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Capital Flows and Real Exchange Rates in Emerging Asian Countries

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Contents

Abstract

This paper examines the nexus between capital flows and real exchange rate (RER) in emerging Asian countries using a dynamic panel-data model for 2000–2009. In contrast to previous studies, capital flows here are separated into foreign direct investment (FDI), portfolio investment, and other investment (bank loans) flows. Inflows and outflows are also treated separately in the model. The estimation results show that compositions of capital flows matter in determining impacts of the flows on the RER. Portfolio investment and other investment (including bank loans) bring in a faster RER appreciation than FDI. However, the magnitudes of appreciation among capital flows are close to each other. The increasing importance of merger and acquisition activities in FDI makes the flows behave closer to other forms of capital flows, especially portfolio investment. The estimation results also show that capital outflows bring about a greater degree of exchange rate adjustment than capital inflows. All in all, the results imply that the swift rebound of capital flows in the region could result in excessive appreciation of the (real) currencies, especially when capital flows are in a form of portfolio investment and bank loans.

I. Introduction

The swift and strong rebound of capital inflows in emerging Asian countries after the current global financial crisis has added new impetus to the debate on how countries receive benefits from capital inflows and avoid costs that are associated with them. One of the unfavorable side effects of "too much" capital flows is (real) exchange rate appreciation, or loss of a country's competitiveness, which could adversely affect tradable production and export sectors. Real exchange rate (RER) appreciation occurs regardless of the exchange rate regime implemented in a country. Under a flexible exchange rate regime, (real) currency appreciation occurs due to the appreciation of the nominal exchange rate while under a fixed exchange rate regime, the appreciation comes mainly through a rise of nontradable prices. Under an intermediate regime, the (real) currency appreciation occurs through a mixture of these two processes.

Stronger currency appreciation has become evident in emerging Asian economies in response to the strong rebound of capital inflows, particularly portfolio investment flows. Besides the currency appreciation, excessive liquidity associated with the strong rebound of capital inflows began to set new levels of asset prices. Particularly in the People's Republic of China (PRC), asset prices have increased noticeably, and worry over asset price bubbles has intensified. Central banks in the region including in the PRC and Taipei,China have begun to tighten capital control policies, while other central banks closely monitor movements of capital flows. In the Republic of Korea; Taipei,China; and Thailand, the central banks have also intervened excessively in the foreign exchange market to slow the appreciation of the currency. To mitigate liquidity in domestic markets, local-currency bonds are issued to mop up liquidity from foreign exchange market intervention. In addition, central banks are still reluctant to raise policy rates even though inflation has begun to show an upward trend, so as to reduce the risks of encouraging speculative capital inflows.

These issues lead to the empirical question on the relationship between the RER and capital flows in emerging Asian countries, particularly how far the (real) exchange rate can be adjusted in response to capital flows. In addition, there is strong evidence that different types of capital flows behave differently, and that the speed of capital reversal after the current crisis has been different across countries. A second question is raised whether the composition of capital flows matters in determining the movements of the (real) exchange rate. In particular, is foreign direct investment (FDI) different from other forms of capital flows, in terms of its impact on the RER? Furthermore, because of economic recovery, recycling excessive savings, and liberalization policy, capital outflows, which had built up

noticeably after 2003 before declining as a result of the global economic downturn, seem to have resumed their path after the second quarter of 2009. These huge capital outflows have raised a third question whether capital inflows and outflows impact in various ways on RERs.

This paper aims to answer these questions by using a dynamic panel data model for emerging Asian economies to examine the relationship between capital flows and RER. There is a sizeable empirical literature on the determinants of RER that includes a capital flows variable in the model (see Elbadawi 1994, Hinkle and Montiel 1999, Baffes et al. 1999, Jongwanich 2007). There has been no systematic analysis that studies how different types of capital flows impact (real) exchange rates. Athukorala and Rajapatirana (2003) and Jongwanich (2008) separate net capital flows into two types, namely, FDI and other forms of capital flows. In this study, other forms of capital flows are disaggregated further into portfolio investment and other investment flows, including bank loans. Capital inflows and outflows for all type of capital are also treated differently in this empirical analysis while the previous two studies treat the impacts of these flows on RER as equal. This study also captures the dynamic relationship between RER and capital flows, while Authukorala and Rajapatirana (2003) investigate the nexus between RER and capital flows across countries in a static relationship, and Jongwanich (2008) investigates the impacts of capital flows on RER only for Thailand. Thus, this paper aims to improve and add new findings to the empirical literature on the issue of RER and capital flows.

The rest of the paper is organized as follows. Section II briefly looks at capital flows in emerging Asian countries. The movements of FDI and other forms of capital flows are shown as well as the simple relationship between net capital flows and RER. Section III sets out the analytical framework of RER determinants, while data and econometric procedure are discussed in Section IV. Results are provided in Section V, while the final section concludes with key findings and provides policy inferences.

II. Capital Flows in Emerging Asia: First Look

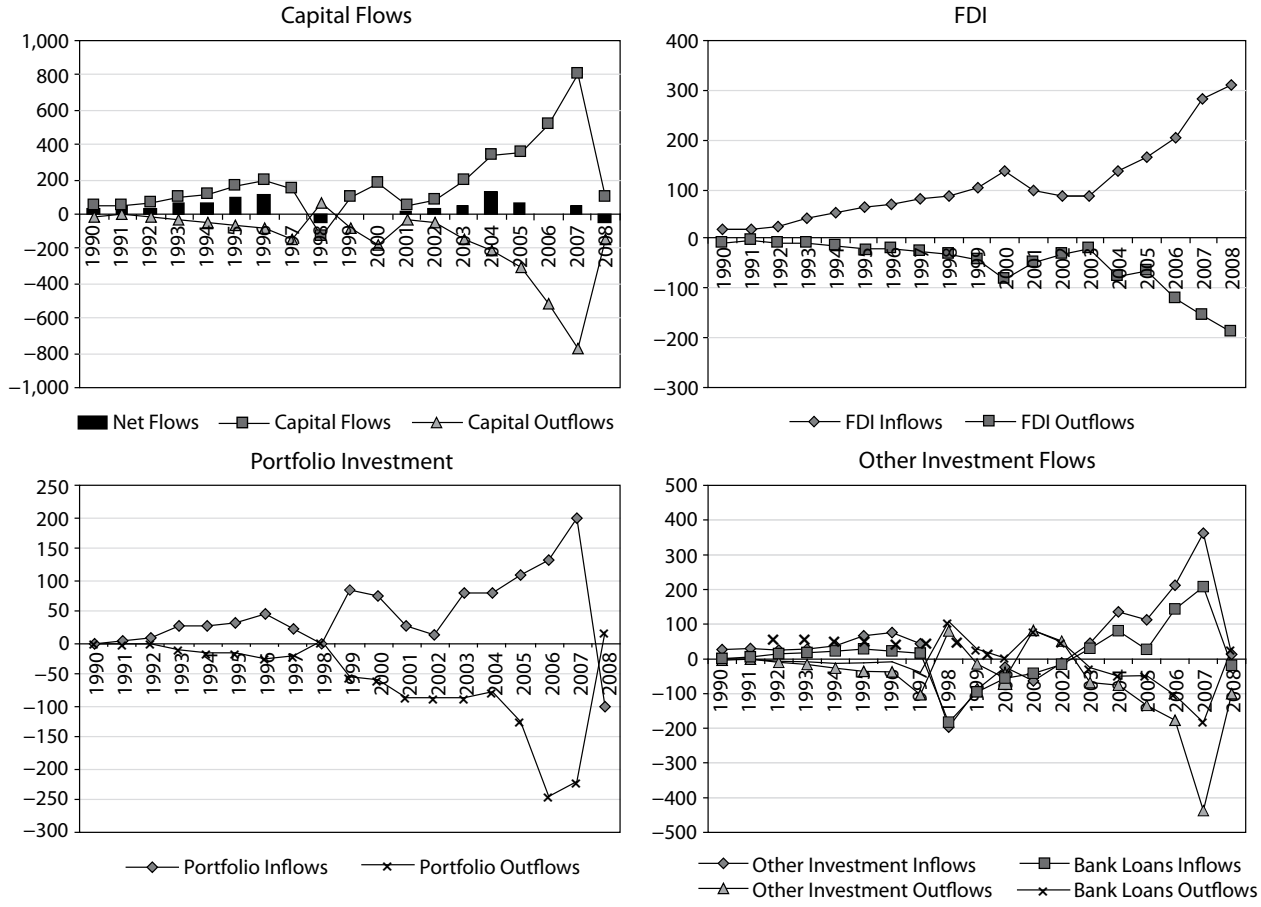
A. Trends and Patterns of Capital Flows

There have been two waves of capital inflows to emerging Asian countries over the past two decades. The first wave began in the latter half of the 1980s, gathered momentum in the early 1990s, then abruptly ended in 1997 because of the Asian financial crisis. The second wave began in 2002 up until 2007. The global financial crisis in late 2008 caused a slowdown in cross-border capital flows in developing Asia (Figure 1).[1] However,

[1] Note that capital flows can be divided into "net inflows" and "net outflows". Net inflows refer to capital that flows from abroad, which can be negative if foreigners are withdrawing their investments faster than new investments are coming in, and similarly for net outflows, which are investments made by domestic investors.

because of strong economic fundamentals, including healthy financial institutions and swift policy responses in the region, Asian economies, especially the PRC, recovered faster than other regions and capital flows have shown an increasing trend again since the second quarter of 2009 (see Appendix).

Figure 1: Capital Flows to/from Developing Asia, 1990–2008 (billion US$)



FDI = foreign direct investment.
Sources: International Financial Statistics (IMF 2009) and CEIC database, both downloaded May 2009.

After 2003, along with a substantial rise in capital inflows, capital outflows, both FDI and other forms of capital flows, became evident in the region. Gross capital outflows reached US$770 billion in 2007 (10.5% of gross domestic product [GDP]), from US$47 billion in 2002 (1.3% of GDP). Portfolio investment grew rapidly, especially in 2006–2007. Portfolio outflows increased to 3.5% of GDP in 2006–2007 (US$219 billion), from 2.4% of GDP in 2002 (US$86 billion). Apart from Hong Kong, China; Singapore; and Taipei,China, the PRC became an important portfolio investor in the region. In 2005–2007, portfolio outflows from the PRC increased to US$46 billion from US$15 billion in 2000–2002. Other investment (bank loans) outflows also increased substantially. Hong Kong,

China; Singapore; and the PRC were the key overseas investors in this type of capital outflows, respectively. Economic recovery, recycling huge foreign exchange reserves, and liberalization in capital outflows could be the key factors supporting portfolio and bank loan outflows.

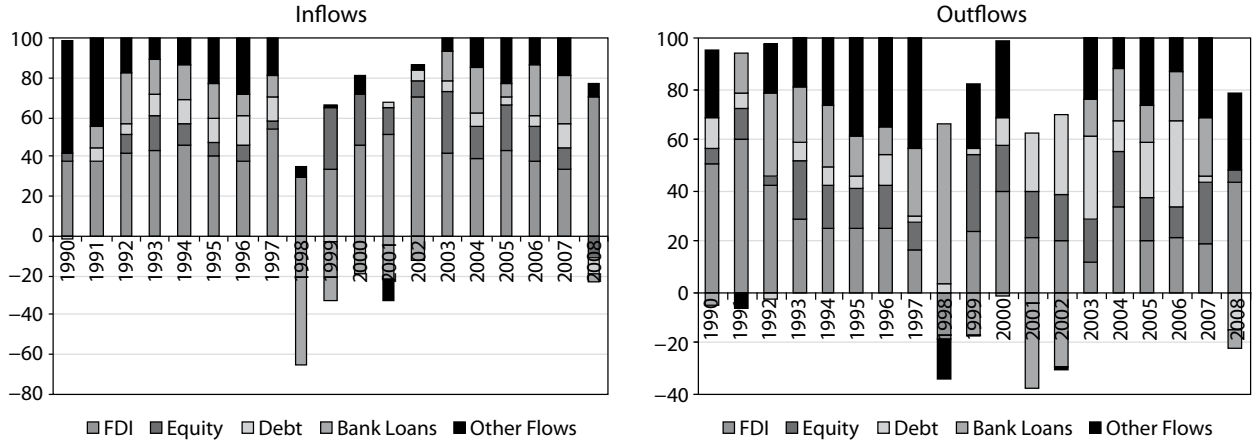
The amount of outward FDI also rose substantially to US$155 billion in 2007 (2.1% of GDP), up from US$33 billion in 2002 (0.9% of GDP). In addition to Singapore and Hong Kong, China, the PRC and India have become important overseas investors. The geography of outward FDI in the region was still concentrated in developing countries; i.e., in 2004 around 80% of total outward FDI went to developing countries, increasing from 69% in 1993. Market-seeking, efficiency-seeking, and resource-seeking FDIs were crucial components of outward FDI from the region. Meanwhile asset-augmenting FDI that mostly went to developed countries to acquire proprietary assets was limited and emanated mostly from emerging Asian countries such as Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China (Hill and Jongwanich 2009). Sovereign wealth funds (SWFs) are also beginning to play a bigger role in outward FDI through their growing involvement in mergers and acquisitions (M&A) (Park and Estrada 2009). The contribution of SWFs to total outward FDI increased from US$8 billion in 1987–2004 to US$31 billion in 2005–2007.

Even though outward FDI flows have increased substantially over the past decades, their contribution to total capital flows was lower than portfolio investment and bank loans (Figure 2). On average, FDI accounted only for less than 25% of total capital outflows in 2003–2007, compared to 43% for portfolio investment and 44% for other investment flows, including bank loans. This picture is consistent throughout the region, even among net overseas investors in terms of FDI like the Republic of Korea and Taipei,China. Note that the surge of capital outflows has limited the role of the financial account (net capital inflows) in supporting reserve accumulation after the 1997 Asian crisis. Reserve accumulation in the region was mostly supported by successive and huge current account surpluses in the region, especially in the PRC.

Among capital inflows, FDI accounted for a substantial proportion of total inflows in the region before and after the crises (Figure 2). The share of FDI in total capital inflows on average was around 40% in 1990–1996, increasing noticeably during the Asian crisis to 70% in 2002 because of the swift reversal of other forms of capital flows, especially bank loans, before moving back to the original level of 40% in 2003. Contribution of FDI to total capital inflows slightly varies among developing Asian countries. FDI has been a dominant composition of capital inflows in the PRC and India over the past decades while in Indonesia and Thailand, the composition of capital inflows started to shift from bank loans toward more FDI after the 1997 Asian financial crisis, accounting for almost 70% of total capital inflows in 2004–2008. In Malaysia and the Philippines, capital inflows shifted from bank loans toward portfolio investment after the Asian crisis and its contribution tended to be at par with FDI inflows. In contrast, after a significant reversal, bank loans

inflows again became a dominant composition of capital inflows in the Republic of Korea after the crisis. Note that FDI in developing Asia was mostly concentrated in the export-oriented manufacturing sector, except in India, where recently FDI inflows moved mostly toward the services sector.

Figure 2: Composition of Capital Flows in Developing Asia, 1990–2008 (percent)



FDI = foreign direct investment.
Note: During the periods where there was reversal of capital flows (either inflows or outflows), the absolute value of all components and composition of capital flows adds up to 100%.
Source: CEIC database, downloaded December 2009.

Portfolio equity has also become an important component of capital inflows in addition to FDI after the Asian crisis, while debt securities remain relatively less so. For the region as a whole, the contribution of portfolio equity on average increased to 22% during 2003–2007, up from less than 10% during the precrisis period. Meanwhile the contribution of debt securities was less than 10% in 2003–2007, slightly less than its contribution during the precrisis level. Bank loans were very volatile and registered as negative inflows during 1999–2002. However, they picked up in 2006–2007, especially in the PRC; India; the Republic of Korea; and Singapore in response to positive interest rate differentials and expected exchange rate appreciation. On average, during 2003–2007, bank loans accounted for 20% of total inflows, increasing slightly from the precrisis level.

Liberalized participation by nonresident investors as well as broadening and deepening of financial markets in economies of the Association of Southeast Asian Nations had a role in encouraging portfolio investment. Stock prices and market capitalization across the countries rose substantially during this period. However, the relatively small contribution of debt securities in the region was due to the still underdeveloped local currency bond market. Bond market capitalization (both public and private) were far lower than that of industrialized countries. However, a number of policy initiatives have been developed and undertaken to promote local currency bond markets such that inflows of debt securities increased. In 2007, debt securities contributed 13% of total capital inflows. Intraregional

portfolio flows increased during 2001–2006 in many Asian economies, especially in Indonesia; Hong Kong, China; and Singapore. However, for the whole region, portfolio shares—measured as the percentage of intraregional portfolio assets to total portfolio assets held by countries in the region—were still relatively low, i.e., 13% in 2006 up from 9% in 2001, compared to the emerging markets where the share was around 35% in 2006.

Another striking feature of capital flows after the 1997 Asian financial crisis is a higher contribution of M&A activities in FDI inflows. During the Asian crisis, an increase in cross-border M&A, or the well-known "fire-sale" phenomenon, was in response to falling asset prices, accompanied by a more liberal FDI regime and significant currency depreciation in the region. This situation is particularly true for crisis-affected countries in Southeast Asia, particularly in the Philippines where the share of M&A in total FDI inflows rose to 2.03 in 1997–1999, from 0.47 in 1991–1996.[2] The Asian financial crisis also encouraged fire-sale M&A in the Republic of Korea but because of the existing high level of M&A activity in the country, there was no significant jump in its contribution to total FDI inflows.

Mergers and acquisitions have also begun to play a more important role in inward FDI inflows in South Asia since the late 1990s, with most of the activities found in India. The total approved average annual M&A jumped noticeably from US$0.2 billion in 1991–1996 to around US$10 billion in 2006–2008, close to M&A activity in the PRC. However, compared to total FDI inflows, M&A activity tended to be pronounced and grew faster in India than in the PRC. Constraints from a number of supply side factors such as quality and quantity of infrastructure, investment climate, including political instability in the region, could have led to less participation of foreign investors in greenfield investment in India.

The contribution of M&A activities has also increased noticeably in outward FDI in the region. M&A tended to contribute to outward FDI more in middle-income countries, i.e., the PRC, India, and Southeast Asian countries than in high-income countries. Athukorala (2009), for example, points out that the number of acquisitions in India rose substantially over the past decade and that after 2004, foreign acquisitions by Indian firms have increased at a much faster rate compared to the average developing country experience. In 2007–2008, India ranked as the fourth largest overseas business acquirer among developing and transition economies, after Singapore, United Arab Emirates, and Russia. In high-income countries, greenfield investment tends to dominate the movements of outward FDI flows, especially in Taipei,China where the share of M&A in total outward FDI was less than 15% in 2000–2008, compared to more than 50% for middle-income countries. The increasing importance of M&A activities in the region could have an implication on the impacts of FDI on movements of RERs. In particular, the impact of FDI on RER could become closer to that of other forms of capital flows, especially portfolio investment.

[2] Note that the ratio of M&A to total FDI flows shown here provides only a rough idea of how greenfield investment is important in FDI dynamism in the region. Since the available data on FDI are generally of poor quality and not all countries record every component of FDI flows, the ratio of M&A to FDI in some countries exceed 1.

Table 1: Share of Cross-border Mergers and Acquisitions in Total FDI Flows, 1991–2008

	Sales/Total FDI Inflows						Purchases/Total FDI Outflows					
	1991–96	1997–99	2000–05	2006	2007	2008	1991–96	1997–99	2000–05	2006	2007	2008
World	0.67	0.86	0.85	0.77	0.83	0.37	0.59	0.87	0.90	0.80	0.76	0.33
Developed Economies	0.90	1.04	1.08	0.95	1.05	0.53	0.56	0.88	0.89	0.80	0.78	0.33
Europe	0.79	0.93	0.91	0.87	0.85	0.56	0.59	0.80	0.81	0.69	0.65	0.32
United States	1.11	1.14	1.45	0.97	1.62	0.46	0.54	1.04	2.66	1.08	1.05	0.35
Japan	9.82	1.18	2.19	-2.82	0.93	0.61	0.23	0.41	0.40	0.68	0.49	0.19
Developing Economies	0.23	0.46	0.40	0.40	0.34	0.15	0.35	0.59	0.73	0.73	0.63	0.33
Africa	0.21	0.94	0.42	0.54	0.26	0.32	0.96	3.26	2.31	3.39	0.52	1.11
Latin America	0.42	0.60	0.44	0.49	0.40	0.15	0.53	0.58	0.44	0.53	0.81	0.16
Asia	0.15	0.29	0.37	0.33	0.33	0.12	0.30	0.46	0.81	0.68	0.59	0.35
East Asia	0.18	0.26	0.37	0.30	0.24	0.07	0.20	0.36	0.56	0.37	0.23	0.25
People's Republic of China	0.03	0.14	0.29	0.16	0.15	0.03	0.49	1.17	2.34	0.70	0.20	0.51
Hong Kong, China	0.65	0.38	0.43	0.36	0.24	0.07	0.22	0.35	0.48	0.25	0.14	0.05
Korea, Rep. of	0.62	0.79	1.24	1.10	1.92	0.51	0.24	0.19	0.21	0.50	0.70	0.32
Taipei,China	0.25	0.63	0.74	0.83	0.71	0.22	0.05	0.22	0.13	0.06	0.17	0.09
South Asia	0.22	0.57	0.32	0.38	0.62	0.10	0.07	0.47	0.99	0.45	1.71	0.47
India	0.16	0.48	0.46	0.35	0.75	0.07	0.73	1.63	1.03	0.46	1.76	0.48
Southeast Asia	0.14	0.34	0.42	0.35	0.40	0.29	0.48	0.68	1.36	0.84	0.71	0.32
Indonesia	0.25	-2.04	0.97	0.20	0.58	0.31	0.33	3.97	3.36	0.22	0.39	0.04
Malaysia	0.09	0.28	0.52	0.46	0.55	0.31	0.88	0.77	1.73	0.60	0.43	0.14
Philippines	0.47	2.03	2.65	0.12	1.64	0.79	1.12	1.27	6.89	3.63	0.08	0.04
Singapore	0.12	0.15	0.21	0.37	0.33	0.43	0.47	0.62	1.23	1.09	1.03	0.76
Thailand	0.16	0.39	0.35	0.47	0.28	0.08	0.27	0.59	0.80	0.37	0.30	0.52

FDI = foreign direct investment.

Note: The negative figures shown in Indonesia (1997–1999) and Japan (2006) are a result of negative figures of total FDI inflows data.

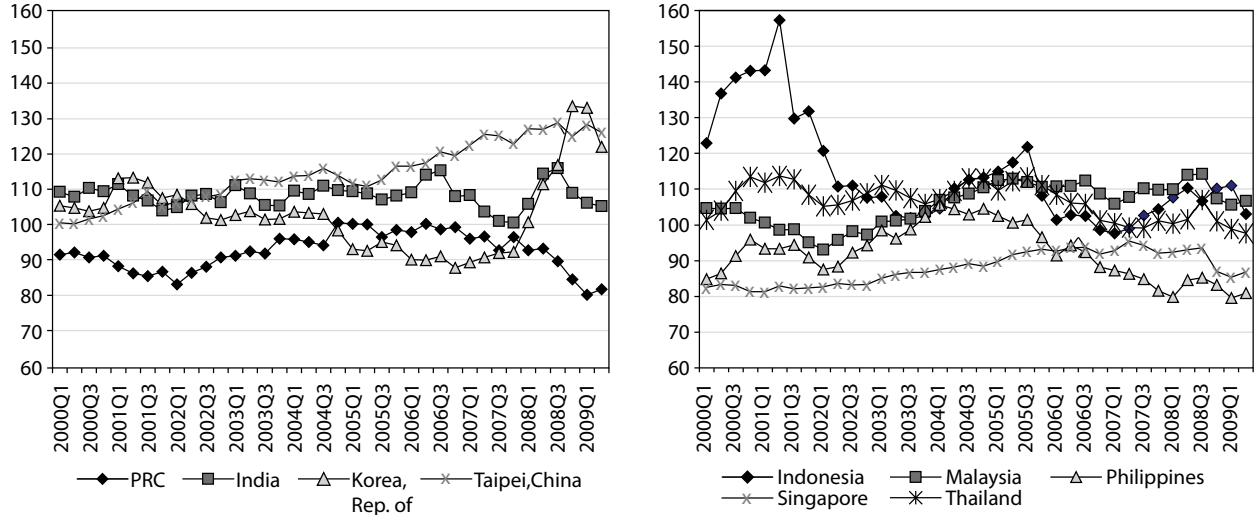
Sources: UNCTAD/TNC database, downloaded April 2009; author's calculations.

However, there was clear evidence that so far FDI has behaved differently compared to other forms of capital flow. Table 2 shows a lower coefficient of variation associated with FDI than that with portfolio and other investment flows (including bank loans). In particular, during the crisis period, volatility of FDI inflows in most of the Asian countries was still lower than 0.5, close to the precrisis period, while volatility of portfolio investment and other investment was in the range of 0.93–11.02 and 0.25–17.46, respectively. Likewise, during the current global financial crisis, volatility of FDI inflows was around 0.04–0.45 while that of portfolio and other investment was as high as 0.51–31.41 and 0–3.3, respectively. This pattern is also revealed in capital outflows. On average, volatility of FDI outflows was less than 0.5 during the crisis periods compared to portfolio and other investment, which was close to/higher than 1.[3]

B. Capital Flows and RER

After the 1997–1999 Asian financial crisis, movements of RER slightly diverged among emerging Asian economies. During 2003–2007, RER appreciated in the Republic of Korea and the Philippines but depreciated in Singapore and Taipei,China. In Indonesia and Thailand, the appreciation began in late 2005, following a slight depreciation since 2003. For the PRC, India, and Malaysia, RER was rather stable and moved within a narrow rage, i.e., 10 percentage points. The global financial crisis made trends of RER change in some countries. In the Republic of Korea particularly, RER depreciated noticeably by 44% in 2008 as real appreciation became evident in the PRC and other Asian countries, with the higher rate of appreciation registering in the PRC and India. Note that RER in the Republic of Korea began to show an appreciation trend in the first quarter of 2009.

Figure 3: Real Exchange Rate in Selected Asian Countries, 2000−2009 (1990=100)



Source: Author's calculations.

[3] Note that this was an exception for Indonesia in the Asian crisis where the sharp reversal of FDI inflows during the crisis period pushed the volatility of FDI to be higher than portfolio investment. In addition, volatility of FDI outflows was higher than other flows during the global crisis in Singapore. This would be a result of FDI outflows, mostly in the form of M&A, declining much more and faster than portfolio and bank loan outflows.

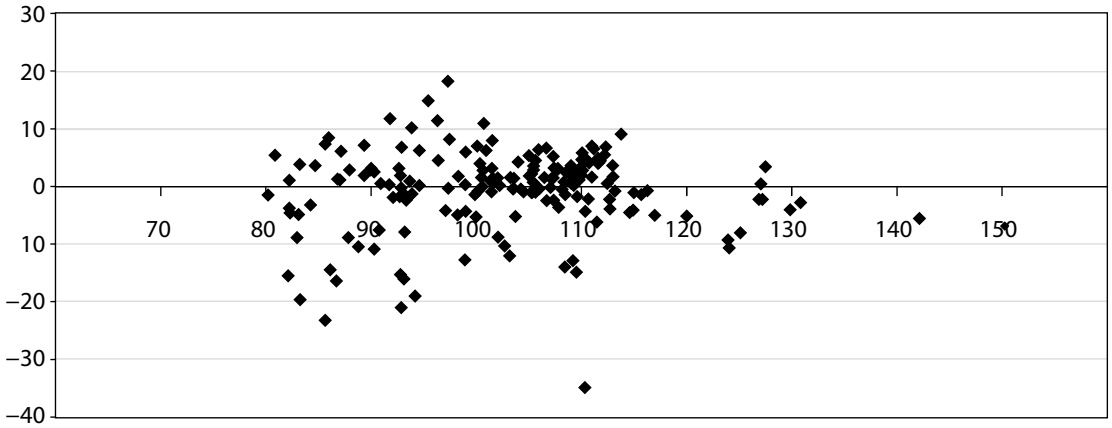
Table 2: Volatility of Capital Flows, 1990–2008

Inflows	FDI				Portfolio				Other Investment			
	1990–96	1997–99	2000–06	2007–08	1990–96	1997–99	2000–06	2007–08	1990–96	1997–99	2000–06	2007–08
Total	**0.52**	**0.16**	**0.33**	**0.07**	**0.79**	**0.96**	**0.55**	**4.35**	**0.51**	**3.05**	**1.71**	**1.31**
PRC	0.70	0.06	0.29	0.05	0.83	1.60	1.06	0.51	3.92	3.98	1.01	2.05
Hong Kong, China		1.22	0.57	0.10		2.17	1.60	2.33		0.36	6.06	2.10
Korea, Rep. of	0.55	0.64	0.53	0.23	0.77	0.80	0.44	11.41	0.88	17.46	2.36	1.29
Indonesia	0.68	1.76	4.37	0.09	1.07	11.02	1.23	0.76	0.99	1.09	0.42	1.65
India	1.08	0.23	0.78	0.35	1.18	0.93	0.67	3.54	0.68	0.25	1.07	
Malaysia	0.23	0.34	0.49	0.04	1.00	1.71	3.42	1.41	1.70	1.25	5.78	
Philippines	0.56	0.32	0.71	0.45	1.34	1.11	1.20	31.41	0.49	1.48	1.47	7.29
Singapore	0.49	0.35	0.36	0.04	1.36	1.09	1.05	2.68	0.94	1.57	0.85	0.00
Taipei,China	0.26	0.63	0.79	0.25	0.67	1.48	0.54	2.69	0.71	0.80	0.72	0.64
Thailand	0.18	0.45	0.40	0.08	0.91	1.11	1.63	20.63	0.44	1.48	1.15	3.29
Outflows	**FDI**				**Portfolio**				**Other Investment**			
	1990–96	1997–99	2000–06	2007–08	1990–96	1997–99	2000–06	2007–08	1990–96	1997–99	2000–06	2007–08
Total	**0.43**	**0.29**	**0.51**	**0.13**	**0.89**	**1.01**	**0.57**	**1.68**	**0.79**	**4.06**	**1.71**	**0.88**
PRC	0.60	0.18	1.21	0.73	0.66	1.16	1.62	1.63	0.83	0.69	1.46	0.25
Hong Kong, China		1.16	0.67	0.01			0.19	0.85		1.39	21.31	3.02
Korea, Rep. of	0.61	0.05	0.44	0.12	1.26	2.37	0.93	3.49	0.72	1.70	2.17	0.23
Indonesia	0.98	0.77	0.13	0.16			2.15	0.77		1.22	2.28	0.54
India	1.46	0.70	1.38	0.02					4.52	0.61	3.30	
Malaysia		2.00	0.76	0.18		2.00	1.31	1.41	1.61	1.53	0.46	1.41
Philippines	1.01	0.15	1.28	1.24	1.42	1.60	0.72	0.13	2.65	3.09	3.24	11.31
Singapore	0.79	0.50	0.71	0.22	0.96	0.17	0.30	0.14	0.83	0.78	0.75	0.14
Taipei,China	0.38	0.15	0.15	0.05	0.72	0.23	0.52	1.64	1.29	3.86	50.76	5.19
Thailand	0.82	0.69	0.88	0.29	2.05	2.01	1.62	0.86	3.09	2.13	2.22	3.30

FDI = foreign direct investment.
Note: Coefficient of variation is measured by dividing standard deviation by mean.
Source: Author's estimates.

The scatter plot in Figure 4 between net capital flows and RER in emerging Asian countries during the first half of 2000–2009 shows no systemic relationship between these two variables. Such evidence obviously calls for the quantitative analysis to provide concrete evidence of the relationship between these two variables. In addition to noninclusion of other factors that can determine the movements of RER, lumping all types of capital flows together could blur the relationship between these two variables. While FDI is concentrated mostly in the tradable sectors, i.e., export-oriented industry, and is relatively stable than other form of capital flows, it would be possible that RER appreciation associated with other forms of capital flows would be larger than that associated with FDI. In addition, if capital outflows, especially FDI, could help to upgrade productivity in the tradable sector, capital outflows may result in real appreciation. Lumping inflows and outflows could also blur the relationship of RER and capital flows.

Figure 4: RER and Net Capital Flows, 2000–2009



RER = real exchange rate.
Note: X-axis represents RER (1990=100) and Y-axis represents net capital flows (percentage of GDP).
Source: Author's calculations.

III. Determinants of Real Exchange Rate: Analytical Framework

The RER is determined here based on the internal and external balance approach. RER is defined as the relative prices of tradable to nontradable goods that result in the simultaneous attainment of *internal* and *external* equilibria (Edwards 1989). *Internal* balance is the situation in which demand for and supply of nontradable goods are equal, as shown in the following equation.

$$y_N(RER) = c_N + g_N = (1-\theta)RER \bullet c + g_N \quad (1)$$

where y_N is the supply of nontradable goods ($\frac{\partial y_N}{\partial RER} < 0$); c_N and g_N are private and government spending on nontradable goods, respectively; θ is the share of total private spending on tradable goods; and c is total private spending in terms of tradable goods. Equation (1) depicts the relationship between *RER* and *c* that is consistent with the internal balance. Starting from a position of internal balance, a rise in *c* creates excess demand for nontradable goods so that the real appreciation (decrease in *RER*) is required to restore balance. Such real appreciation would switch resources toward nontradable goods and create demand for tradable goods. This implies a negative relationship between *c* and *RER*.

The *external balance* implies reaching the steady state of change in total net foreign asset ($\dot{f}$) in the economy. The change in net foreign asset is defined as follows:

$$\dot{f} = y_T(RER) - \theta c - g_T + rf \qquad (2)$$

where y_T is supply of tradable goods ($\frac{\partial y_T}{\partial RER} > 0$), *rf* is the real yield on foreign assets, and g_T is government spending in tradable goods.[4] When the net foreign asset reaches steady state (i.e., $\dot{f}$ = 0), equation (2) can also trace out the relationship of *RER* and *c*. Starting from a position of external balance, a rise in *c* causes a current account deficit. The real depreciation is required to switch resources toward the tradable sector and create demand for nontradable goods to restore external balance. This reveals a positive relationship between *RER* and *c*.

Solving equations (1) and (2) yields the determinants of RER as shown in equation (3):

$$RER = e(g_N, g_T, rf^*) \qquad (3)$$
$$\quad\;\; - \quad + \quad -$$

Since f^* is determined at the steady-state equilibrium, it is unobserved data. Under the assumption of credit ceiling constraint, f^* become exogenous and at the external equilibrium, the negative value of rf^* ($-rf^*$) equals the country's current account balance net of interest transfer (Baffes et al. 1999). A widening current account deficit implies that the country relies on higher net foreign capital inflows (*NFC*) to maintain external balance. The (equilibrium) RER must appreciate in order to restore equilibrium.

There are, however, strong reasons to hypothesize that the degree of RER appreciation would vary among different types of capital flows. A number of empirical studies (e.g., Ito 2000, Lipsey 2000, Athukorala and Rajapatirana 2003) argue that the appreciation of RER associated with net FDI inflows could be smaller than that associated with portfolio and bank lending flows. Compared to other flows, FDI has a general tendency

[4] See more details in Hinkle and Montiel (1999).

to concentrate more on the tradable goods sector and export-oriented industry. The pressure on RER appreciation into nontradable prices relating to FDI activity is expected to be lower than that relating to other forms of capital flows. In addition, the speed of RER appreciation could vary among different types of capital flows. Table 2 clearly shows that FDI flows are relatively stable compared to portfolio and other investment flows. It is plausible to hypothesize that the speed of RER appreciation associated with other forms of capital flows would be faster than FDI. For these reasons, net capital inflows are separated into FDI, portfolio investment (*PORT*), and other investment (bank loans) (*OTHIN*).

While the speed of capital inflows and outflows tends to be different, with the latter gathering momentum after 2003, it is plausible to hypothesize that inflows and outflows would result in a different degree of RER adjustment. A significant building up of capital outflows in the 2000s may lead to a stronger relationship of these flows and RER than capital inflows. Particularly in terms of FDI, the sign associated with outward FDI and inward FDI could be different, especially when the former can bring technological advantage back home (to the FDI-exporting country). The RER could appreciate more when a country exports capital in terms of FDI. For these reasons, this study also separates net capital flows into capital inflows and outflows for all three types of capital flows (FDI, PORT, and OTHIN) to test whether they provide different implications on RER movements.

In addition to capital flows, equation (3) can be extended to capture other variables that shift the internal and external balance and affect the RER. Another three key variables—which are conventionally the set of fundamentals suggested by previous studies in determining the (equilibrium) RER—are included in this study. These are productivity differentials (*PROD*), terms of trade (*TOT*), and trade policy (*OPEN*).[5]

From equation (3), government spending on tradable (G_N) and nontradable (G_T) sectors affects the RER in a different direction so that it seems to be appropriate to include both G_N and G_T in the RER function. However, there is no data available for these countries to separate government spending into tradable and nontradable goods. The ratio of total government spending to GDP (*GSPEND*) is, therefore, used as a proxy for the government side. Since government spending tends to be relatively more intensive in nontradable goods, the negative relationship between *GSPEND* and RER is expected.

Differences in the rate of productivity growth in tradable-good production of a country compared to that of the main trading partner countries (*PROD*) is a potential factor that affects the RER. An increase in *PROD* will raise the demand for labor employed in the tradable sector. Under full employment condition, labor must be drawn from the nontradable sector toward the tradable one, which puts pressure on the wage rate in the nontradable sector. This causes the RER to appreciate to restore both internal

[5] See Edwards (2000) and the works cited therein.

and external balance. Thus, the RER has a negative relationship with productivity improvement in tradable good production. This is known as the Harrod-Balassa-Samuelson effect (Obstfeld and Rogoff 1996).

Terms of trade *(TOT*), the ratio of export to import prices, is included to capture exogenous changes in world prices that will affect the RER. An exogenous increase in export prices relative to import prices improves the country's terms of trade. *TOT* improvement generates an income effect, which increases domestic demand. To restore internal and external balances, nontradable prices have to increase relative to tradable prices (*RER* appreciation) in order to switch the demand from nontradable toward tradable goods. This effect, however, could be counterbalanced by a substitution effect where demand for tradable goods increases from relatively lower import prices, and leads to an overall real depreciation. Thus, in theory, the relationship between the *RER* and *TOT* is ambiguous. However, a sizable empirical literature has found that in developing countries, an improvement in *TOT* tends to cause appreciation in the *RER* because the income effect generally tends to overwhelm the substitution effect (Elbadawi 1994, Baffes et al. 1999).

The third variable considered here is trade openness (*OPEN*). A shift in a country's trade policy toward greater liberalization leads to an increase in demand for tradable goods. The RER is required to depreciate in order to switch the demand from tradable goods toward nontradable goods and then restore internal and external balance. Thus the *RER* is hypothesized to have a positive relationship with the degree of trade liberalization.

When these variables are incorporated, the RER function takes the form

$$RER_{i,t} = f\left[\underset{(-)}{GSPEND_{i,t}}, \underset{(?)}{FDI_{i,t}}, \underset{(-)}{PORT_{i,t}}, \underset{(-)}{OTHIN_{i,t}}, \underset{(-)}{PROD_{i,t}}, \underset{(?)}{TOT_{i,t}}, \underset{(+)}{OPEN_{i,t}}\right] \quad (4)$$

where $RER_{i,t}$ = RER of country *i* at time *t*

$GSPEND_{i,t}$ = government spending of country *i* at time *t*

$FDI_{i,t}$ = net flows of foreign direct investment of country *i* at time *t*

$PORT_{i,t}$ = net flows of portfolio investment of country *i* at time *t*

$OTHIN_{i,t}$ = net flows of other investment flows (bank loans) of country *i* at time *t*

$PROD_{i,t}$ = difference in the rate of productivity growth in tradable-good production of a country *i* at time *t* compared to that of the main trading partner countries

$TOT_{i,t}$ = terms of trade of country *i* at time *t*

$OPEN_{i,t}$ = trade openness of country *i* at time *t*

IV. Data and Econometric Procedure

Based on data availability, the empirical model is estimated by including nine emerging Asian countries, namely the PRC; India; Indonesia; the Republic of Korea; Malaysia; Philippines; Singapore; Taipei,China; and Thailand during the period 2000–2009. To capture well the dynamic relationship between RER and capital flows, biannual data are used. Applying biannual data instead of quarterly or monthly data has two reasons. First, there is no quarterly capital flow data in the PRC, and only biannual data are available for FDI, portfolio investment, and other investment flows. Second, biannual data, to some extent, could redress business cycle fluctuations associated with data series.

A. Data

The RER is generally defined as the ratio of the domestic price of tradable (P_T) to nontradable goods (P_N). With the unavailability of indices for both tradable and nontradable prices, the RER has to be proxied by available domestic and world price indices and nominal exchange rate. There is no unique way of constructing a proxy measure, but all commonly used measures in empirical studies are defined as:

$$RER = \frac{\prod_{i=1}^{m}\left[E_i P_i^w\right]^{\omega_i}}{P^d} \tag{5}$$

where E denotes the nominal exchange rate (measured as domestic currency per foreign currency), P^w is an index of foreign prices, P^d is an index of domestic prices, and m is number of trading partner countries. The geometric averaging method is used where ω_i is the appropriate weight for each foreign country and the sum of weights must equal one or $\Sigma\omega_i = 1$. There is no unique measure for foreign prices. However, by construction, the wholesale price index (WPI) or producer price index contains a higher proportion of tradable prices than the consumer price index (CPI). This study applies WPI as a proxy of foreign prices (P^w). A number of previous studies apply CPI as a proxy of world prices because of data consistency and because it is mostly available for all countries. This study also uses CPI as an alternative to proxy world prices. Domestic prices (P^d) are proxied by CPI. Trade weight is employed as the appropriate weight in this study. All in all, there are two series of RER in this study, namely RER (WPI-CPI) and RER (CPI-CPI).

Net capital flows is divided into FDI, portfolio investment, and other investment and are measured as a percentage of GDP. The productivity differentials (PROD) or Harrod-Balassa-Samuelson effect is measured as the ratio of a country's real GDP per capita (US$ prices) to its key trading partners.[6] An increase in this variable implies productivity improvement in the host country, compared to its key trading partners. The price of

[6] Note that because of data limitations, productivity differentials are measured in terms of a country's real GDP per capita.

exports relative to the price of imports is the TOT variable. The sum total value of exports and imports divided by (nominal) GDP is used as a proxy for trade policy openness (*OPEN*). An increase in OPEN variable reflects a higher degree of trade liberalization.

Government spending, nominal exchange rate, producer price and consumer price index, nominal GDP, and all types of capital flows are compiled from the International Monetary Fund's International Financial Statistics online database. Real GDP in US dollar terms, all types of capital flows in the PRC, prices of exports and imports, and exports and imports value are from CEIC Data Company, Ltd. For RER, the trade weight of key trading partners is compiled from the World Bank's Direction of Trade Statistics, while population is compiled from World Development Indicators.

B. Econometric Procedure

To capture the dynamic relationship between the RER, capital flows, and other independent variables, the dynamic panel-data model is applied for nine emerging Asian countries for 2000–2009. The dynamic panel-data model of RER function is shown in equation (6):

$$RER_{i,t} = \alpha_0 + \sum_{j=1}^{m} \alpha_{1,j} RER_{i,t-j} + \sum_{j=1}^{m} \alpha_{2,j} GSPEND_{i,t-j} + \sum_{j=1}^{m} \alpha_{3,j} FDI_{i,t-j} + \sum_{j=1}^{m} \alpha_{4,j} PORT_{i,t-j} + \sum_{j=1}^{m} \alpha_{5,j} OTHIN_{i,t-j} + \sum_{j=1}^{m} \alpha_{6,j} PROD_{i,t-j} + \sum_{j=1}^{m} \alpha_{7,j} TOT_{i,t-j} + \sum_{j=1}^{m} \alpha_{8,j} OPEN_{i,t-j} + u_{i,t} + \varepsilon_{i,t} \quad (6)$$

where *i* represents the country and *t* represents time dimension. To resolve the problem of time-invariant country characteristics (fixed effects, $u_{i,t}$), a fixed-effect panel model can be applied. However, estimating equation (6) with a fixed-effect panel model could result in bias in the regression results. For example, with the first lag of all variables in the model, the first differences in equation (6) yields:

$$\Delta RER_{i,t} = \alpha_0 + \alpha_1 \Delta RER_{i,t-1} + \alpha_2 \Delta GSPEND_{i,t} + \alpha_3 \Delta FDI_{i,t} + \alpha_4 \Delta PORT_{i,t} + \alpha_5 \Delta OTHIN_{i,t} + \alpha_6 \Delta PROD_{i,t} + \alpha_7 \Delta TOT_{i,t} + \alpha_8 \Delta OPEN_{i,t} + \Delta \varepsilon_{i,t} \quad (7)$$

Although fixed effects $u_{i,t}$ are gone from the model, the $RER_{i,t-1}$ in $\Delta RER_{i,t-1}$ is a function of the $\varepsilon_{i,t-1}$, which is also a part of $\Delta \varepsilon_{i,t}$. This implies that $\Delta RER_{i,t-1}$ is correlated with $\Delta \varepsilon_{i,t}$ by construction. To solve this problem, Arellano and Bond (1991) show how to construct estimators based on a moment equation constructed from further lagged levels of $RER_{i,t}$ and the first differenced error terms. The general method of moments (GMM) is applied using a further lagged level of $RER_{i,t}$ as instruments. While all types of capital flows could be simultaneously determined by movements of RER, a further lagged level of these variables is used as instrument in estimating equation (7). The Sargan test and

Arellano-Bond test are applied to ensure the appropriateness of instruments and to avoid serial correlation in disturbance terms. Note that after the Sargan test, the Huber/White methodology is applied for robust standard errors to adjust for any heteroskedasticity problem. Dummy variables for time dimensions are also included to redress the problem of unobservable events occurring along with different time periods, i.e., period-specific effects.

V. Results

Tables 4 and 5 report the estimation results based on the dynamic panel-data model. The estimation result reported in Table 3 is based on the RER that uses wholesale (producer) price index as a proxy of world prices, i.e., RER (WPI-CPI) while in Table 4, consumer price index is applied to construct the RER, i.e., RER (CPI-CPI). There are three columns in both Tables 3 and 4. Column A shows the estimation result based on equation (7), including lagged dependent and independent. Column B reports the estimation results when net capital flows of all types (FDI, portfolio, and other investment) are divided into inflows and outflows. Column C reports estimation results where impacts of capital flows, especially FDI, in some countries tend to vary significantly from the estimated result provided in Column A. Sargan tests show the models do not encounter the overidentifying restrictions for instrument variables while the Arellano-Bond tests also show that there is no serial correlation problem in the disturbance terms.[7]

Table 3, column A shows that the speed of RER adjustment associated with different types of capital flows differs. While an increase in net portfolio capital flows and other investment flows (including bank loans) would immediately/simultaneously result in RER appreciation, the effect of FDI on RER would occur with a time lag. The estimation result clearly shows the statistical insignificance of net FDI flows on RER in the first period, but the relationship between these two variables becomes statistically significant in the following period. This is in contrast to the results shown for net portfolio investment and other investment flows in which a 1% increase in these net inflows leads to an immediate appreciation of RER by 0.15% and 0.10%, respectively.

[7] Note that the results slightly change when all types of capital flows are treated as exogenous variables. It is plausible to assume simultaneity between capital flows and RER, so the results reported here use instrument variables (through GMM) to redress the simultaneity problem. Note also that the dummy of the current global financial crisis is also included in the empirical model, but it turns out to be statistically insignificant, with positive coefficient. The dummy is dropped from the regression result.

Table 3: Estimation Results—RER Based on Wholesale Price Index

RER (WPI-CPI)	Column A	Column B	Column C
Intercept	1.55 (3.20*)	1.34 (6.25*)	1.18 (4.37*)
1st lag real exchange rate (RER_{t-1})	0.73 (5.90*)	0.71 (7.00*)	0.75 (8.22*)
2nd lag real exchange rate (RER_{t-2})	−0.15 (−2.04**)	−0.08 (−1.10)	−0.08 (−1.21)
Productivity differences ($PROD_t$)	−0.13 (−3.80*)	−0.18 (−4.16*)	−0.20 (−4.12*)
Government spending ($GSPEND_t$)	−0.09 (−2.32**)	−0.04 (−0.74)	0.002 (0.03)
Terms of trade (TOT_t)	−0.12 (−1.86***)	0.04 (0.43)	−0.008 (−0.11)
Trade openness ($OPEN_t$)	0.19 (2.40*)	0.18 (3.55*)	0.12 (2.88*)
Net portfolio flows (% of GDP) ($PORT_t$)	−0.15 (−1.86***)		0.003 (0.06)
Portfolio inflows (% of GDP) ($PORTINFLOWS_t$)		0.07 (−1.24***)	
Portfolio outflows (% of GDP) ($PORTOUTFLOWS_t$)		−0.15 (−1.85***)	
1st lag net portfolio flows (% of GDP) ($PORT_{t-1}$)	0.12 (1.29)		
Other investment flows (% of GDP) ($OTHIN_t$)	−0.10 (−2.14**)		−0.10 (−3.04*)
Other investment inflows (% of GDP) ($OTHINFLOWS_t$)		0.06 (1.95***)	
Other investment outflows (% of GDP) ($OTHOUTFLOWS_t$)		−0.15 (−4.39*)	
1st lag other investment flows (% of GDP) ($OTHIN_{t-1}$)	−0.02 (−0.32)		
Net FDI flows (% of GDP) (FDI_t)	−0.05 (−0.58)		
1st lag net FDI flows (% of GDP) (FDI_{t-1})	−0.14 (−1.86***)		−1.33 (−2.67*)
1st lag FDI inflows (% of GDP) ($FDIINFLOWS_{t-1}$)		−0.15 (−1.42***)	
1st lag FDI outflows (% of GDP) ($FDIOUTFLOWS_{t-1}$)		−0.24 (−3.57*)	
FDI_{t-1}*DumINDIA			0.31 (0.29)
FDI_{t-1}*DumINDONESIA			0.10 (0.25)
FDI_{t-1}*DumKOREA			−0.62 (−0.78)

continued.

Table 3. *continued.*

FDI_{t-1}*DumMALAYSIA			0.66 (1.03)
FDI_{t-1}*DumPHILIPPINES			1.44 (3.10*)
FDI_{t-1}*DumSINGAPORE			1.23 (2.33*)
FDI_{t-1}*DumTAIPEI,CHINA			3.40 (4.32*)
FDI_{t-1}*DumTHAILAND			1.30 (2.41*)
Observations	143	130	143
Overall fit for the regression Wald chi-square	225.4* (P>chi2 = 0.00)	375.2* (P>chi2 = 0.00)	345.6* (P>chi2 = 0.00)
AB test for autocorrelation	AR(2) = 1.93 AR(3) = –1.91 AR(4) = –0.39	AR(2) = 1.93 AR(3) = –1.86 AR(4) = –0.31	AR(2) = 1.91 AR(3) = –0.90 AR(4) = –0.24
Sargan test	Chi2 (72) = 83.50 (P>chi2 = 0.17)	Chi2 (100) = 106.35 (P>chi2 = 0.31)	Chi2 (110) = 120.15 (P>chi2 = 0.24)

* = 1% statistical significance; ** = 5% statistical significance; *** = 15% statistical significance.
Note: Value in parenthesis is t-statistics.
Source: Author's estimation.

The slower adjustment of the RER associated with FDI than RER associated with other forms of capital flows could result from the nature of FDI flows, which is relatively more stable than other forms of capital flows (Table 1). In addition, because FDI flows tend to concentrate more in tradable good sectors and export-oriented industry, the pressure of flows on nontradable prices tends to be slower than that arising from the other forms of capital flows. However, the magnitude of RER appreciation associated with FDI, even with a time lag, tends to be close to that associated with portfolio investment flows. A 1% rise in net FDI inflows results in an appreciation of the RER in the following period by 0.14%, compared with 0.15% arising from portfolio investment flows. The closer magnitude of real appreciation between these two flows could result from the fact that after the Asian crisis, M&A activities have become a more important component of FDI flows, both inflows and outflows, especially in the PRC, India, and Southeast Asian countries. Particularly, on average, the share of M&A activities in outward FDI was higher at 0.86 in 2000–2008. Taipei,China was an exception as outward FDI was dominated by greenfield investment, and the share of M&A activity in outward FDI was only 0.11 in 2000–2008.

Table 3, column B shows further that during the estimation period, capital outflows dominate the movements of the RER, instead of capital inflows. For portfolio investment, the coefficient associated with outflows is double that associated with inflows. A 1% rise in portfolio inflows results in RER appreciation by 0.07%; a 1% increase in portfolio outflows leads to depreciation of the RER by 0.15%. This evidence is also found in FDI flows and other investment flows. Particularly for other investment flows, the strong

relationship, with an expected sign, is found only between RER and capital outflows, i.e., a 1% increase of other investment flows leads to a 0.15% depreciation of the RER. By contrast, capital inflows of other investments (including bank loans) are associated with a real depreciation of 0.06. The strong effect of capital outflows on the RER during this period could result from financial liberalization in capital outflows, recycling of huge capital inflows, as well as huge current account surplus in the region. Capital outflows have been built up dramatically during this period.

Likewise, outward FDI dominates the movements of the RER, compared to inward FDI. A 1% rise in FDI outflows is associated with a 0.24% depreciation of the RER in the following period, and a 0.15% appreciation in response to a 1% increase in FDI inflows. The different proportion of FDI components could explain the different responses of exchange rates to FDI inflows and outflows. While in most emerging Asian countries capital inflows are dominated mostly by greenfield investment (even though declining), capital outflows are dominated by M&A activities. It seems also that M&A activities could not bring in enough productivity improvement in the home country to offset the usual effect of capital on exchange rate movements. In addition to market-seeking FDI and efficiency-seeking FDI, recycling excess savings in the region and liberalization policy in overseas investment (e.g., in India in the early 2000s) led to a noticeable rise in FDI outflows. All in all, the stronger effect of capital outflows compared to capital inflows on the exchange rate seems to be one of the reasons why the RER in the region after 2003 (see Figure 3) tended to move within a narrow range.

While composition of FDI flows, i.e., greenfield or M&A activities, could have implications on exchange rate movements, doubt surfaces when the coefficient associated with FDI in Table 3 columns A and B for all emerging Asian countries emerges, particularly in Taipei,China where M&A activities are far lower than other emerging countries. The slope dummy variables associated with lag FDI flows for each country, using the PRC as a benchmark, are included in the model and results are reported in Table 3 column C. One interesting result revealed from this regression is the positive and statistical significance of the slope dummy variable for Taipei,China. The coefficient (3.40) is far higher than the coefficient of the benchmark country (–1.33). Thus, in Taipei,China, a rise in net FDI flows seems to result in real depreciation, instead of real appreciation. For other countries, the negative relationship between net FDI flows and RER is found, with a lower magnitude found in Southeast Asian countries than in the PRC and India. It is noteworthy that there is no significant difference in coefficients associated with net portfolio inflows and net other investment inflows as slope dummy variables associated with these flows for each country do not yield statistical differences.

The relationship of these capital flows with RER is virtually unchanged when a different measure of RER, i.e., RER (CPI-CPI) is applied. The results in Table 4 are similar to those in Table 3. From these two tables, productivity differences, government spending, and trade openness are statistically significant and have an expected sign in determining

the RER. An improvement in productivity compared to trading partners and a rise in government spending result in RER appreciation while a higher degree of trade liberalization is associated with real depreciation. The results imply that the huge fiscal stimulus recently implemented in these emerging countries to redress the impacts of the global crisis would bring about real currency appreciation, other things being equal. A negative relationship between TOT and RER is observed, reflecting a stronger income effect rather than substitution effect in RER movements.

Table 4: Estimation Results—RER Based on Consumer Price Index

RER (CPI-CPI)	Column A	Column B	Column C
Intercept	1.74 (3.51*)	1.40 (6.41*)	1.32 (4.87*)
1st lag real exchange rate (RER_{t-1})	0.70 (5.43*)	0.70 (6.61*)	0.74 (7.82*)
2nd lag real exchange rate (RER_{t-2})	−0.14 (−1.87**)	−0.08 (−1.10)	−0.08 (−1.21)
Productivity differences ($PROD_t$)	−0.13 (−3.27*)	−0.18 (−4.38*)	−0.20 (−4.15*)
Government spending ($GSPEND_t$)	−0.08 (−2.28**)	−0.04 (−0.76)	−0.002 (−0.03)
Terms of trade (TOT_t)	−0.10 (−1.75**)	0.02 (0.26)	−0.02 (−0.27)
Trade openness ($OPEN_t$)	0.22 (2.62*)	0.19 (3.62*)	0.13 (3.07*)
Net portfolio flows (% of GDP) ($PORT_t$)	−0.16 (−2.01**)		−0.01 (−0.08)
Portfolio inflows (% of GDP) ($PORTINFLOWS_t$)		−0.08 (−1.36***)	
Portfolio outflows (% of GDP) ($PORTOUTFLOWS_t$)		−0.16 (−2.02**)	
1st lag net portfolio flows (% of GDP) ($PORT_{t-1}$)	0.11 (1.17)		
Other investment flows (% of GDP) ($OTHIN_t$)	−0.10 (−1.97**)		−0.11 (−3.53*)
Other investment inflows (% of GDP) ($OTHINFLOWS_t$)		0.06 (1.82**)	
Other investment outflows (% of GDP) ($OTHOUTFLOWS_t$)		−0.17 (−4.75*)	
1st lag other investment flows (% of GDP) ($OTHIN_{t-1}$)	−0.03 (−0.60)		
Net FDI flows (% of GDP) (FDI_t)	−0.05 (−0.60)		
1st lag net FDI flows (% of GDP) (FDI_{t-1})	−0.17 (−2.02**)		−1.25 (−2.50*)

continued.

Table 4. *continued.*

1st lag FDI inflows (% of GDP) ($FDIINFLOWS_{t-1}$)		−0.16 (−1.42***)	
1st lag FDI outflows (% of GDP) ($FDIOUTFLOWS_{t-1}$)		−0.25 (−4.09*)	
FDI_{t-1}*DumINDIA			0.12 (0.12)
FDI_{t-1}*DumINDONESIA			−0.05 (−0.13)
FDI_{t-1}*DumKOREA			−0.59 (−0.74)
FDI_{t-1}*DumMALAYSIA			0.53 (0.82)
FDI_{t-1}*DumPHILIPPINES			1.37 (2.90*)
FDI_{t-1}*DumSINGAPORE			1.14 (2.15**)
FDI_{t-1}*DumTAIPEI,CHINA			3.29 (4.24*)
FDI_{t-1}*DumTHAILAND			1.12 (1.92**)
Observations	143	130	143
Overall fit for the regression Wald chi-square	340.5* (P>chi2 = 0.00)	388.6* (P>chi2 = 0.00)	345.6* (P>chi2 = 0.00)
AB test for autocorrelation	AR(2) = −2.03 AR(3) = −1.86 AR(4) = −0.41	AR(2) = 2.21 AR(3) = −1.86 AR(4) = 0.31	AR(2) = 1.91 AR(3) = −0.90 AR(4) = 0.25
Sargan test	Chi2 (72) = 85.34 (P>chi2 = 0.13)	Chi2 (100) = 107.3 (P>chi2 = 0.29)	Chi2 (110) = 120.15 (P>chi2 = 0.24)

* = 1% statistical significance; ** = 5% statistical significance; *** = 15% statistical significance.
Note: Value in parenthesis is t-statistics.
Source: Author's estimation

VI. Conclusions and Policy Inferences

The swift rebound of capital inflows in Asian countries after the current global financial crisis has worried policy makers about the adverse effects of capital flows associated with excessive liquidity in the region. Asset prices have begun to increase noticeably in many countries, especially in the PRC. Meanwhile, stronger currencies have given policy makers concern about their country's competitiveness, and in some economies such as the Republic of Korea; Taipei,China; and Thailand, central banks have intervened in the foreign exchange market by buying dollars to slow down exchange rate appreciation and by issuing local-currency bonds to mop up the liquidity created by such intervention. In addition, although inflation in the region has begun to show an increasing trend, central banks are still reluctant to raise their policy rates to reduce the risks of attracting too much speculative capital flows.

The rebound of capital flows and stronger currencies raises the question on the nexus of RER and capital flows. The dynamic panel-data model is applied for nine emerging Asian countries, including the PRC; India; Indonesia; the Republic of Korea; Malaysia; Philippines; Singapore; Taipei,China; and Thailand during 2000–2009. The estimation results show that compositions of capital flows matter in determining impacts on RER. Other forms of capital flows, both portfolio investment and other investment (including bank loans), bring in a faster speed of RER appreciation than FDI inflows. The nature of FDI flows, which are relatively stable and concentrated mostly in tradable and export-oriented sectors, leads to the slower adjustment of nontradable prices and the RER. However, the magnitude of appreciation among capital flows tends to be close to each other. The increasing importance of M&A activities in contributing to FDI makes the flows behave closer to other forms of capital, especially portfolio investment. The estimation results also show that during the estimation period, capital outflows bring about a greater degree of exchange rate adjustment than capital inflows. This evidence is found for all types of capital flows.

The estimation results imply that the swift rebound of capital inflows into the region could result in an excessive appreciation of the (real) currencies, especially when capital flows are in the form of portfolio investment and bank loans. Capital controls have recently been imposed/tightened in some emerging Asian countries, including the PRC and Taipei,China while other countries closely monitor movements of capital flows. These policies, however, could come with costs and need to be cautiously implemented. Policy makers need to ensure that impositions of capital controls will not lead to a significant deterioration of business sentiment, which eventually discourage investment and economic growth.

Another policy option in addition to capital controls and foreign exchange intervention combined with sterilization policy to redress (real) currency appreciation is to encourage capital outflows by relaxing rules and regulations for investors to perform investment overseas. This policy could apply for all types of capital flows, including FDI that has a higher contribution of M&A activities. India and Thailand set examples of implementing this policy option. In 2005, firms in India were allowed to invest up to 200% of their net worth, subject to an upper limit of $100 million per annum. With prior approval from the Reserve Bank of India, firms were permitted to transfer funds through any authorized foreign exchange dealer (Athukorala 2009). In August 2009, the central bank of Thailand relaxed the rule on capital outflows by letting Thai companies with minimum assets of $150 million invest directly in foreign securities without going through mutual or private funds. However, a key concern for encouraging capital outflows from these countries at this stage is how to encourage the country to recycle excessive savings without structural adjustment in economic fundamentals. Thus, liberalization of capital outflows should be implemented along with redressing the problem of excessive savings in some Asian countries, especially in the PRC, as well as with encouraging the efficient use of savings to improve both quantity and quality of investment in the region, the Asian crisis-affected countries in particular.

Appendix Table 1: Capital Inflows and Outflows, Emerging Asian Economies: Total Financial Account (billion US$)

Inflows	PRC	Hong Kong, China	Korea, Rep. of	Indonesia	India	Malaysia	Philippines	Singapore	Taipei,China	Thailand
1st wave	28.2	0.0	23.1	7.4	7.3	6.1	6.2	14.6	5.7	15.4
Crisis	47.1	−55.3	5.3	−5.3	12.2	4.1	4.2	26.9	9.7	−9.6
2nd wave	144.8	100.3	45.3	7.2	35.2	9.5	5.1	53.2	36.9	10.1
2007	241.2	252.4	85.3	16.6	60.1	21.1	11.0	104.0	23.4	15.4
2008	142.7	−47.8	−102.6	16.1	26.1	−13.7	−10.5	72.1	−6.3	5.8
2007Q1		24.8	25.2	3.7	6.9	8.3	3.2	21.4	0.9	3.8
2007Q2		55.5	27.3	5.7	14.9	10.8	5.0	33.1	14.1	4.1
2007Q3		75.6	12.8	3.9	15.6	−2.6	2.4	23.6	−1.4	4.3
2007Q4		120.8	26.8	3.4	22.6	4.9	0.9	25.3	9.8	3.2
2008Q1		−13.6	10.5	4.7	10.4	9.1	−2.0	36.3	12.9	5.3
2008Q2		14.5	4.8	5.4	7.7	−0.8	−1.0	11.9	4.5	1.9
2008Q3		20.2	1.4	5.4	7.5	−15.2	−1.4	14.1	−9.1	−0.3
2008Q4		−4.9	−50.3	0.7	0.5	−6.8	−5.4	10.0	−14.5	−1.4
2009Q1		−9.8	−1.7	2.8			−0.6	−2.1	−5.9	0.0
2009Q2		8.4	18.7	2.9			1.2		9.2	2.3
2009Q3				3.8					8.0	2.8
2009Q4										
Outflows										
1st wave	4.4	0.0	11.6	0.4	0.5	−1.2	1.0	17.4	9.1	1.2
Crisis	40.4	−52.9	6.9	0.1	2.9	6.4	0.5	40.2	8.0	2.9
2nd wave	85.8	120.9	32.9	6.9	7.4	15.6	4.0	63.5	44.4	6.9
2007	170.8	272.3	76.1	13.6	17.3	32.0	7.4	102.6	61.8	16.1
2008	126.8	−51.8	−51.7	17.3	17.7	14.2	−4.9	83.3	−3.0	−6.5
2007Q1		35.7	20.7	1.9	4.1	7.5	2.2	33.2	11.5	5.9
2007Q2		61.9	21.2	3.8	4.7	8.5	5.1	36.2	23.1	2.8
2007Q3		85.3	18.0	5.0	2.6	6.3	−0.7	31.4	12.0	3.2
2007Q4		119.2	30.6	2.9	5.7	9.9	0.9	24.5	15.3	4.2
2008Q1		−14.7	8.8	5.2	5.7	2.7	−3.0	34.3	13.0	−7.8
2008Q2		17.5	8.5	3.4	2.9	6.0	−0.4	15.6	3.4	5.3
2008Q3		30.7	2.5	3.2	3.9	6.5	−0.5	22.8	−2.8	−0.6
2008Q4		−13.3	−16.8	5.4	5.9	3.0	−0.1	11.1	−16.7	−7.1
2009Q1		−13.8	−5.4	2.4	4.9		0.1	5.3	−5.6	3.9
2009Q2		47.2	1.9	0.7			0.0	0.0	10.4	5.8
2009Q3				0.4					12.5	5.7
2009Q4										

Appendix Table 2: Foreign Direct Investment

Inflows	PRC	Hong Kong, China	Korea, Rep. of	Indonesia	India	Malaysia	Philippines	Singapore	Taipei,China	Thailand
1st wave	25.5	0.0	1.2	3.0	1.1	4.6	1.1	6.9	1.3	2.0
Crisis	42.2	13.1	5.9	0.9	2.8	3.7	1.6	12.5	1.8	5.8
2nd wave	79.5	36.1	4.9	4.3	12.4	5.1	1.8	20.3	3.8	8.0
2007	138.4	54.4	1.8	6.9	25.1	8.5	2.9	31.5	7.8	11.2
2008	147.8	63.0	2.2	9.3	41.2	7.4	1.4	22.6	5.4	8.6
2007Q1		13.2	1.3	1.0	5.1	1.6	1.6	10.2	1.9	3.7
2007Q2		9.5	0.1	1.0	7.5	3.3	0.5	8.2	1.8	2.2
2007Q3		13.1	−0.1	2.2	4.7	2.1	0.5	6.9	1.1	2.8
2007Q4		18.6	0.4	2.7	7.9	1.4	0.3	6.1	2.9	2.5
2008Q1		19.6	−0.7	2.4	14.2	1.2	0.2	8.3	0.6	2.7
2008Q2		14.8	−0.2	1.6	11.9	4.9	0.4	3.8	1.1	1.9
2008Q3		11.1	1.6	3.4	8.8	0.1	0.6	3.6	1.0	2.3
2008Q4		17.5	1.5	1.9	6.3	1.2	0.2	6.9	2.7	1.7
2009Q1		11.8	−0.1	2.1	8.0		0.0	3.0	0.3	1.6
2009Q2		5.8	0.8	1.3			0.9		0.5	1.3
2009Q3				0.4					1.0	1.2
2009Q4										
Outflows										
1st wave	2.6	0.0	2.4	0.4	0.1	0.0	0.2	3.9	2.7	0.5
Crisis	2.3	12.1	4.4	0.2	0.1	0.5	0.1	7.0	4.5	0.4
2nd wave	10.2	36.9	7.2	3.4	7.6	4.7	0.9	11.4	7.5	0.8
2007	17.0	61.1	15.6	4.7	17.3	11.1	3.5	24.4	11.1	1.9
2008	53.5	59.9	12.8	5.9	18.4	15.2	0.3	8.9	10.3	2.8
2007Q1		14.0	2.2	1.3	4.1	1.4	0.1	5.9	2.0	0.3
2007Q2		9.9	3.0	−0.4	4.7	3.3	3.3	6.7	2.2	0.3
2007Q3		13.6	2.5	1.4	2.6	3.5	0.1	5.9	2.6	0.4
2007Q4		23.6	7.9	2.4	5.8	2.9	0.0	5.9	4.4	0.9
2008Q1		12.4	4.1	1.7	5.7	2.8	0.0	2.7	3.2	0.5
2008Q2		25.1	2.7	1.4	2.9	4.9	0.1	0.8	2.6	1.2
2008Q3		6.9	3.9	1.5	3.9	6.0	0.1	4.1	2.2	0.2
2008Q4		15.5	2.1	1.2	5.9	1.6	0.1	1.4	2.3	0.9
2009Q1		4.6	1.1	1.3	4.8		0.1	1.4	1.0	0.7
2009Q2		15.2	0.7	1.0			0.1		1.3	0.9
2009Q3				0.5					1.6	0.9
2009Q4										

Appendix Table 3: Portfolio Investment

	PRC	Hong Kong, China	Korea, Rep. of	Indonesia	India	Malaysia	Philippines	Singapore	Taipei, China	Thailand
Inflows										
1st wave	1.9	0.0	10.8	2.4	2.1	−0.7	1.6	0.8	2.2	2.8
Crisis	2.4	18.4	7.3	−2.1	1.4	−0.3	1.5	1.3	4.8	1.6
2nd wave	21.3	20.9	18.7	5.5	14.8	4.4	3.0	7.6	20.9	3.7
2007	21.0	75.2	30.4	10.0	35.0	9.3	3.9	18.4	4.9	2.9
2008	9.9	−18.3	−38.5	3.0	−15.0	−21.1	−4.4	−4.5	−15.8	−2.5
2007Q1		18.9	5.2	3.0	1.8	6.8	1.7	5.9	−0.8	0.6
2007Q2		7.3	13.3	5.7	7.5	6.2	1.3	6.4	10.1	1.2
2007Q3		10.1	−1.8	1.7	10.9	−6.4	0.9	5.1	−5.6	1.0
2007Q4		38.8	13.6	−0.4	14.8	2.7	0.0	1.0	1.2	0.1
2008Q1		−32.9	−9.9	2.8	−3.8		0.0	−0.2	9.3	2.7
2008Q2		11.6	6.7	4.1	−4.2		−2.5	−0.9	−3.6	−1.1
2008Q3		9.4	−17.9	0.0	−1.3		0.1	−1.0	−15.2	−2.3
2008Q4		−6.4	−17.4	−3.9	−5.8		−2.0	−2.3	−6.3	−1.8
2009Q1		−0.2	0.8	1.7				−1.3	−1.0	0.1
2009Q2		2.6	18.0	1.6					8.7	
2009Q3				3.3					7.0	
2009Q4										
Outflows										
1st wave	0.4	0.0	2.1				0.5	5.9	1.9	0.004
Crisis	5.1	0.0	−0.1			0.04	0.4	12.4	5.1	0.018
2nd wave	25.9	47.8	22.6	1.4		1.5	0.5	15.2	35.2	2.5
2007	2.3	77.9	56.4	4.4	−0.2	3.9	−0.8	28.2	45.0	9.6
2008	−32.7	19.3	−23.1	1.3	0.0	2.9	−0.6	18.6	−3.3	−0.4
2007Q1		19.6	17.5	0.5	−0.02	−0.5	1.1	3.5	10.9	1.1
2007Q2		14.3	14.4	1.9	−0.05	1.5	−0.5	8.7	17.1	0.9
2007Q3		6.9	9.7	1.3	0.02	1.9	−0.7	6.8	8.8	2.1
2007Q4		37.1	14.9	0.8	−0.10	1.0	−0.7	9.3	8.1	5.5
2008Q1		−8.9	0.1	0.8	−0.03	−0.1	−1.0	4.0	6.4	−1.3
2008Q2		8.5	0.7	−0.1	0.03	1.1	−1.0	5.0	7.2	4.9
2008Q3		−1.0	−5.5	0.1	0.01	0.5	1.2	4.4	−4.2	1.9
2008Q4		20.7	−18.4	0.5	0.03	1.4	0.1	5.2	−12.7	−5.9
2009Q1		−9.8	−2.8	−0.1	0.10		0.0	6.2	0.8	0.5
2009Q2		32.0	1.2	−0.4			−0.1		9.1	4.8
2009Q3				−0.1					10.9	4.8
2009Q4										

Appendix Table 4: Bank Loans

Inflows	PRC	Hong Kong, China	Korea, Rep. of	Indonesia	India	Malaysia	Philippines	Singapore	Taipei,China	Thailand
1st wave	−2.5		5.9	0.8	1.4	1.6	1.8	3.8	1.5	6.5
Crisis	−0.4	−117.2	−4.9	−0.8	1.8		0.1	3.7	−0.2	−8.8
2nd wave	13.0	53.5	18.2	0.1	4.2	1.2	0.3	8.5	9.8	−0.9
2007	6.9	132.5	41.7	0.8	3.4	6.4	1.1	20.9	16.1	−1.3
2008	−13.6	1.5	−20.2	2.0	4.9	1.9	−0.7	0.0	0.6	0.7
2007Q1		−5.6	15.6	0.0	2.5	0.5	−0.3		−1.7	−0.6
2007Q2		41.2	9.9	0.2	−0.6	2.5	0.8		0.5	−0.3
2007Q3		39.5	7.1	0.1	2.6	3.5	0.3		11.9	0.0
2007Q4		57.3	9.0	0.5	−1.1	−0.2	0.3		5.5	−0.3
2008Q1		5.7	15.1	0.0	4.3	3.0	−0.3		3.7	0.6
2008Q2		−1.4	−3.8	0.8	1.9	5.1	0.5		4.9	0.5
2008Q3		6.3	12.9	0.7	0.8	1.9	0.1		3.6	−0.2
2008Q4		−9.0	−44.4	0.6	−2.2	−8.1	−1.0		−11.7	−0.2
2009Q1		−12.1	−6.0	−0.8	−0.5		−1.2		−5.9	−0.1
2009Q2		−13.2	2.4	0.3			−0.6		−5.2	−0.6
2009Q3				0.8					2.7	0.9
2009Q4										
Outflows										
1st wave			5.3		0.4	−0.2	0.3	1.8	1.4	0.7
Crisis	1.2	−45.3	0.5		0.8	1.2	−0.1	6.7	1.3	2.6
2nd wave	11.3	48.4	5.1	−0.2	−0.1	3.8	1.5	8.4	6.8	2.4
2007	23.4	124.3	10.2	−2.3	−4.5	12.4	2.2	9.0	10.2	0.9
2008	49.4	−43.7	12.2	4.8	−1.3	−11.9	−2.4	0.0	17.2	−11.9
2007Q1		−3.3	−0.9	−0.4		5.2	1.0			3.9
2007Q2		29.0	1.8	0.8		4.5	1.2			0.8
2007Q3		43.3	4.2	1.5		−0.5	−0.4			−0.8
2007Q4		55.4	5.1	−4.2		3.2	0.5			−3.0
2008Q1		−11.2	4.4	1.7		0.9	−0.3			−6.9
2008Q2		−8.8	3.2	1.1		−3.5	0.6			−0.3
2008Q3		21.7	4.4	−1.8		−7.6	−1.5			−3.1
2008Q4		−45.4	0.2	3.8		−1.7	−1.2			−1.6
2009Q1		−7.6	−3.4	1.4			0.4			2.6
2009Q2		−51.6	−0.6	2.0			0.2			−0.6
2009Q3				2.4						−3.3
2009Q4										

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About the Paper

Juthathip Jongwanich examines the nexus between capital flows and real exchange rate in emerging Asian countries using a dynamic panel-data model for 2000–2009. The results show that portfolio investment and bank loans bring in a faster real exchange rate appreciation than foreign direct investment, but the magnitudes of appreciation arising from foreign direct investment become close to other types of capital flows, mainly because of the higher proportion of mergers and acquisitions. The results also show that capital outflows bring about a greater degree of exchange rate adjustment than capital inflows.

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