfolio investment flows. However, once third-country effects are taken into account, the effects of bilateral flows become insignificant. Third-country effects are highly significant and positive in most cases. Capital flows from the G7 countries significantly affect the stock return movements in EA countries even after controlling for potentially important factors such as trade agreements, industry differences, inflation, economic development, and financial depth. The main conclusions of the regression results remain unchanged even when we extend the sample to include the non-Asian BRICS countries (Brazil, Russia, and South Africa) and FDI data. Therefore, it could be argued that in terms of stock returns in EA countries, no "de-coupling" has taken place.

This study is related to the literature using asset pricing models to measure third-country effects. Globally integrated financial markets result in domestic stock returns being partly determined by global returns. That is, global common shocks explain part of the variation of domestic stock returns. Global shocks can be empirically identified by using factor models (Forbes and Chinn, 2004; Brooks and Del Negro, 2006) or arbitrage pricing theory or asset pricing models such as Fama-French, or Heston-Rouwenhorst models (Bekaert et al., 2009; Dutt and Mihov, 2013; Brooks and Del Negro, 2004, 2005).[6] The advantage of this approach is that one can identify global factors, country-specific factors, and other potential factors such as sector-specific and regional factors that determine market returns in each country without using quantitative measures of cross-border transactions.

The remainder of this study is organized as follows. Section 2 provides an overview of the related literature and of recent developments in the financial globalization of EA countries. Section 3 then

[6] Another strand of studies uses GARCH models and their variants and measures the share of stock return variation explained by global common factors as a measure of the degree of integration with global markets. See, for example, Gérard et al. (2003).

outlines the models and variables used for the estimation in this study, while Section 4 presents the results of the empirical analysis. Finally, Section 5 concludes.

2. Financial Globalization in Emerging Asia

A large body of theoretical and empirical studies has focused on the role of real and financial linkages in explaining economic comovements in emerging markets. With regard to excess stock return comovements, previous studies in the 1990s and the early 2000s have found that the degree of comovements in emerging markets with the rest of the world is generally low, implying that developed countries with large stock markets have only a limited impact on developing countries with small financial markets (Bekaert and Harvey, 1997; De Santis and Imrohoroglu, 1997; Forbes and Chinn, 2004). Reasons for the limited impact include the presence of transaction costs, restrictions on cross-country capital flows (Bekaert and Harvey, 2000), and home bias in international investment (Karolyi and Stulz, 2003).

Under the recent development of EA's stock markets in global markets, however, one should consider not only bilateral capital flows among emerging markets but also third-country effects from the developed economies in order to properly analyze the reasons behind the stock market comovements. However, few studies have focused on the role of bilateral flows in emerging markets, mainly because of the lack of data on bilateral financial flows and their limited size. In this study, we focus on both bilateral capital flows and third-country effects based on quantitative data of financial flows.

From a theoretical perspective, the effect of financial integration on comovements a priori is indeterminate. On the one hand, financial integration may lead to greater synchronization through demand-side effects. On the other, it may lead to greater specialization in production through the reallocation of capital across sectors, which could reduce comovements. The literature on international

business cycles suggests that financial globalization can result in greater exposure to non-global shocks such as country-specific or sector-specific shocks, which can lower comovements (see, e.g., Kalemli-Ozcan et al., 2013).

A good example why a priori the effect is indeterminate is provided by Forbes and Chinn (2004)." Consider the case that a negative shock in large country *g* leads to investor pessimism which drives down stock returns in country *g*. One possible scenario is that this pessimism leads investors in country *g* to reduce their investment in small country *x* to ensure their liquidity, which lowers stock returns in country *x* (resulting in higher comovement). The other scenario is that investors in country *g* increase their exposure to relatively better positioned country *y*, potentially driving up stock returns in country *y* (resulting in lower comovement).

Figure 2 shows relative trends in bilateral financial flows within EA countries and financial inflows from the G7 countries into EA countries from 2001 to 2012. As can be seen, nominal bilateral financial flows among EA countries rose by a factor of more than 13, while financial inflows from the G7 rose by a factor of more than 5 during this period. That being said, the amount of financial inflows from the G7 still remains much larger than bilateral financial flows among the EA countries, suggesting that inflows from the G7 (particularly the US) still have an important impact on the EA countries.

Next, Table 2 shows the total stock market capitalization of the 10 EA countries that our study focuses on and of the G7 countries. As can be seen, the share of the 10 EA countries in global stock market capitalization increased by more than 10 percentage points from 2001 to 2012, while the share of the G7 countries decreased by 25 percentage points. The share of the 10 EA countries and the G7 countries together in global stock market capitalization was 88% in 2001 and 75% in 2012. On the other hand, the share of the G7 countries alone shrank from 81% in 2001 to 57% in 2012. In sum, while the weight of the 10 EA countries in global stock market capitalization has increased and that of the G7

countries has decreased, capital inflows in the EA countries from the G7 countries are nevertheless still large.

3. Empirical Estimation

3.1. Estimation Models

We first estimate the following static regression model:

$$\boldsymbol{\rho}_{jk,t} = \alpha + \beta \boldsymbol{X}_{jk,t} + \gamma \boldsymbol{Z}_{jk,t} + u_{jkt}, \quad (1)$$

where $\boldsymbol{\rho}_{jkt}$ is the pairwise excess stock return correlation, $\boldsymbol{X}_{jk,t}$ is a vector of bilateral capital flows between countries *j* and *k* and the capital flows from large country *g* to small countries *j* and *k* (third-country effect) and $\boldsymbol{Z}_{jk,t}$ is a set of control variables. The error terms are $u_{jkt} = \eta_{jk} + v_t + \varepsilon_{jkt}$, where η_{jk} represents country-pairwise fixed effects that capture country-pair specific factors explaining comovements, v_t is a set of year dummies, and ε_{jkt} represents pure error terms.

This static model, however, does not capture the potential dynamics of stock return comovements. Therefore, we also use the following dynamic model with lagged values of the dependent variable on the right hand side:

$$\boldsymbol{\rho}_{jk,t} = \alpha + \beta \boldsymbol{X}_{jk,t} + \gamma \boldsymbol{Z}_{jk,t} + \theta \boldsymbol{\rho}_{jk,t-1} + u_{jkt}. \quad (2)$$

As discussed by Blundell and Bond (1998), Rioja and Valev (2004), and Wintoki et al. (2012), this type of model potentially suffers from biased and inconsistent estimators as well as possible

simultaneity of explanatory variables. To resolve these problems, we use the system generalized method of moments (GMM) to estimate the following model:[7]

$$\begin{bmatrix} \boldsymbol{\rho}_{jk,t} \\ \boldsymbol{\Delta\rho}_{jk,t} \end{bmatrix} = \alpha + \beta \begin{bmatrix} \boldsymbol{X}_{jk,t} \\ \boldsymbol{\Delta X}_{jk,t} \end{bmatrix} + \gamma \begin{bmatrix} \boldsymbol{Z}_{jk,t} \\ \boldsymbol{\Delta Z}_{jk,t} \end{bmatrix} + \theta \begin{bmatrix} \boldsymbol{\rho}_{jk,t-1} \\ \boldsymbol{\Delta\rho}_{jk,t-1} \end{bmatrix} + \begin{bmatrix} \eta_{jk} \\ 0 \end{bmatrix} + \begin{bmatrix} v_t \\ \boldsymbol{\Delta} v_t \end{bmatrix} + \begin{bmatrix} \varepsilon_{jkt} \\ \boldsymbol{\Delta}\varepsilon_{jkt} \end{bmatrix}, \qquad (3)$$

assuming following orthogonality conditions:

$$E(\boldsymbol{\rho_{jk}}_{,t-s}\varepsilon_{jkt}) = E(\boldsymbol{X}_{jk,t-s}\varepsilon_{jkt}) = E(\boldsymbol{Z}_{jk,t-s}\varepsilon_{jkt}) = 0,$$
$$E(\boldsymbol{\rho_{jk}}_{,t-s}(\eta_{jk} + \varepsilon_{jkt})) = E(\boldsymbol{X}_{jk,t-s}(\eta_{jk} + \varepsilon_{jkt})) = E(\boldsymbol{Z}_{jk,t-s}(\eta_{jk} + \varepsilon_{jkt})) = 0, \text{ for } s>1. \qquad (4)$$

The system GMM estimator controls for unobservable heterogeneity bias, inconsistency, and simultaneity, which enables us to produce efficient estimates. We use lagged variables as instruments for estimating the system. We use lagged levels and lagged first differences of predetermined and endogenous variables as instruments. The model is estimated using two-step GMM, which procures asymptotically more efficient estimates than one-step GMM.

3.2. Measures of Excess Stock Return Correlation

Variables used in the estimation and data sources are shown in Table 3. Excess stock returns are measured as U.S. dollar denominated stock returns minus the risk free rate, for which the three-month U.S. Treasury bill rate is used. Following Bekaert et al. (2009), we use weekly stock returns computed from national stock indices in order to avoid potential econometric problems resulting from the non-synchronous trading of securities when using very high frequency data. The indices are chosen from

[7] See Blundell and Bond (1998) and Arellano and Bover (1995) for details of the system GMM.

Bloomberg's list of *Indexes by Location* and their names are shown in Table 1. If multiple indices are listed for one country, one of them is chosen based on data availability and frequency of use in the academic literature. Using the computed weekly excess returns, we then calculate pairwise correlations coefficients for each year. The pairwise correlation coefficients (ρ_{jkt}) are all Fisher's z transformed to avoid the limited dependent variable problem.[8]

3.3. Measures of Cross-Border Financial Flows

Measuring the degree of bilateral financial integration has been a long-standing challenge to economists. Some studies have used the degree of restrictions on cross-border financial transactions (e.g., Kose et al., 2009) or non-bilateral measures of financial openness (e.g., Dellas and Hess, 2005). However, these measures capture de jure restrictions on financial flows (e.g., Imbs, 2006) and make it difficult to identify the origin of financial flows. Moreover, as mentioned earlier, there are relatively few de jure restrictions on capital flows during our observation period. Therefore, the approach taken in this study is to use data on direct bilateral asset holdings from the IMF's CPIS as a quantitative measure of financial integration. The data are available from 2001, which restricts our observation period to the period from 2001 to 2012.[9] The IMF compiles data not only on portfolio investment but, since 2009, also data on foreign direct investment (FDI).[10] In the analysis below, we mainly rely on the data on portfolio capital flows but also use capital flow data including FDI to check the sensitivity of our baseline results.

[8] Simple correlation coefficients can be non-constant over time as they may be subject to amplification during periods of high market volatility (Forbes and Rigobon, 2002). One way to tackle this problem is to use conditional correlations. Bekaert et al. (2009) argue that factor models capture the expected correlation and the residual error terms (if >0) can be considered as the effect of contagion, which hikes stock return volatility (and simple correlation coefficients). Another way is to control for the impact of time-variant interdependence among equity markets, which is the most important time-variant transmission channel of stock returns that can cause volatility (Longin and Solnik, 1995). Conceptually, the approach taken in this study is similar to the latter approach.

[9] While the CPIS reports bilateral equity holdings and debt securities holdings separately, we use aggregate portfolio investment data due to numerous gaps in the separate data series. As Imbs (2006) documented, the components of the portfolio investment data in the CPIS (equity and debt investments) are strongly correlated with each other and the amount of equity transaction is much larger than debt transaction in general, which rationalizes the use of aggregate portfolio investment data instead of equity flows data for this study.

[10] The survey is called *Coordinated Direct Investment Survey*.

Bilateral capital flows between countries j and k are measured by $\frac{F_{jkt}+F_{kjt}}{Y_{jt}+Y_{kt}}$, where F_{jkt} denotes country j residents' portfolio investment assets held in country k and, conversely, F_{kjt} denotes country k residents' portfolio investment assets held in country j. Y denotes the GDP of each country. We also use a measure that includes both portfolio investment and FDI, which is defined as $\frac{F_{jkt}+F_{kjt}}{Y_{jt}+Y_{kt}} + \frac{D_{jkt'}+D_{kjt'}}{Y_{jt'}+Y_{kt'}}$, where $D_{jkt'}$ denotes country j's direct investment assets held in country k, and vice versa. Since direct investment are available only from 2009 onward, we use the average of $\frac{D_{jkt'}+D_{kjt'}}{Y_{jt'}+Y_{kt'}}$ during period t' (from 2009 to 2012) for the FDI measure for all periods.

Capital flows from the G7 countries (labeled g) to a pair of EA countries j and k are measured by $\frac{F_{gkt}+F_{gjt}}{Y_{jt}+Y_{kt}}$, where F_{gjt} (F_{gkt}) denotes country g's portfolio investment assets held in country j (k). Note that we do not include the EA countries' portfolio investment assets held in the G7 countries because many data points are missing and even if they exist, the absolute amount is small.[11] Capital flows data including FDI from the G7 countries to EA are constructed by the same method as above.

3.4. Control Variables

Stock market comovements are the result of not only capital flows but also a number of other factors. In order to avoid the omitted variable bias that would result from ignoring such factors, we include a vector of control variables in the regression.

First, the literature often stresses the importance of economic fundamentals, particularly the role of industry structure. Roll (1992) argues that similarities in the industrial structure can lead to a high correlation in stock returns. However, examining data for 12 European countries, Heston and

[11] In the empirical estimation, we also use data that include capital flows in both directions (from the G7 to EA, vice versa). The results are similar to the case when we use portfolio investment assets only.

Rouwenhorst (1994) find that industrial structure does not appear to play a significant role in stock return comovements. More recently, Dutt and Mihov (2013) use time-varying country-pair-specific industrial composition measures to test if Roll (1992) or Heston and Rouwenhorst (1994) stands and confirm the findings of Roll (1992). In this study, following Imbs (2006), we use the Krugman index (Krugman, 1991) to measure similarities in industrial specialization (*Krugman Index*). We define the index as follows: $S_{jkt}^{1} = \sum_{n=1}^{7} \left| s_{njt} - s_{nkt} \right|$, where s_{njt} and s_{nkt} denote the output share of ISIC 1 digit-level industry *n* in country *j*'s and country *k*'s total output respectively. The data are taken from the United Nations' *Statistical Yearbook*. The expected sign of the estimated coefficient of this variable is negative. If countries *j* and *k* have similar industrial structures (so that the *Krugman index* is small), sector-specific shocks will move stock returns in both countries in the same direction and therefore create a high correlation of stock returns.

Second, the role of multilateral trade liberalization is considered. From a theoretical perspective, participating in regional trade agreements, by lowering the cost of imported goods, is likely to increase the expected future stock returns of member countries, thereby increasing synchronization of stock returns (Basu and Morey, 2005). Previous research suggests that this theoretical prediction is empirically supported (Henry, 2000; Berben and Jansen, 2005). We use a dummy variable that takes 1 when a pair of countries has a bilateral trade agreement or belongs to the same regional trade agreement otherwise 0 (*RTA*). The expected sign of the coefficient is positive.

Third, we use three variables to control for different macroeconomic fundamentals of countries in each pair: (1) the pairwise sum of the logged real per capita GDP in U.S. dollars as a proxy for the economic development of each pair of countries (*Economic Development*); (2) the absolute difference in annual changes in the CPI as the proxy for differences in inflation rates of each pair of countries (*Inflation Difference*); and (3) the sum of the ratios of domestic credit to the private sector to output as a

proxy for the availability of domestic financial intermediation (*Financial Depth*). The sign for the *Economic Development* variable is expected to be positive, that for the *Inflation Difference* variable negative, and that for the *Financial Depth* variable positive.

4. Estimation Results

4.1. Test for Strict Exogeneity

Before estimating the model, we test the strict exogeneity of the capital flows data by examining whether the effects of bilateral capital flows among EA economies and third-country effects of capital flows from the G7 countries are related to past stock return comovements. Theoretically, stock return comovements could lead to increased or decreased third-country effects. From the perspective of portfolio diversification, if two countries exhibit similar stock return movements, there is less incentive for investors to invest in both countries at the same time, implying that stock return comovements have a negative effect on capital inflows from the G7 countries. However, theories on crisis contagion focusing on information cascades suggest that investors in advanced economies may classify two small countries that show similar stock return movements in the same investment category and therefore change their investment in these countries simultaneously, which means that stock return comovements would be positively correlated with capital inflows from the G7 countries.

Using the method described in Wooldridge (2002), we run the following panel regression to test strict exogeneity:

$$\boldsymbol{Y_t} = \alpha + \beta \boldsymbol{X}_{t+1} + \gamma \boldsymbol{Z}_t + \eta_{jk} + \varepsilon_{jkt}, \quad (6)$$

where $\boldsymbol{Y_t}$ is the pairwise correlation of stock returns at time *t*, $\boldsymbol{X_{t+1}}$ is a subset of the bilateral and third-country capital flows and control variables at time *t*+1, and $\boldsymbol{Z_t}$ is the bilateral and third-country capital flows and control variables at time *t*. The null hypothesis of strict exogeneity is that β is near zero and insignificant, since stock return comovements should not be correlated with the future realization of a subset of the bilateral and third-country capital flows and control variables.

Table 4 shows that the coefficient estimates for the future values of the bilateral and third-country capital flows are all statistically insignificant, indicating that they are strictly exogenous. Coefficients on most control variables are also insignificant, also implying strict exogeneity. Note that the future values of *RTA* and *Inflation Difference* variables are significantly different from zero, but their signs are opposite to the theoretically predicted value. Given these results, all explanatory variables are assumed to be strictly exogenous and lagged $\boldsymbol{Y}$ is endogenous, so that GMM-type instruments are used only for lagged dependent variable $\boldsymbol{Y}$ for dynamic models.[12]

4.2. Baseline Estimation

Table 5 reports the regression results of the baseline model. We first examine the model with bilateral capital flows only (first four columns) and then the model with both bilateral and third-country capital flows (last four columns). We use both static and dynamic panel regression models for the two sets of control variables (with and without the *Financial Depth* and *Krugman Index* variables, while the *RTA*, *Economic Development*, and *Inflation Difference* variables are always included). For the static models, the standard Hausman test supports the use of a random effects model. For the dynamic models, a one-year lag of the dependent variable is included in the regression, while the set of two- and three-year lags

[12] In the sensitivity analysis, we examine the case assuming that bilateral capital flows among EA economies are predetermined.

of the dependent variable (GMM-type) and one-year lags of all explanatory variables (IV-type) are used as instruments.

The regression results show the following observations. The coefficients on bilateral portfolio investment flows are marginally significant when third-country capital flows are excluded. The coefficients are positive, implying that more bilateral financial flows increase stock return comovements in EA countries. However, the positive effect of bilateral financial flows disappears when third-country effects are included. In the regressions with both bilateral and third-country capital flows, bilateral financial flows all become insignificant and in some cases have negative signs, while third-country effects are all positive and significant at the 1% level. These results are consistent across both the static and dynamic models and both sets of control variables.

This result strongly suggests that positive excess stock return comovements in EA countries are mainly due to capital flows from the G7 countries and not due to bilateral financial flows among EA countries. This result is similar to findings of previous studies using different approaches (Forbes and Chinn, 2004; Dellas and Hess, 2005; Froot and Ramadorai, 2008). When all five control variables are used, the positive effects of G7 capital flows are stronger than in the case with only three control variables.

The most plausible explanation of the insignificant coefficient on bilateral capital flows is as follows: regional and bilateral integration of financial markets in EA countries is still incomplete and the size of financial flows among EA countries is quite small compared to capital flows from the G7 countries (Figure 2). That is, EA financial markets are more integrated with the United States and other G7 markets than with each other. Therefore, bilateral capital flows among EA countries do not explain stock return correlations, while capital flows from third countries (i.e., the G7 countries) do play a significant role in stock return correlations.

The coefficients on the control variables are plausible in most cases. The coefficients on *Economic Development* are positive and significant, implying that the stock return correlation tends to be higher for richer country pairs in the region. The coefficients on the *Krugman index* are, as expected, negative, although most of them are insignificant.[13] The coefficients on the *RTA* variable are positive and significant, which is consistent with the theoretical prediction that participation in the same regional and bilateral trade agreements should lead to a higher stock return correlation (Dutt and Mihov, 2013).[14] Finally, most of the coefficients on the *Financial Development* variable are insignificant.

4.3. Sensitivity Analysis

Having established that capital flows from the G7 countries play a significant role in stock return comovements in the EA region, we are interested in which country or countries have the most important effect. Consequently, Tables 6 shows the regression results when we replace capital flows from the G7 countries overall with capital flows from the United States only, Japan only, and the sum of four European countries (France, Germany, Italy, and the United Kingdom) only. In all cases, the coefficients on third-country effects are significant and positive, implying that all three country blocks have significant effects. Bilateral capital flows are all insignificant and the signs of the coefficients are positive in the static models but negative in the dynamic models. The coefficients on the control variables in all cases are similar to those of the baseline result.

Next, we extend the analysis to other emerging markets in other regions. The first four columns of Table 7 show the case when we extend our sample which includes non-EA BRICS countries, i.e., Brazil,

[13] A possible reason is the rough sectoral classification that we used. Introducing more detailed classification as in Dutt and Mihov (2013) may produce different results.

[14] Several previous studies such as Forbes and Chinn (2004) and Walti (2011) have used trade flows as explanatory variables. However, the coefficients reported in those studies are not significant and in many cases negative (not shown). From a theoretical perspective, trade flows could have a positive or negative effect on stock return comovements, depending on the type of trade. In this study, we do not explicitly include trade flows because of potential endogeneity problems arising from simultaneity with RTA and industry structure. The potential endogeneity problems arising when including trade flow are well documented in Beine and Candelon (2011) and Lane and Milesi-Ferretti (2008).

Russia, and South Africa, in addition to the 10 EA countries. Now, with 13 countries, we have 78 country pairs for a 12-year observation period. The results in Table 7 show that the main conclusion still holds even for this extended sample: the coefficients on third-country capital flows are still positive and significant. Moreover, the coefficients on bilateral flows are insignificant in most cases. One interesting result is that the coefficient of the *Krugman index* is negative and significant. Because the newly included countries have very different industrial structures from the EA countries, sectoral differences among the countries in the sample are much more pronounced, explaining the significantly negative coefficient on the *Krugman index*.

The last four columns in Table 7 report the case when we expand the capital flow data to include FDI. The inclusion of FDI in capital flow data is important both from a theoretical and an empirical perspective as shown in Imbs (2006) and Otto et al. (2001). Ideally, it would be preferable to consider portfolio investment and FDI separately. The empirical results show that the main result still holds with FDI data included: third-country effects are significant and positive. The actual size of the coefficients decreases, but this is due to the fact that the absolute size of capital flows is now larger, since FDI is included.

Finally, Table 8 displays two additional sensitivity analyses. In the first case, we exclude time fixed effects but include financial crisis dummies (2008, 2009=1, otherwise 0); in the second case, we assume bilateral capital flows among EA economies are predetermined (= correlated with past errors, and not correlated with current and future errors). Both cases show that the main conclusion still stands.

5. Conclusion

The objective of this paper is to analyze the sources of stock return synchronization in EA countries – that is, whether such synchronization is due to increased bilateral capital flows among EA countries or

due to synchronized capital flows from the G7 economies into EA countries. The regression results show that the main force behind stock return comovements in EA is the third-country effect, not bilateral capital flows. Although there has been considerable progress in Asian financial market integration in recent years as a result of initiatives for regional economic and financial cooperation, capital flows among EA countries are still comparatively small and, as shown in the empirical analysis, do not play a significant role in the comovement of stock market returns. Instead, stock market comovements are still largely explained by capital flows from the G7 countries.

The results of the various models in this study highlight the need for a more in-depth examination of the sources of stock return comovements in the countries of Emerging Asia. First, as highlighted by Kalemli-Ozcan et al. (2013), in addition to portfolio investment and FDI, cross-border bank lending may play an important role in stock market comovements, so that ideally these should be included in the analysis in order to gain a comprehensive understanding of the impact of capital flows from third countries. Next, uncertainty shocks can play an important role in explaining asset price comovements (Hirata et al., 2013) and therefore should also be included in the analysis. However, creating uncertainty measures for emerging economies presents a challenge.

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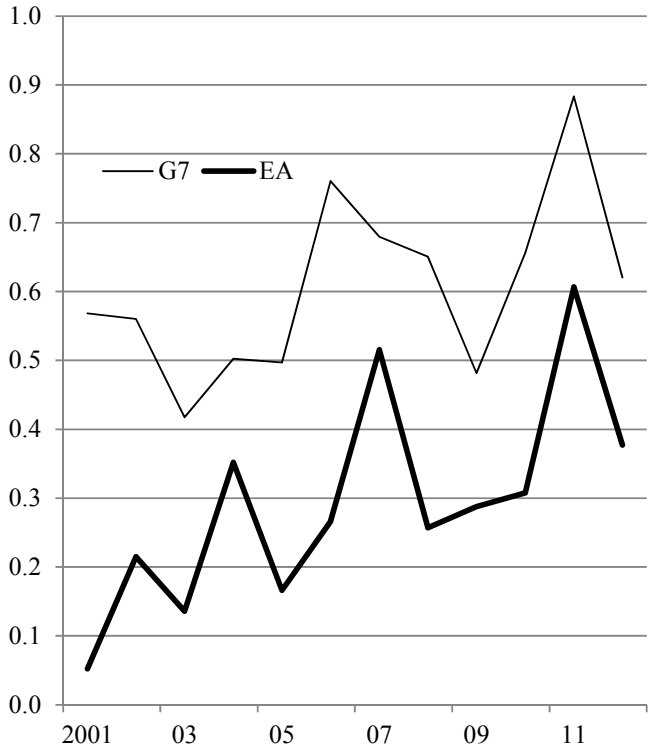
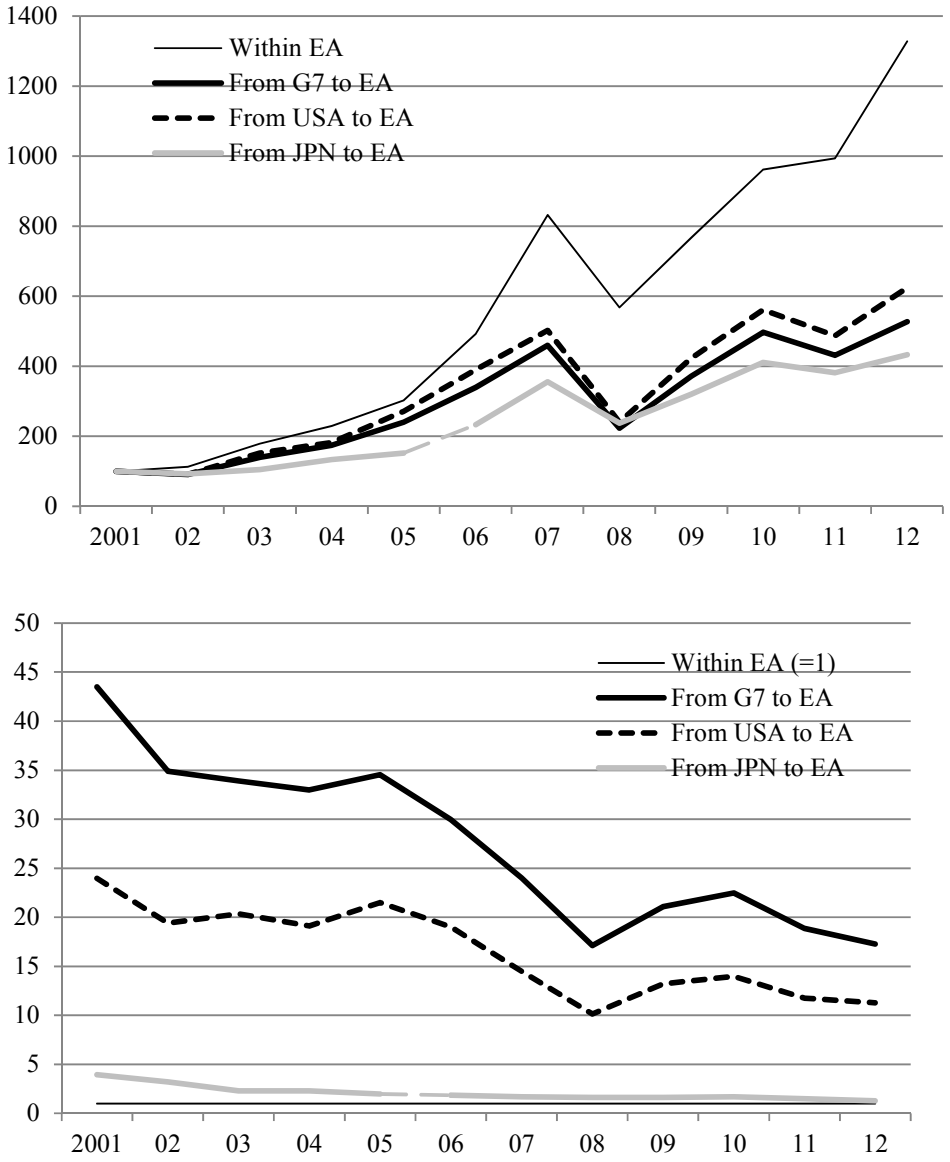
Figure 1. Average Stock Return Correlation in the G7 and the EA Countries



Notes: The figure shows the equally-weighted average annual pairwise correlation coefficients of excess stock returns among the G7 countries and among 10 EA countries. See Table 1 for a list of the countries included.

Figure 2. Capital Flows within the EA Countries and Inflows from the G7



Notes: The figure shows bilateral portfolio flows among the 10 EA countries and financial inflows from the G7 countries. The upper chart shows the flows (1990=100), while the lower chart shows the relative flows by setting bilateral financial flows among EA countries to one for each year.

Table 1. Sample Countries and the Stock Market Indices

EA	China (02, Shanghai Stock Exchange: Index: A Shares), Hong Kong (*, Hong Kong Hang Seng Index), India (92, Bombay Stock Exchange: Index: SENSEX), Indonesia (89, Jakarta Stock Exchange Composite Index), Korea (92, Korea Stock Exchange KOSPI 200 Index), Malaysia (88, FTSE Bursa Malaysia EMAS Index), Philippines (91, Philippines Stock Exchange All Share Index), Singapore (*, Straits Times Index STI), Taiwan (91, Taiwan TPEx Exchange Index), Thailand (87, Stock Exchange of Thailand SET Index)
G7	United States of America (*, S&P 500 Index), Canada (*, S&P/TSX Composite Index), Germany (*, Deutsche Boerse AG German Stock Index DAX), France (*, CAC 40 Index), Italy (*, FTSE MIB Index), United Kingdom (*, FTSE 100 Index), Japan (83, Nikkei 225)

Notes: Numbers in parentheses show the year in which the domestic stock market was opened to foreign investors (Bekaert and Harvey, 2000, 2002; Bekaert, et al., 2005). * indicates that the country's domestic stock market was already fully liberalized before the start of our estimation period. In addition, the names of national stock indices used in this study are shown in parentheses.

Table 2. Share in Global Stock Market Capitalization

	EA	BRICS	G7		
				USA	Japan
2001	7.4%	3.9%	81.2%	51.7%	8.4%
2005	9.7%	7.1%	73.3%	41.4%	11.6%
2008	19.2%	15.2%	64.5%	36.2%	9.9%
2010	19.9%	17.4%	55.0%	31.2%	7.5%
2012	18.2%	14.1%	57.1%	34.2%	6.7%

Notes: Data sources are International Financial Statistics, IMF and Taiwan Stock Exchange. The BRICS include not only the non-EA BRICS (Brazil, Russia, and South Africa) but also the EA BRICS (China and India).

Table 3. Variables, Summary Statistics, and Data Sources

Variable	N	Mean	SD	Data Source
Stock Return Correlation	540	0.374	0.464	Bloomberg, CEIC, FRED
Bilateral Capital Flows	540	0.006	0.013	CPIS, World Development Indicators
Third-country Capital Flows	540	0.162	0.132	CPIS, World Development Indicators
RTA	540	0.391	0.488	CEPII
Economic Development	540	9.620	0.986	Penn World Table, World Development Indicators
Inflation Difference	540	3.030	2.795	World Development Indicators
Financial Depth	540	1.960	0.644	Global Financial Development Database
Krugman Index	540	0.075	0.041	UNIDO

Table 4. Testing Strict Exogeneity

	1	2	3	4
Third-country Capital Flows (t+1)	0.318		0.154	0.389
	(0.711)		(0.351)	(0.902)
Bilateral Capital Flows (t+1)		6.020	5.744	5.367
		(0.911)	(0.845)	(0.807)
RTA (t+1)				-0.207 ***
				(-3.228)
Economic Development (t+1)				-1.250
				(-1.467)
Inflation Difference (t+1)				0.036 ***
				(3.397)
Financial Depth (t+1)				0.001
				(0.308)
Krugman Index (t+1)				-1.291
				(-0.287)
Third-country Capital Flows (t)	0.751 *	1.067 ***	0.923 **	0.658
	(1.874)	(5.203)	(2.153)	(1.531)
Bilateral Capital Flows (t)	0.625	-5.329	-4.999	-4.132
	(0.448)	(-0.830)	(-0.758)	(-0.642)
RTA (t)	0.079 *	0.077 *	0.072 *	0.279 ***
	(1.872)	(1.840)	(1.727)	(4.450)
Economic Development (t)	0.071 ***	0.068 **	0.068 **	1.305
	(2.366)	(2.304)	(2.281)	(1.540)
Inflation Difference (t)	0.002	0.002	0.002	-0.018 ***
	(0.330)	(0.376)	(0.463)	(-2.400)
Financial Depth (t)	0.000	0.000	0.000	0.000
	(0.891)	(0.937)	(0.901)	(-0.067)
Krugman Index (t)	-1.378 ***	-1.382 ***	-1.409 ***	-0.367
	(-2.797)	(-2.861)	(-2.874)	(-0.081)

Table 5. Stock Market Correlation Regressions

	w/o Third-country Capital Flows				w/ Third-country Capital Flows			
	Static Models		*Dynamic Models*		*Static Models*		*Dynamic Models*	
Portfolio Investment								
Third-country Capital Flows					1.066 ***	1.000 ***	1.119 ***	1.087 ***
					(6.428)	(5.251)	(5.974)	(5.255)
Bilateral Capital Flows	3.653 **	3.330 *	3.146	2.921 *	0.277	-0.101	-0.987	-1.154
	(2.099)	(1.849)	(1.610)	(1.750)	(0.228)	(-0.087)	(-0.760)	(-0.985)
Controls								
RTA	0.101 *	0.109 **	0.093	0.114 **	0.120 ***	0.139 ***	0.157 ***	0.167 ***
	(1.851)	(2.289)	(1.479)	(2.269)	(2.983)	(3.375)	(3.518)	(3.783)
Economic Development	0.127 ***	0.128 ***	0.156 ***	0.137 ***	0.068 ***	0.069 ***	0.085 ***	0.078 ***
	(4.224)	(5.569)	(4.617)	(4.886)	(2.366)	(2.829)	(2.645)	(2.713)
Inflation	-0.004	-0.007	-0.008	-0.018 ***	0.001	-0.005	-0.014 *	-0.015 **
Difference	(-0.676)	(-1.243)	(-0.394)	(-2.476)	(0.112)	(-0.836)	(-1.942)	(-2.255)
Financial Depth	0.032		-0.028		0.033		0.002	
	(0.713)		(-0.452)		(0.904)		(0.057)	
Krugman Index	-0.705		-0.450		-1.113 ***		-0.609	
	(-1.045)		(-0.518)		(-2.567)		(-1.119)	
Lagged Dependent Variable								
Dep Var (t-1)			-0.139 ***	-0.118 ***			-0.113 ***	-0.113 ***
			(-2.480)	(-2.794)			(-2.560)	(-2.607)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	540	540	495	495	540	540	495	495
R-squared	0.293	0.291	0.273	0.275	0.337	0.331	0.271	0.314
AR(1) test (p-value)			0.000	0.000			0.000	0.000
AR(2) test (p-value)			0.318	0.288			0.232	0.291
Hansen test of over-identification (p-value)			0.292	0.668			0.707	0.667
Diff-in-Hansen test of exogeneity (p-value)			0.109	0.591			0.604	0.591

Table 6. Third-Country Effects by Country/Region

	Third-country Capital Flows from					
	USA		Japan		Europe	
	Static	*Dynamic*	*Static*	*Dynamic*	*Static*	*Dynamic*
Portfolio Investment						
Third-country Capital Flows (USA)	1.799 ***	1.755 ***				
	(6.514)	(5.629)				
Third-country Capital Flows (Japan)			9.120 ***	13.573 ***		
			(3.750)	(4.618)		
Third-country Capital Flows (Europe)					3.021 ***	4.353 ***
					(5.966)	(5.261)
Bilateral Capital Flows	0.385	-0.684	0.059	-2.559	1.242	-1.072
	(0.327)	(-0.566)	(0.045)	(-1.415)	(0.958)	(-0.748)
Controls						
RTA	0.125 ***	0.163 ***	0.099 **	0.121 ***	0.106 ***	0.149 ***
	(3.108)	(3.547)	(2.276)	(2.747)	(2.573)	(3.648)
Economic Development	0.064 **	0.085 ***	0.090 ***	0.088 **	0.084 ***	0.087 ***
	(2.171)	(2.579)	(2.736)	(2.297)	(3.222)	(2.753)
Inflation Difference	0.001	-0.013 *	0.001	-0.011	-0.002	-0.015 **
	(0.232)	(-1.926)	(0.084)	(-1.609)	(-0.270)	(-2.126)
Financial Depth	0.033	0.004	0.049	0.021	0.026	-0.007
	(0.909)	(0.095)	(1.172)	(0.426)	(0.724)	(-0.159)
Krugman Index	-0.975 ***	-0.455	-1.222 ***	-0.968 *	-1.187 ***	-0.842
	(-2.332)	(-0.837)	(-2.523)	(-1.648)	(-2.596)	(-1.539)
Lagged Dependent Variable						
Dep Var (t-1)		-0.112 ***		-0.113 ***		-0.114 ***
		(-2.546)		(-2.465)		(-2.622)
Constant	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
N	540	495	540	495	540	495
R-squared	0.335	0.319	0.316	0.302	0.327	0.321
AR(1) test (p-value)		0.000		0.000		0.000
AR(2) test (p-value)		0.288		0.345		0.265
Hansen test of over-identification (p-value)		0.629		0.670		0.771
Diff-in-Hansen test of exogeneity (p-value)		0.565		0.632		0.665

Table 7. Sensitivity Analysis (Sample Countries, Definition of Investment)

	Emerging Asia + BRICS				Portfolio Investments + FDI			
	Bilateral		Third+Bilateral		Bilateral		Third+Bilateral	
	Static	Dynamic	Static	Dynamic	Static	Dynamic	Static	Dynamic
Portfolio Investment								
Third-Country Effects			0.835 ***	0.845 ***				
			(4.278)	(3.308)				
Bilateral Capital Flows	3.197 *	1.792	0.379	0.480				
	(1.926)	(0.680)	(0.293)	(0.268)				
Third-Country Effects (w/ FDI)							0.466 ***	0.491 ***
							(3.873)	(3.589)
Bilateral Capital Flows (w/ FDI)					0.163	0.014	-0.980	-1.385 **
					(0.126)	(0.010)	(-1.563)	(-2.089)
Controls								
RTA	0.003	0.011	0.025	0.047	0.128 **	0.117 *	0.119 ***	0.138 ***
	(0.061)	(0.161)	(0.585)	(0.988)	(2.041)	(1.694)	(2.381)	(2.591)
Economic Development	0.158 ***	0.184 ***	0.117 ***	0.132 ***	0.145 ***	0.167 ***	0.080 ***	0.095 ***
	(6.031)	(5.442)	(4.147)	(3.902)	(4.859)	(5.099)	(2.702)	(2.865)
Inflation Difference	-0.005	0.000	-0.003	-0.002	-0.006	-0.020 ***	-0.002	-0.016 **
	(-0.919)	(0.037)	(-0.672)	(-0.255)	(-0.958)	(-2.674)	(-0.275)	(-2.145)
Financial Depth	0.008	0.024	-0.012	-0.013	0.037	-0.028	0.055	0.014
	(0.243)	(0.558)	(-0.357)	(-0.329)	(0.800)	(-0.541)	(1.379)	(0.307)
Krugman Index	-1.578 ***	-2.047 ***	-1.762 ***	-1.698 ***	-0.588	-0.081	-0.651	-0.109
	(-3.135)	(-2.536)	(-4.010)	(-3.194)	(-0.868)	(-0.099)	(-1.323)	(-0.181)
Lagged Dependent Variable								
Dep Var (t-1)		-0.132 ***		-0.150 ***		-0.111 ***		-0.112 ***
		(-4.643)		(-4.925)		(-2.485)		(-2.572)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	936	858	936	858	540	495	540	495
R-squared	0.249	0.238	0.263	0.253	0.283	0.262	0.316	0.302
AR(1) test (p-value)		0.000		0.000		0.000		0.000
AR(2) test (p-value)		0.009		0.270		0.222		0.251
Hansen test of over-identification (p-value)		0.897		0.412		0.778		0.740
Diff-in-Hansen test of exogeneity (p-value)		0.012		0.720		0.719		0.668

Table 8. Sensitivity Analysis (Time Dummies Only for the Crisis Period)

	Crisis				Predetermined Bilateral Effects	
	Bilateral		Third+Bilateral		Bilateral	Third+Bilateral
	Static	Dynamic	Static	Dynamic	Dynamic	Dynamic
Portfolio Investment						
Third-Country Effects			1.128 ***	0.863 ***		1.189 ***
			(6.282)	(4.412)		(3.820)
Bilateral Capital Flows	3.371 *	1.851	-0.361	-1.437	-1.549	-3.559
	(1.796)	(1.233)	(-0.276)	(-1.157)	(-0.050)	(-0.900)
Controls						
RTA	0.137 ***	0.137 **	0.144 ***	0.173 ***	0.140 **	0.182 ***
	(2.392)	(2.253)	(3.222)	(3.531)	(2.280)	(3.290)
Economic Development	0.145 ***	0.167 ***	0.074 ***	0.113 ***	0.167 ***	0.088 ***
	(4.609)	(4.805)	(2.460)	(3.238)	(4.481)	(2.510)
Inflation Difference	-0.015 **	-0.038 ***	-0.008	-0.034 ***	-0.018 ***	-0.012 **
	(-2.012)	(-4.660)	(-1.200)	(-4.422)	(-2.685)	(-1.980)
Financial Depth	0.018	-0.036	0.028	-0.016	-0.024	0.006
	(0.373)	(-0.665)	(0.701)	(-0.353)	(-0.460)	(0.140)
Krugman Index	-0.630	0.000	-1.031 **	-0.197	0.021	-0.498
	(-0.813)	(0.000)	(-2.159)	(-0.300)	(0.030)	(-0.900)
Dummy 2008	-0.032	-0.109	0.038	-0.030		
	-0.387	-1.175	0.468	-0.327		
Dummy 2009	0.003	0.002	-0.013	0.009		
	0.048	0.033	-0.198	0.146		
Lagged Dependent Variable						
Dep Var (t-1)		-0.119 ***		-0.116 ***	-0.113 ***	-0.108 ***
		(-2.763)		(-2.699)	(-2.380)	(-2.330)
Time Fixed Effects	No	No	No	No	Yes	Yes
N	540	495	540	495	495	495
R-squared	0.140	0.112	0.188	0.157	0.112	0.157
AR(1) test (p-value)		0.000		0.000	0.000	0.000
AR(2) test (p-value)		0.489		0.478	0.489	0.478
Hansen test of over-identification		0.870		0.739	0.870	0.739
Diff-in-Hansen test of exogeneity (p-value)		0.915		0.789	0.915	0.789