

CAPITAL FLOWS DURING QUANTITATIVE EASING AND AFTERMATH: EXPERIENCES OF ASIAN COUNTRIES

Donghyun Park, Arief Ramayandi, and Kwanho Shin

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Donghyun Park, Arief Ramayandi,
and Kwanho Shin

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ABSTRACT

A potentially important side effect of quantitative easing (QE) by the United States (US) Federal Reserve System (the Fed) is the expansion of capital flows into developing countries. As a result, there is widespread concern that QE tapering may trigger financial instability in those countries. The central objective of our paper is to empirically investigate this important issue by (1) examining the effect of QE on capital flows into developing Asia, and (2) analyzing the different factors which influence the effect of QE tapering on financial instability in order to identify the most significant factors. We find that QE1 had a bigger impact on capital flows than QE2 and QE3, and credit expansion and capital inflows magnified the effect of QE tapering on financial instability. While there is no evidence that macroprudential policies directly reduced the effect of QE tapering, they can nevertheless be useful preemptive measures.

Keywords: Asia, capital flows, financial stability, global financial crisis, macroprudential measures, quantitative easing, tapering

JEL Classification: F32, F44, G01

I. INTRODUCTION

The global financial crisis drove the central banks of advanced economies to adopt unconventional monetary expansions to support financial stability and economic growth. In particular, the US Federal Reserve launched three rounds of quantitative easing (QE) policies, which involved massive purchases of United States (US) government bonds. While QE was targeted for the US economy, policymakers in emerging economies have expressed concerns over its spillover impact on global liquidity and hence their financial stability. In fact, a number of studies uncover a tangible impact of QE on capital flows into emerging economies. For example, Cho and Rhee (2013) found that QE, in particular QE1, significantly contributed to the recovery of capital inflows to Asian countries. Lim, Mohapatra, and Stocker [LMS] (2014) found that emerging markets outside Asia also experienced a surge of capital flows after QE. In addition, Chen, Filardo, He and Zhu (2012); and Moore, Nam, Suh and Tepper (2013) found that QEs had a significant impact on asset prices in emerging markets.

Financial market volatility suffered by Asian countries in May 2013, when the Fed Chairman Ben Bernanke first hinted at QE tapering, underlines the vulnerability of developing Asia to shifts in the monetary policy of the advanced economies. In particular, India and Indonesia, two countries with sizable current account deficits, experienced significant turbulence in their financial markets, although both have subsequently stabilized. Of central interest to policymakers in the region at the time is the spillover effect of a more concerted QE tapering on financial stability. The central objective of our paper is to empirically investigate this important issue by (1) examining the effect of QE on capital flows into developing Asia, and (2) analyzing the different factors which influence the effect of QE tapering on financial instability in order to identify the most significant factors. The spillover impact of QE tapering will depend on the impact of QE on capital flows, which is why it is meaningful to address the first question.

The rest of this paper is as follows. In Section II, we analyze the impact of QE on capital flows into developing Asia during QE. For a more systematic analysis, we apply the methodology of LMS (2014) and distinguish between different types of capital flows. In Section III, we take a closer look at the country-specific experiences of six Asian countries—India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand. In Section IV, we investigate the role of various factors in determining the impact of QE tapering on financial stability. While our basic empirical framework is that of Eichengreen and Gupta [EG] (2013), we extend it in a number of important ways. Section V concludes our paper.

II. CAPITAL FLOWS INTO DEVELOPING ASIA DURING QUANTITATIVE EASING (QE)

In this section, we examine the behavior of capital flows, particularly into developing Asia, during QE. We look at capital flows as a whole as well as four different types of capital flows—bank loans, bonds, equity, and foreign direct investment (FDI). Our sample includes the developing economies covered by LMS (2014) and adds other emerging economies analyzed by EG (2013). We drop Hong Kong, China and Singapore since they are high-income financial centers. We also dropped some other economies for data availability reasons. We end up with the final sample of 62 economies listed in Appendix A1. The data sources for most economies are World Development Indicators (WDI), International Financial Statistics (IFS), and Datastream. Appendix A2 lists the definitions and sources of the variables we use in our empirical analysis. While we are interested in the impact of QE on emerging markets in general, our primary focus lies in Asian countries. Our sample includes six Asian countries—India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand (hereinafter referred to as Asian countries).

QE was implemented by the Fed as an extraordinary response to the extraordinary shock of the US subprime crisis which morphed into the global financial crisis. But one of its side effects was a marked expansion of global liquidity and global financial flows. Rey (2013) argues that large global capital flow cycles, which are often misaligned with individual emerging market's macroeconomic conditions, emerge due to lax monetary conditions in the US or the European Union. Figure 1 presents capital flows into developing countries by four asset classes—FDI, portfolio equity, portfolio debt, and loans¹—from Q1 2000 to Q2 2013. The figure shows a big surge of capital flows during QE periods after they collapsed during the global financial crisis (GFC). Our QE dates follow those of LMS (2014), who define QE1 as Q1 2009–Q3 2010, QE2 as Q4 2010–Q2 2011, and QE3 as Q4 2012–Q2 2013.

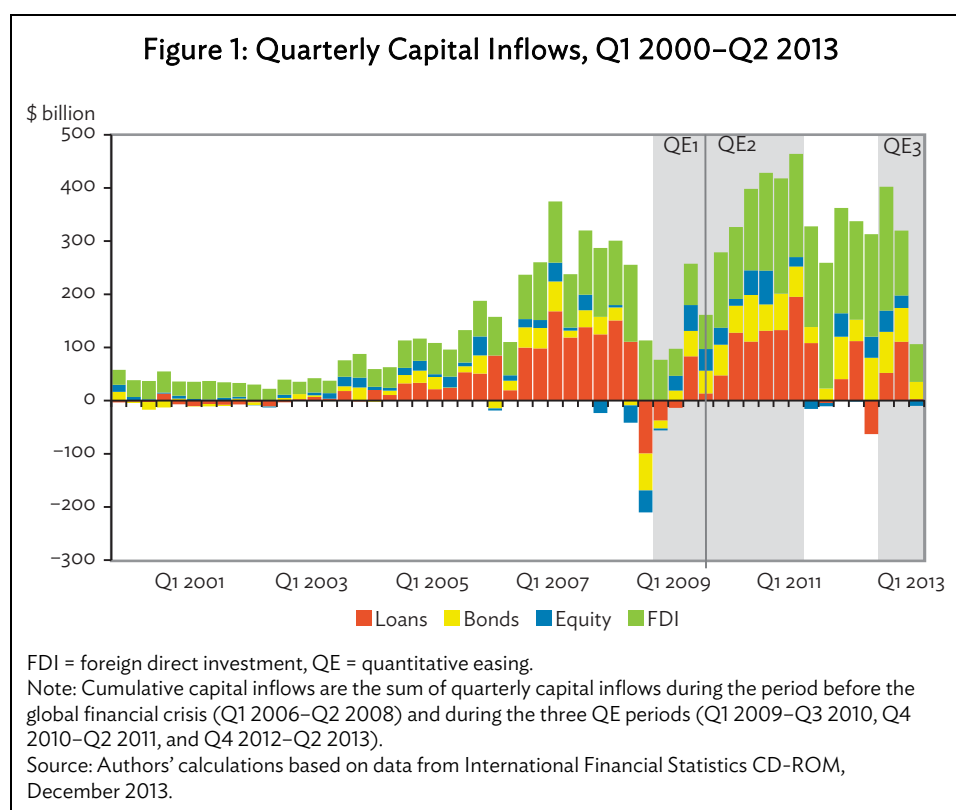
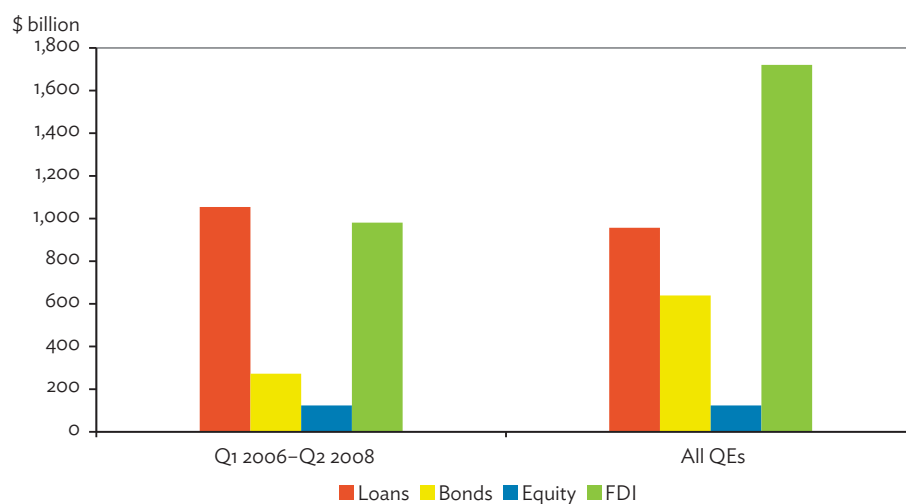


Figure 1 shows that total capital flows into developing countries during QEs are comparable to those before the GFC. However, the composition of capital flows is somewhat altered. Figure 2 weighs cumulative capital flows by type during the pre-crisis period (Q1 2006–Q3 2008) versus the sum of the flows during the three QE periods. Figure 2 clearly shows that while bank-led flows (i.e., loans) dominated before the GFC shrank, other flows (i.e., bonds, equity, and FDI) rose after the crisis. This pattern reflects bank deleveraging to strengthen their balance sheets as the GFC intensified. As a result, bank-based funding was replaced by funds flowing through direct capital markets. Azis and Shin (2013) also find this reversal in the pattern of capital flows. Figure 3 and Figure 4 show capital flows into Asia during the same period. Again, capital inflows into Asian countries during QE periods are comparable to those before the GFC. We can also observe the same pattern of reversals, i.e., shrinking bank loans and expanding bonds and equity flows after the GFC.

¹ More precisely, loans are collected from the IFS that are classified as “other liabilities” which also include trade credit.

Figure 2: Cumulative Capital Inflows before the Global Financial Crisis and during Quantitative Easing

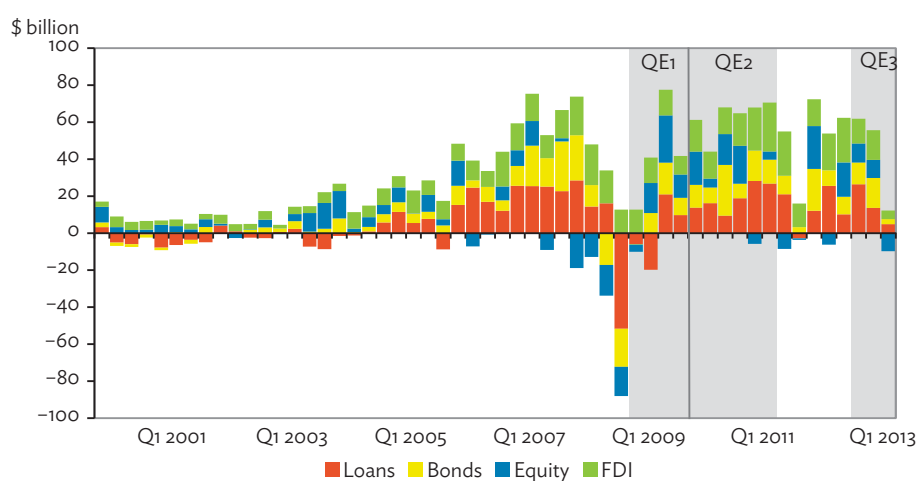


FDI = foreign direct investment, QE = quantitative easing.

Note: Cumulative capital inflows are the sum of quarterly capital inflows during the period before the global financial crisis (Q1 2006–Q2 2008) and during the three QE periods (Q1 2009–Q3 2010, Q4 2010–Q2 2011, and Q4 2012–Q2 2013).

Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

Figure 3: Quarterly Capital Inflows to Six Asian Countries, Q1 2000–Q2 2013



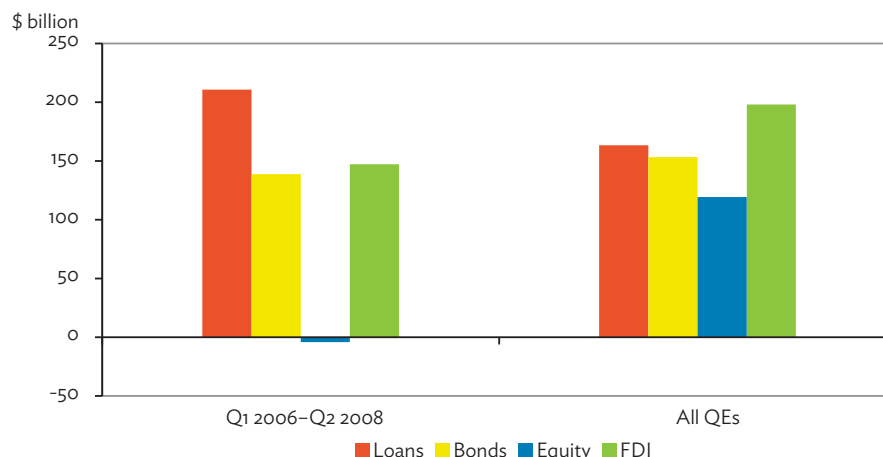
FDI = foreign direct investment, QE = quantitative easing.

Notes:

1. Cumulative capital inflows are the sum of quarterly capital inflows during the period before the global financial crisis (Q1 2006–Q2 2008) and during the three QE periods (Q1 2009–Q3 2010, Q4 2010–Q2 2011, and Q4 2012–Q2 2013).
2. Six Asian countries include India, Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand.
3. Loans, bonds, and equity data for Malaysia cover only Q1 2002–Q2 2013.

Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

Figure 4: Cumulative Capital Inflows to Six Asian Countries before the Global Financial Crisis and during Quantitative Easing



FDI = foreign direct investment, QE = quantitative easing.

Notes:

1. Cumulative capital inflows are the sum of quarterly capital inflows during the period before the global financial crisis (Q1 2006–Q2 2008) and during the three QE periods (Q1 2009–Q3 2010, Q4 2010–Q2 2011, and Q4 2012–Q2 2013).
2. Six Asian countries include India, Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand.
3. Loans, bonds, and equity data for Malaysia cover only Q1 2002–Q2 2013.

Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

In order to empirically investigate the impact of QE on capital flows into developing countries, we follow the methodology adopted by LMS (2014). Their baseline specification is a balanced dynamic panel regression as follows²:

$$FI_{it} = \rho FI_{it-1} + \lambda L_{it} + \pi PB_{it} + \gamma C_{it} + \theta QE_t + \beta' X_{it} + \delta CRISIS_t + \alpha_i + \tau_t + \varepsilon_{it}$$

where FI_{it} is financial flows into country i at t . Financial flows are transmitted via three different channels: (1) liquidity (L_{it}), (2) portfolio balance (PB_{it}), and (3) confidence (C_{it}). The liquidity channel L_{it} , is measured by the US 3-month Treasury bill rate. The portfolio balance channel PB_{it} , is measured by the US yield spread—difference between yields on 10-year US bonds and 3-month bills—and the interest rate differential between the developing country vis-à-vis the US. Finally the confidence channel is measured by the Volatility Index (VIX).

The impact of QE that is not explicitly captured by the three channels is measured by θ . QE_t is a dummy variable that takes the value of 1 during the three QE periods and 0 otherwise. In some specifications, we include individual QE dummies - QE_{1t} , QE_{2t} and QE_{3t} corresponding to QE1, QE2, and QE3 periods, respectively. It is important to note that θ does not necessarily reflect the full effects of QE. Insofar as QE affects capital flows through the three channels, the estimate of θ represents a lower bound to the potential effects of QE. The explanatory variables include a vector of additional time-varying country-specific controls X_{it} such as current gross domestic product (GDP) and country rating, and a crisis dummy ($CRISIS_t$) that takes a value of 1 between Q3 2008 and Q2 2009 and 0

² We exclude the post-crisis dummy because most post-crisis periods overlap with the QE periods. Interestingly, while it is included in Lim, Mohapatra, and Stocker (2014), its estimate is not statistically significant.

otherwise. We include the country fixed effect, α_i and time trend, τ_t . Since we include country fixed effects in addition to the lagged dependent variable, we apply Arellano-Bond dynamic panel GMM estimation in order to avoid bias in the standard dynamic panel estimation.

Table 1 reports the results for gross financial inflows. In column [2], when QE1, QE2, and QE3 dummies are included separately, all the coefficients are statistically significant. In line with LMS (2014), the impact of QE1 is the largest and the impact of QE3 is the smallest. In column [3], when the QE dummy is interacted with the Asia dummy, the estimated coefficient is quite large and statistically significant, indicating that capital flows to Asian countries were especially large during QE. In column [4], when the individual QE dummies are interacted with the Asia dummy, only the coefficient of the QE1 dummy is statistically significant. This suggests that capital flows to Asia were particularly large during QE1, but not QE2 and QE3.

Table 1: Gross Financial Inflows, Q1 2000–Q2 2013

Dependent Variable	Gross Inflows			
	[1]	[2]	[3]	[4]
Lagged inflows	0.373*** [0.020]	0.374*** [0.020]	0.372*** [0.020]	0.375*** [0.020]
All QEs	2.305*** [0.378]		2.069*** [0.394]	
QE1		2.594*** [0.441]		2.218*** [0.461]
QE2		1.985*** [0.554]		1.840*** [0.584]
QE3		1.773** [0.744]		1.907** [0.778]
3M US treasury bill rate	-0.073 [0.226]	-0.084 [0.227]	-0.077 [0.226]	-0.094 [0.227]
Yield curve	-0.665** [0.285]	-0.704** [0.289]	-0.667** [0.285]	-0.711** [0.288]
Interest rate differential	0.005 [0.024]	0.006 [0.024]	0.003 [0.024]	0.005 [0.024]
VIX	-0.078*** [0.021]	-0.084*** [0.022]	-0.079*** [0.021]	-0.085*** [0.022]
ln GDP	7.090*** [0.980]	7.058*** [0.982]	7.094*** [0.980]	7.129*** [0.982]
GDP growth rate for developing countries	0.065 [2.266]	-0.818 [2.450]	0.059 [2.264]	-0.823 [2.449]
GDP growth rate for high-income countries	5.317 [4.284]	7.061 [4.496]	5.365 [4.281]	6.945 [4.493]
Country rating	-0.098** [0.043]	-0.102** [0.043]	-0.098** [0.043]	-0.104** [0.043]
Crisis	-0.403 [0.662]	-0.35 [0.666]	-0.391 [0.662]	-0.36 [0.665]
Asia* all QEs			1.701** [0.813]	
Asia* QE1				2.695*** [0.988]
Asia* QE2				1.009 [1.404]
Asia* QE3				-0.989 [1.756]

continued on next page

Table 1 continued

Dependent Variable	Gross Inflows			
	[1]	[2]	[3]	[4]
Observations	2,331	2,331	2,331	2,331
Number of countries	54	54	54	54

***, **, and * denote the significance levels of 1%, 5%, and 10%, respectively; GDP = gross domestic product; QE = quantitative easing; US = United States; VIX = Volatility Index.

Notes:

1. The dependent variable is the gross capital inflow to the developing country.
2. The results in columns [1]–[2] are replications of Table 1 (columns B1 and B2) in Lim, Mohaparta and Stocker (2014).
3. All QEs, QE1, QE2, and QE3 are dummy variables for quantitative easing for the whole period, QE1 period, QE2 period, and QE3 period, respectively.
4. Asia is a dummy variable for six Asian countries: India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand.
5. We apply Arellano–Bond dynamic panel GMM estimation in order to avoid bias in the standard dynamic panel estimation.
6. We also include country fixed effects and a time trend.
7. Numbers in parentheses are standard errors.

Source: Authors' calculations.

In Table 2, capital flows are decomposed into loans, bonds, equity, and FDI, and the same equation is estimated for each type of capital flows. There are three major findings. First, in line with LMS (2014), the impact of QE not captured by the three channels is largest for loans. Second, bonds and equity flows are more influenced by the explicitly modeled three channels. Third, FDI flows are not influenced much by QE. All three channels are not statistically significant and the coefficient of the QE dummy is even negative.

Table 2: Financial Inflows by Type, Q1 2000–Q2 2013

Dependent Variable	Loans		Bonds		Equity		FDI	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lagged inflows	0.331*** [0.021]	0.331*** [0.021]	0.319*** [0.023]	0.326*** [0.023]	0.305*** [0.023]	0.307*** [0.023]	0.314*** [0.021]	0.310*** [0.021]
All QEs	1.340*** [0.316]		0.673*** [0.156]		0.673*** [0.132]		–0.198 [0.154]	
QE1		1.319*** [0.367]		1.063*** [0.181]		0.932*** [0.151]		–0.517*** [0.180]
QE2		1.536*** [0.464]		0.302 [0.230]		0.407** [0.193]		–0.056 [0.226]
QE3		1.045* [0.620]		–0.144 [0.298]		0.062 [0.260]		0.740** [0.301]
3M US treasury bill rate	0.371* [0.192]	0.366* [0.193]	–0.128 [0.094]	–0.143 [0.094]	–0.363*** [0.077]	–0.375*** [0.078]	0.095 [0.089]	0.113 [0.089]
Yield curve	0.031 [0.239]	0.016 [0.241]	–0.233* [0.119]	–0.296** [0.120]	–0.481*** [0.100]	–0.525*** [0.101]	–0.027 [0.113]	0.033 [0.114]
Interest rate differential	–0.001 [0.020]	–0.002 [0.020]	0.005 [0.010]	0.005 [0.010]	–0.002 [0.009]	–0.001 [0.009]	–0.003 [0.012]	–0.001 [0.012]
VIX	–0.041** [0.018]	–0.042** [0.018]	–0.023*** [0.009]	–0.031*** [0.009]	–0.015** [0.007]	–0.021*** [0.008]	–0.007 [0.009]	0.002 [0.009]
In GDP	3.500*** [0.815]	3.483*** [0.816]	–0.395 [0.367]	–0.433 [0.367]	0.935*** [0.314]	0.891*** [0.315]	3.616*** [0.389]	3.695*** [0.389]
GDP growth rate for developing countries	0.073 [1.901]	–0.309 [2.056]	1.463 [0.906]	0.081 [0.990]	1.156 [0.766]	0.171 [0.839]	–1.754* [0.906]	–0.302 [0.978]
GDP growth rate for high-income countries	4.343 [3.617]	4.305 [3.815]	–0.094 [1.747]	2.416 [1.839]	–1.807 [1.464]	0.01 [1.549]	2.729 [1.687]	0.713 [1.770]

continued on next page

Table 2 continued

Dependent Variable	Loans		Bonds		Equity		FDI	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Country rating	-0.031 [0.036]	-0.031 [0.036]	-0.029* [0.017]	-0.034** [0.017]	0.011 [0.014]	0.006 [0.014]	-0.007 [0.018]	-0.002 [0.018]
Crisis	-0.041 [0.558]	-0.071 [0.562]	-0.387 [0.273]	-0.295 [0.275]	-0.430* [0.231]	-0.362 [0.233]	0.222 [0.268]	0.181 [0.268]
Observations	2312	2312	1726	1726	1857	1857	2331	2331
Number of countries	54	54	51	51	47	47	54	54

***, **, and * denote the significance levels of 1%, 5%, and 10%, respectively; FDI = foreign direct investment; GDP = gross domestic product; QE = quantitative easing; US = United States, VIX = Volatility Index.

Notes:

1. The results in columns [1], [3], [5], [7] are replications of Table 5 (columns D2, D3, D5, D6) in Lim, Mohaparta and Stocker (2014).
2. The dependent variable is bank loans (columns [1]–[2]), bonds (columns [3]–[4]), equity (columns [5]–[6]), and FDI flows (columns [7]–[8]) to the developing country.
3. All QEs, QE1, QE2, and QE3 are dummy variables for quantitative easing for the whole period, QE1 period, QE2 period and QE3 period, respectively.
4. We apply Arellano–Bond dynamic panel GMM estimation in order to avoid bias in the standard dynamic panel estimation.
5. We also include country fixed effects and a time trend.
6. Numbers in parentheses are standard errors.

Source: Authors' calculations.

In Table 3, we include interaction terms of the Asia and QE dummies as additional regressors. Table 3 shows that capital inflows into Asian countries were not larger than elsewhere, except for equity flows during QE1. In addition, compared to other regions, FDI flows into Asian countries were significantly lower during QE3.

Table 3: Financial Inflows by Type (Asia dummy included), Q1 2000–Q2 2013

Dependent Variable	Loans		Bonds		Equity		FDI	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lagged inflows	0.331*** [0.021]	0.330*** [0.021]	0.319*** [0.023]	0.328*** [0.023]	0.299*** [0.023]	0.302*** [0.023]	0.314*** [0.021]	0.310*** [0.021]
All QE episodes	1.263*** [0.329]		0.612*** [0.163]		0.546*** [0.137]		-0.207 [0.164]	
QE1		1.259*** [0.385]		0.967*** [0.191]		0.721*** [0.159]		-0.580*** [0.192]
QE2		1.418*** [0.486]		0.341 [0.243]		0.382* [0.203]		-0.141 [0.241]
QE3		0.969 [0.645]		-0.199 [0.311]		0.11 [0.271]		0.954*** [0.315]
3M US treasury bill rate	0.369* [0.192]	0.365* [0.193]	-0.129 [0.094]	-0.146 [0.094]	-0.364*** [0.077]	-0.379*** [0.077]	0.094 [0.089]	0.108 [0.089]
Yield curve	0.031 [0.239]	0.018 [0.241]	-0.234* [0.119]	-0.298** [0.120]	-0.478*** [0.100]	-0.522*** [0.101]	-0.028 [0.113]	0.029 [0.114]
Interest rate differential	-0.002 [0.020]	-0.003 [0.020]	0.004 [0.010]	0.005 [0.010]	-0.003 [0.009]	-0.002 [0.009]	-0.003 [0.012]	0 [0.012]
VIX	-0.042** [0.018]	-0.042** [0.018]	-0.023*** [0.009]	-0.031*** [0.009]	-0.016** [0.007]	-0.022*** [0.008]	-0.007 [0.009]	0.001 [0.009]
ln GDP	3.481*** [0.815]	3.460*** [0.817]	-0.391 [0.367]	-0.428 [0.367]	0.911*** [0.314]	0.905*** [0.315]	3.610*** [0.389]	3.730*** [0.389]
GDP growth rate for developing countries	0.042 [1.901]	-0.316 [2.056]	1.45 [0.906]	0.072 [0.990]	1.126 [0.764]	0.181 [0.836]	-1.755* [0.906]	-0.31 [0.978]

continued on next page

Table 3 continued

Dependent Variable	Loans		Bonds		Equity		FDI	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
GDP growth rate for high-income countries	4.394 [3.618]	4.337 [3.816]	-0.071 [1.748]	2.39 [1.839]	-1.738 [1.460]	-0.045 [1.545]	2.738 [1.688]	0.706 [1.770]
Country rating	-0.032 [0.036]	-0.032 [0.036]	-0.029* [0.017]	-0.035** [0.017]	0.012 [0.014]	0.006 [0.014]	-0.007 [0.018]	-0.001 [0.018]
Crisis	-0.042 [0.558]	-0.068 [0.562]	-0.387 [0.273]	-0.296 [0.275]	-0.436* [0.231]	-0.384* [0.232]	0.219 [0.268]	0.17 [0.268]
Asia*all QE	0.589 [0.691]		0.421 [0.328]		0.832*** [0.266]		0.058 [0.354]	
Asia*QE1		0.402 [0.835]		0.639 [0.391]		1.332*** [0.320]		0.376 [0.422]
Asia*QE2		1.011 [1.248]		-0.281 [0.572]		0.091 [0.480]		0.557 [0.583]
Asia*QE3		0.675 [1.510]		0.418 [0.681]		-0.272 [0.580]		-1.654** [0.719]
Observations	2312	2312	1726	1726	1857	1857	2331	2331
Number of countries	54	54	51	51	47	47	54	54

***, **, and * denote the significance levels of 1%, 5%, and 10%, respectively; FDI = foreign direct investment; GDP = gross domestic product; QE = quantitative easing; US = United States; VIX = Volatility Index.

Notes:

1. The dependent variable is bank loans (columns [1]–[2]), bonds (columns [3]–[4]), equity (columns [5]–[6]), and FDI flows (columns [7]–[8]) to the developing country.
2. All QEs, QE1, QE2, and QE3 are dummy variables for quantitative easing for the whole period, QE1 period, QE2 period and QE3 period, respectively.
3. Asia is a dummy variable for six Asian countries: India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand.
4. We apply Arellano-Bond dynamic panel GMM estimation in order to avoid bias in the standard dynamic panel estimation.
5. We also include country fixed effects and a time trend.
6. Numbers in parentheses are standard errors.

Source: Authors' calculations.

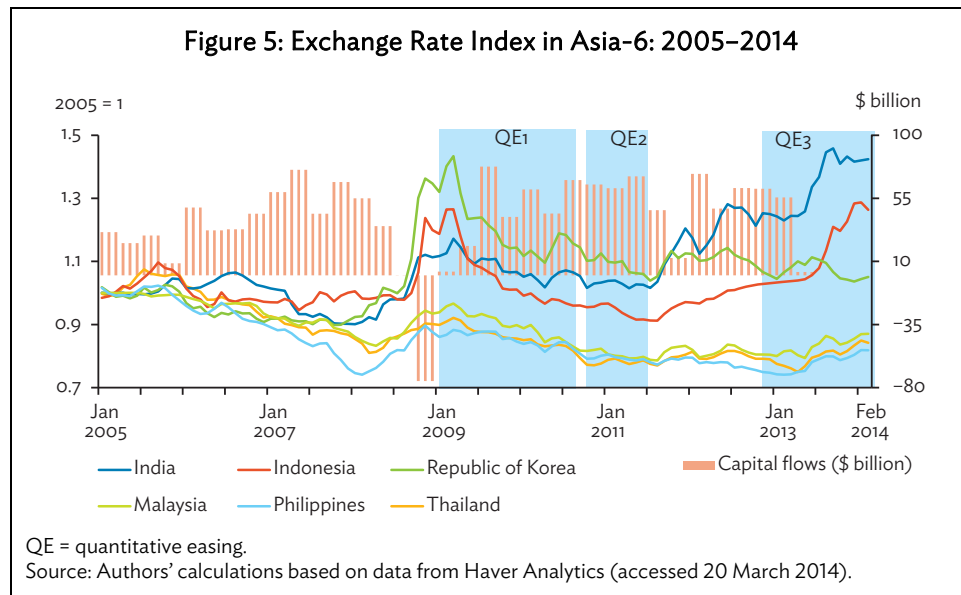
III. EXPERIENCES OF INDIVIDUAL ASIAN COUNTRIES

In this section, we delve into the country-specific pattern of capital flows and other related variables in the six Asian countries. After all, there is no a priori reason why the pattern should be the same across these countries. Figure 3 shows that there was a rapid outflow of foreign capital from the six Asian countries following the GFC of 2008. The capital largely returned to the region after QE1 began, eventually becoming comparable to the level prior to the GFC. Capital inflows to the region remained much the same during QE2 and the first few quarters of QE3, but then fell sharply in Q2 of 2013, as talk of a possible end to QE3³ soured investor sentiment and caused some capital flow reversals.

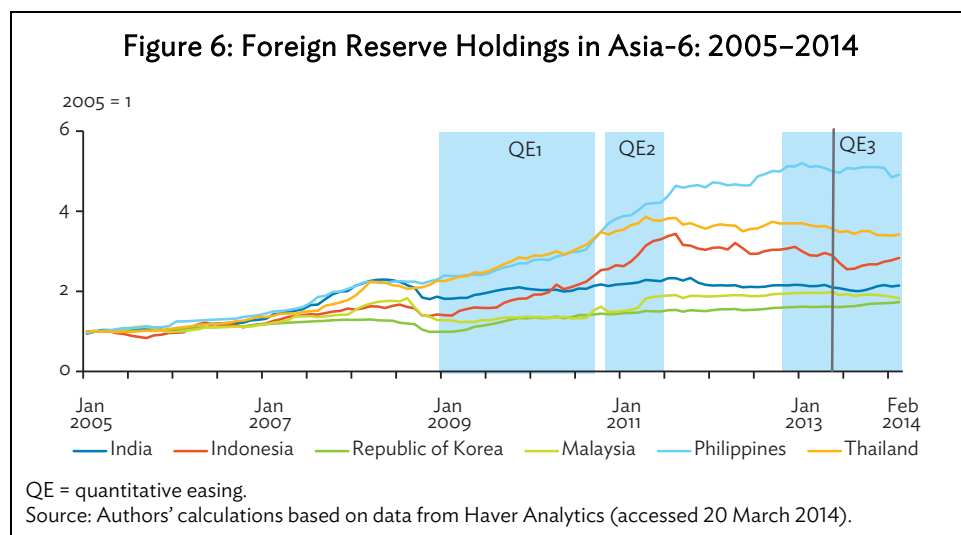
These movements in foreign capital are closely associated with exchange rate movements in the six Asian countries (Figure 5). A sharp drop in capital inflows during the second half of 2008 coincided with sharp currency depreciation, most notably in India, Indonesia, and the Republic of Korea. The recovery of foreign capital flows into the six countries in QE1 and QE2 coincided with currency appreciation. The region's exchange rates were generally stable after QE2, except in India and Indonesia,

³ In late May 2013, then Federal Reserve chairman, Ben Bernanke, first began to talk about the possibility of tapering the US Fed's purchases of asset backed securities from \$85 billion a month to a somewhat lower amount.

where currencies depreciated before stabilizing in the second half of 2013. This idiosyncratic movement of the Indian rupee and the Indonesian rupiah partly reflected some country-specific factors.

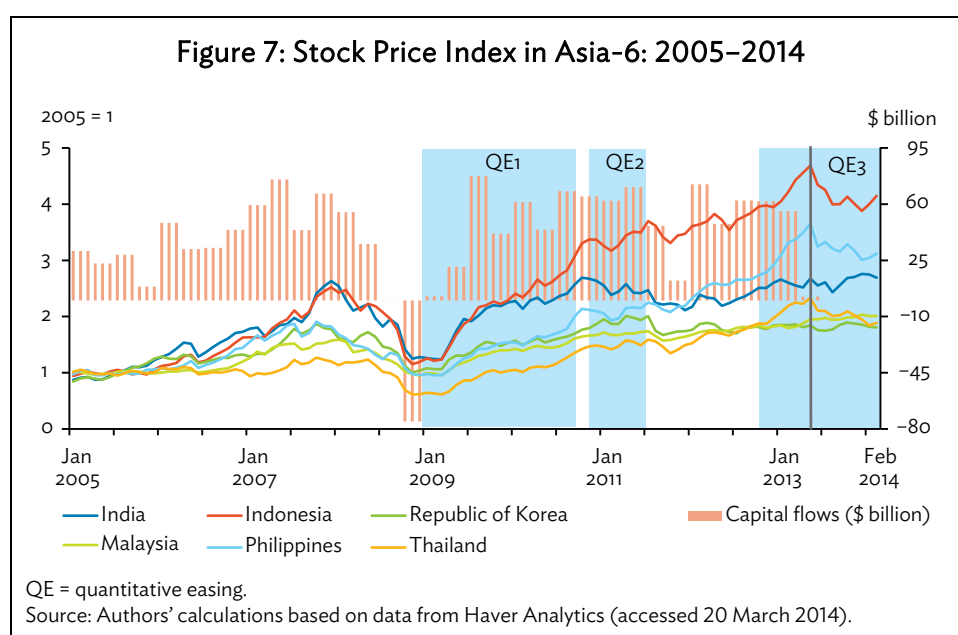


The talk of QE3 taper in May 2013 jolted financial markets in emerging economies, causing sharp currency depreciation as foreign capital flows reversed direction. Exchange rates fell across the region, except the Republic of Korea, steeply in India and Indonesia, and more gently in Malaysia, the Philippines, and Thailand. The differences in currency movements across countries may reflect not only specific country characteristics but also differences in central bank intervention. Movements in the stock of foreign reserve holdings (Figure 6) suggest that the Philippines and Thailand intervened less aggressively than other countries to defend their currencies. Following QE1, despite currency appreciations, all six countries increased their foreign reserves, with the Philippines, Thailand, and Indonesia experiencing the largest gains. This suggests that exchange rates bore only part of the impact of capital inflows during that period. Reserve accumulation diminished when QE2 ended and did not resume when QE3 was introduced. When the Fed mentioned QE3 tapering in May 2013, only the central banks of Indonesia and, to a lesser extent, India appeared to have intervened to defend their currencies.



Since the GFC, however, currency intervention does not seem to be a key factor in explaining differences in currency movements across Asia. Instead, factors related to underlying country-specific economic fundamentals played a more dominant role in the movements of capital flows and exchange rates.

Movements of foreign capital in and out of the six Asian countries during the GFC and QE were also mirrored closely in equity prices (Figure 7). When foreign capital moved out in the second half of 2008, the stock price index of these countries plummeted. On the other hand, when foreign capital inflow recovered during QE1 and QE2, equity prices increased sharply. Equity prices fell slightly as foreign capital inflows slowed down when QE2 ended, but rose again when capital inflows resumed. The QE3 tapering talk led to sharp corrections in Indonesia, the Philippines and Thailand, but not in the other three countries.



Both exchange rate and equity price index closely tracked the movements of foreign capital flows, particularly during the GFC, QE1, and QE2. The two variables are tightly correlated in these periods, when inflows of foreign capital were associated with exchange rate appreciation and higher stock prices (Table 4). The correlation is tightest during QE1 and QE2 when exchange rates appreciated and stock prices rebounded following the sharp corrections that accompanied large withdrawal of foreign capital during the GFC. There were also close correlations prior to the GFC, although to a lesser degree in most cases.

Table 4: Correlation Between Exchange Rates and Stock Price Indices, 2005–2014

	India	Indonesia	Republic of Korea	Malaysia	Philippines	Thailand
All sample	0.41	0.00	–0.04	–0.87	–0.75	–0.65
Pre GFC	–0.31	–0.63	–0.78	–0.94	–0.95	–0.43
GFC–QE2	–0.57	–0.85	–0.73	–0.88	–0.66	–0.91
QE1–QE2	–0.90	–0.92	–0.90	–0.96	–0.92	–0.99
Post–QE2	0.63	0.45	–0.61	0.53	–0.21	–0.22

GFC = global financial crisis, QE = quantitative easing.

Source: Authors' calculations.

Overall, however, exchange rate and stock prices are only closely correlated in Malaysia, the Philippines and Thailand, but not in India, Indonesia, and the Republic of Korea. The relation between the two variables seemed to break down in the post-GFC period. With less intervention from their central banks, the Indonesian rupiah and Indian rupee depreciated during this period. However, capital inflows to the two countries continue to drive an increase in their equity price indices. In sum, the movements of both exchange rates and equity prices provide a good suggestion about the direction of flows in foreign capital.

IV. IMPACT OF QE TAPERING

In this section, we analyze the impact of QE tapering on financial stability in developing countries. More specifically, we analyze the different factors which influence the effect of QE tapering on financial instability in order to identify the most significant factors. Since QE tapering has just begun, it is not easy to assess its impact. Recently, however, EG (2013) set forth an innovative approach to help answer the critical question—why are some countries likely to be hit harder by QE tapering? The Fed's May 2013 taper talk triggered a sharp depreciation of the exchange rate in some emerging economies. Based on this experience, EG (2013) investigated what factors are associated with the negative impact of the Fed tapering.

The basic regression equation estimated by EG (2013) takes the following linear form:

$$ERD_i = X_i\beta + \epsilon_i$$

where ERD_i is the exchange rate depreciation experienced by country i between the end of April and the end of August 2013, and X_i is a vector of country-specific factors for country i that are associated with exchange rate depreciation. The factors considered are (1) deterioration in current account deficit and real exchange rate appreciation, as measures of local market impact and loss of competitiveness; (2) cumulative private capital inflows or the stock of portfolio liabilities, as measures of the size of the financial market; (3) GDP growth, inflation, government budget deficit, and foreign reserves, as measures of economic fundamentals; and (4) exchange rate regime, capital market openness, public debt, and institutional quality, as structural variables. The exchange rate regime follows the categorizations in the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Institutional quality is measured by the rule of law obtained from the World Bank's Worldwide Governance Indicators. EG (2013) use the values of these variables in 2012 or their averages over the period 2010–2012.

The major findings are as follows. First, there is little evidence that stronger macroeconomic fundamentals such as budget deficit, public debt, foreign reserves, and GDP growth in the preceding period were helpful in stabilizing the exchange rate. Second, the size of the financial markets and inflation matter more. Third, countries that allowed the real exchange rate to appreciate when large amounts of capital were flowing into emerging markets and hence experienced deterioration of the current accounts were hit more severely. They conclude that a broader array of macroprudential policies which moderate the upward pressure on the real exchange rate and the widening of the current account deficit are required to prevent the negative impact of QE tapering.

In this paper we extend EG (2013) in several dimensions. First, we include domestic credit expansion, which is considered as one of the most important indicators of financial instability, as an additional variable. Second, we try to separate the role of the size of the financial market from actual capital flows during the QE periods. Third, using a recent comprehensive database constructed by Forbes, Fratzscher and Straub (2013), we include macroprudential measures and capital controls as additional explanatory variables. Finally, by introducing a dummy variable for Asia, we investigate if some variables have a significantly bigger effect on the region than the rest of the world.

In columns [1]–[4] in Table 5, we estimate the same equation as in EG (2013), except that we include an additional explanatory variable, namely domestic credit expansion in 2009–2012.⁴ All our regression results are consistent with the results of EG (2013). Increase in current account deficit and appreciation of real exchange rate are highly significant at 1% level. None of the economic fundamental variables are statistically significant, except inflation, which is significant at 10% level. Capital flows between 2010 and 2012 are also mostly significant. We also find that increase in domestic credit, a newly introduced explanatory variable, is significant. This suggests that domestic credit expansion can help trigger a sharp depreciation of the exchange rate in the face of capital inflows.

Table 5: Factors Associated with Exchange Rate Depreciation, April–August 2013

Dependent Variable	Percent Change in Nominal Exchange Rate							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Increase in current account deficit, 2010–12	0.023*** [0.005]	0.023*** [0.005]	0.024*** [0.005]	0.023*** [0.006]	0.025*** [0.006]	0.024*** [0.006]	0.026*** [0.006]	0.025*** [0.006]
Average annual %change in real exchange rate, 2009–2012	–0.537*** [0.116]	–0.504*** [0.115]	–0.479*** [0.114]	–0.466*** [0.119]	–0.543*** [0.116]	–0.511*** [0.117]	–0.489*** [0.115]	–0.476*** [0.120]
Increase in credit to GDP ratio, 2009–2012	0.097** [0.040]	0.108*** [0.040]	0.083* [0.041]	0.099** [0.043]	0.099** [0.040]	0.109*** [0.040]	0.085** [0.042]	0.102** [0.043]
Log of average inflows of bond, equity, loans 2010–2012	0.438* [0.257]	0.442* [0.250]	0.224 [0.304]	0.549** [0.272]	0.507* [0.269]	0.481* [0.262]	0.297 [0.314]	0.621** [0.283]
Reserves/M2, 2012	3.321 [2.428]	3.556 [2.226]	2.451 [2.377]	3.133 [2.461]	3.327 [2.434]	3.613 [2.247]	2.557 [2.383]	3.231 [2.468]

continued on next page

⁴ While EG (2013) also include the budget deficit and public debt as additional factors, we exclude them since they are not statistically significant.

Table 5 continued

Dependent Variable	Percent Change in Nominal Exchange Rate							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Real GDP 2012, percent change	0.031 [0.163]				0.049 [0.165]			
Inflation (CPI), 2012		0.164* [0.094]				0.153 [0.097]		
Exchange rate regime, 2012			0.949** [0.463]				0.941** [0.464]	
Rule of law, 2012				-0.085 [0.689]				0.007 [0.697]
Asia					-1.299 [1.470]	-0.785 [1.442]	-1.393 [1.488]	-1.452 [1.572]
R ²	0.691	0.718	0.677	0.647	0.696	0.72	0.683	0.653
Observations	51	50	52	52	51	50	52	52

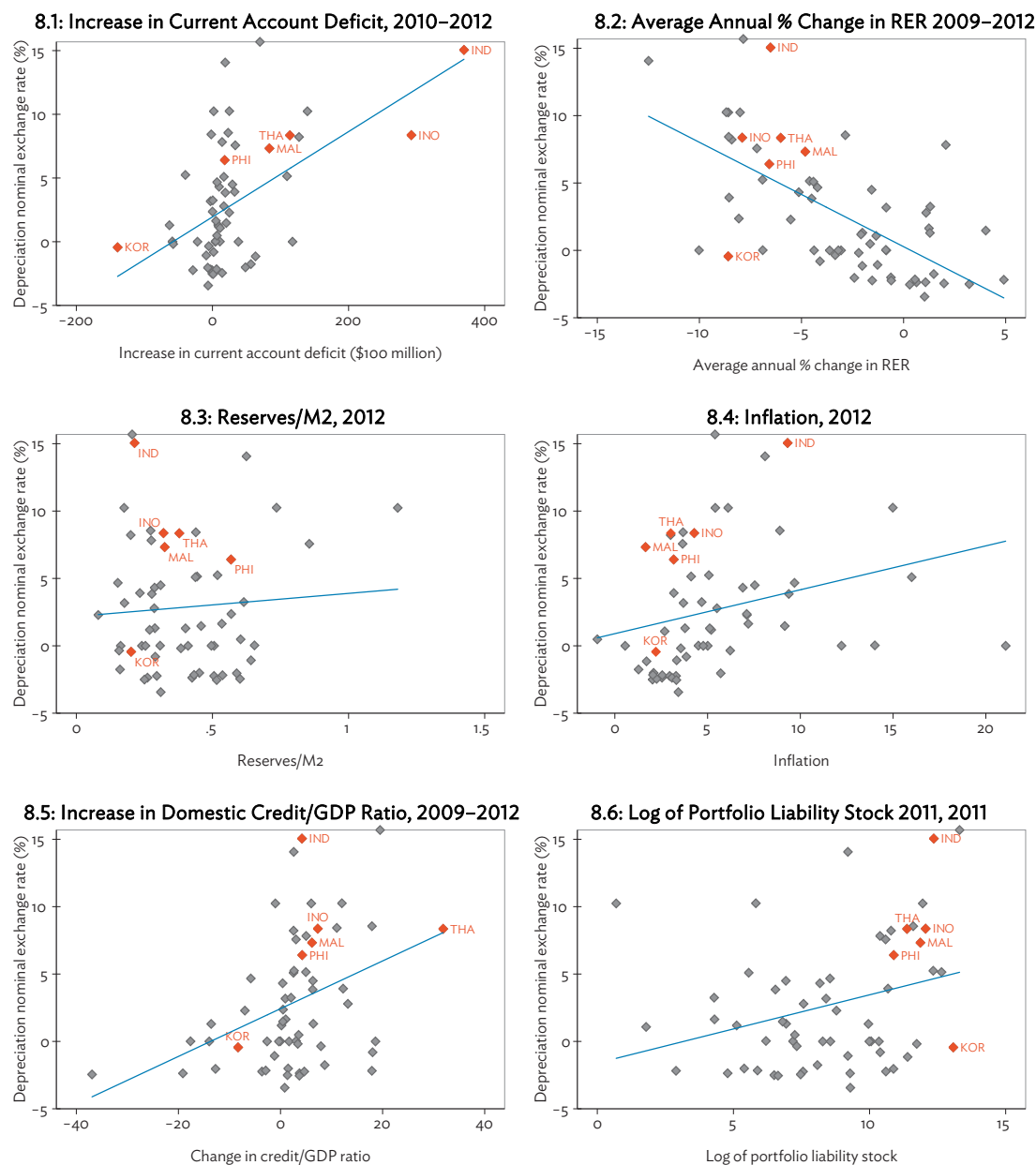
***, **, and * denotes the significance levels of 1%, 5%, and 10%, respectively; CPI = consumer price index; GDP = gross domestic product.

Notes:

1. The results in columns [1]–[4] are replications of Table 6 (columns [1], [4], [7], and [8]) in Eichengreen and Gupta (2013), except that we include an additional explanatory variable that is, increase in domestic credit, 2009–2012.
2. The dependent variable is the exchange rate depreciation experienced by the developing country between the end of April and the end of August 2013.
3. An increase in nominal and real exchange rates represents depreciation.
4. The exchange rate regime is the categorization in the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).
5. Rule of law measures the institutional quality obtained from the World Bank's Worldwide Governance Indicators.
6. Asia is a dummy variable for six Asian countries: India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand.
7. Numbers in parentheses are standard errors.

Source: Authors' calculations.

In columns [5]–[8], we added an Asia dummy that takes the value of 1 for the six Asian countries and 0 otherwise. The results show that the coefficients are all negative, though not statistically significant. Hence there is no evidence that Asia was hit harder by the tapering talk of May 2013 than elsewhere. Figure 8 suggests that the exchange rates of the six countries behave similarly to those of other countries in the sample, particularly in terms of past current account deficits and past increases in domestic credit.

Figure 8: Individual Economic Factors Associated with Exchange Rate Depreciation

GDP = gross domestic product, IND = India, INO = Indonesia, KOR = Republic of Korea, MAL = Malaysia, PHI = Philippines, RER = real exchange rate, THA = Thailand.

Note: The solid line is the bilateral linear relationship between each factor and the exchange rate depreciation for the developing country from the end of April to the end of August 2013.

Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

In EG (2013), it is not clear what the size of capital flows represents. They emphasize that the size of capital flows is a proxy for financial market liquidity and interpret its significance in the regression as suggesting that countries with large financial markets are likely to be hit harder, as international investors seeking to diversify their global portfolios concentrate on countries with relatively large and liquid financial systems. However, they use actual capital flows as a proxy for financial market liquidity. In Table 6, we try to separate the financial market liquidity from the actual

capital flows during the QE period. To do so, we use the stock of external portfolio liability in 2011 constructed by Lane and Milesi-Ferretti (2007) as a proxy for financial market liquidity as an additional regressor, in addition to capital flows during QE periods.⁵

**Table 6: Factors Associated with Exchange Rate Depreciation
(capital flows during each QE episode included), April–August 2013**

Dependent Variable	Percent Change in Nominal Exchange Rate				
	[1]	[2]	[3]	[4]	[5]
Increase in current account deficit, 2010–12	0.020*** [0.005]	0.020*** [0.005]	0.021*** [0.005]	0.020*** [0.005]	0.020*** [0.005]
Average annual %change in real exchange rate, 2009–2012	–0.717*** [0.126]	–0.730*** [0.133]	–0.693*** [0.130]	–0.736*** [0.126]	–0.724*** [0.126]
Increase in credit to GDP ratio, 2009–2012	0.044 [0.039]	0.038 [0.042]	0.065 [0.039]	0.037 [0.040]	0.053 [0.039]
Log of portfolio liability 2011	–0.293 [0.215]	–0.298 [0.221]	–0.134 [0.208]	–0.300 [0.218]	–0.222 [0.208]
Reserves/M2, 2012	4.229* [2.110]	4.187* [2.214]	4.979** [2.170]	3.482* [2.042]	3.141 [2.079]
Inflation (CPI), 2012	0.196* [0.101]	0.195* [0.103]	0.185* [0.103]	0.190* [0.103]	0.193* [0.104]
Capital flows during QE1		0.050 [0.358]	0.352** [0.135]		
Capital flows during QE2		0.486 [0.680]		0.617*** [0.199]	
Capital flows during QE3		0.111 [0.326]			0.488** [0.183]
Capital flows during all QEs	0.198*** [0.060]				
R ²	0.815	0.816	0.798	0.795	0.779
Observations	44	44	46	46	48

***, **, and * denotes the significance levels of 1%, 5%, and 10%, respectively; CPI = consumer price index; GDP = gross domestic product; QE = quantitative easing.

Notes:

1. The dependent variable is the exchange rate depreciation experienced by the developing country between the end of April and the end of August 2013.
2. An increase in nominal and real exchange rates represents depreciation.
3. The exchange rate regime is the categorization in the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).
4. Rule of law measures the institutional quality obtained from the World Bank's Worldwide Governance Indicators.
5. Asia is a dummy variable for six Asian countries: India, Indonesia, Republic of Korea, Malaysia, Philippines, and Thailand.
6. Numbers in parentheses are standard errors.

Source: Authors' calculations.

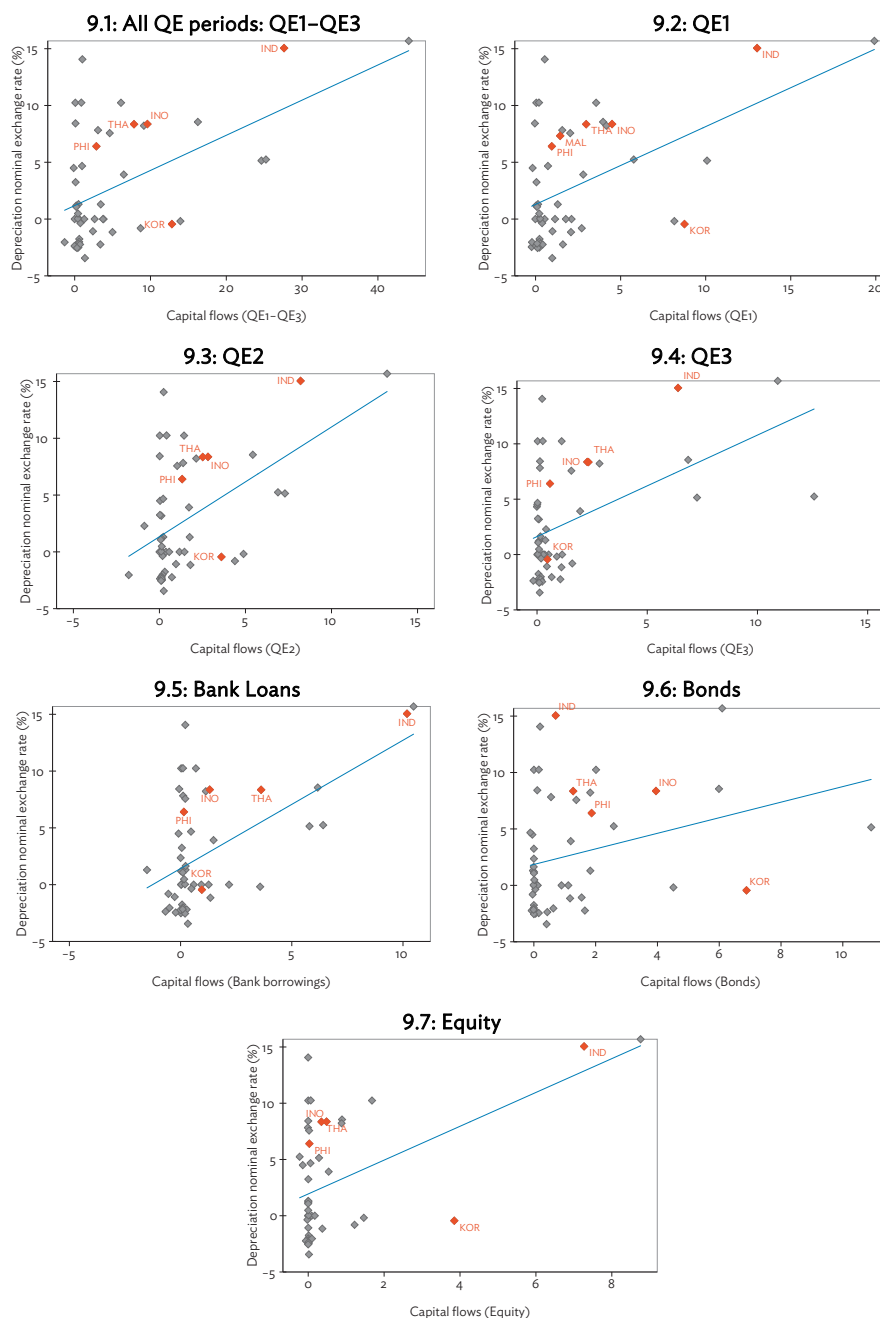
The regression results in column [1] in Table 6 indicate that actual capital flows are much more important than the size of the financial market. Capital flows, defined as the sum of loans, bonds, and equity flows⁶ during QE periods, is significant at 1% level, while the stock of external portfolio liabilities is insignificant. Estimates of other coefficients do not change a lot except that the coefficient of increase in capital flows is no longer statistically significant. In column [2], we used capital flows in QE1, QE2, and QE3 periods as regressors and find that none of the three is statistically significant. We believe that this is due to multicollinearity among the three capital flows. When we use capital flows in

⁵ Eichengreen and Gupta (2013) also used, instead of actual financial flows in 2010–2012, the portfolio liability stock from Lane and Milesi-Ferretti (2007) as an alternative measure of financial market liquidity, but they did not use both of them as regressors simultaneously.

⁶ Since FDI flows are not much related to QE periods, we exclude them from the calculation of capital flows.

QE1, QE2, and QE3 one by one in columns [3]–[5], the coefficient of each capital flow is statistically very significant. Figure 9.1–9.4 suggests that the trends in the six Asian countries are consistent with the aggregate trend captured by the regression results. Capital flows during each QE round led to exchange rate depreciation during the taper talk.

Figure 9: Capital Flows and Exchange Rate Depreciation



IND = India, INO = Indonesia, KOR = Republic of Korea, MAL = Malaysia, PHI = Philippines, QE = quantitative easing, THA = Thailand.

Note: The solid line is the bilateral linear relationship between capital flows measured for QE periods/each type and the exchange rate depreciation for the developing country from the end of April to the end of August 2013.

Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

In order to understand which type of capital flow had the biggest effect on depreciation, we decompose capital flows during QE periods into loans, bonds, and equity flows, and use them as regressors in Table 7. In column [1], we include these three types of capital flows as explanatory variables and find that none of them are statistically significant. However, when we use each type of capital flow one by one as a regressor in columns [2]–[4], we find that the coefficients of loans and equity are significant at 1% level. These results show that countries receiving capital flows in the form of bank loans and equity are particularly vulnerable to QE tapering. Interestingly, while bond flows expand a lot during QE periods, they do not trigger financial instability. The evidence from the six Asian countries indicates a positive relationship for bank loans (Figure 9.5) and a negative relationship for bond flows (Figure 9.6). The relationship for equity flows is unclear, particularly if we exclude the outlier observation of India (Figure 9.7).

**Table 7: Factors Associated with Exchange Rate Depreciation
(different types of capital flows included), April–August 2013**

Dependent Variable	Percent Change in Nominal Exchange Rate			
	[1]	[2]	[3]	[4]
Increase in current account deficit, 2010–12	0.018*** [0.006]	0.017*** [0.005]	0.024*** [0.005]	0.019*** [0.005]
Average annual %change in real exchange rate, 2009–2012	–0.714*** [0.135]	–0.755*** [0.125]	–0.708*** [0.137]	–0.673*** [0.129]
Increase in credit to GDP ratio, 2009–2012	0.048 [0.041]	0.041 [0.039]	0.077* [0.041]	0.076* [0.038]
Log of portfolio liability 2011	–0.217 [0.240]	–0.209 [0.196]	–0.099 [0.236]	–0.027 [0.185]
Reserves/M2, 2012	4.855** [2.261]	4.428** [2.085]	4.445* [2.326]	5.766** [2.158]
Inflation (CPI) 2012	0.172 [0.113]	0.146 [0.101]	0.224** [0.109]	0.196* [0.103]
Capital flows during QE (Loans)	0.316 [0.370]	0.655*** [0.202]		
Capital flows during QE (Bonds)	0.079 [0.261]		0.343 [0.245]	
Capital flows during QE (Equity)	0.447 [0.353]			0.797*** [0.265]
R ²	0.821	0.812	0.771	0.807
Observations	44	46	46	44

***, **, and * denotes the significance levels of 1%, 5%, and 10%, respectively; CPI = consumer price index; GDP = gross domestic product; QE = quantitative easing.

Notes:

1. The dependent variable is the exchange rate depreciation experienced by the developing country between the end of April and the end of August 2013.
2. An increase in nominal and real exchange rates represents depreciation.
3. Portfolio liability refers to the stock of external portfolio liability in 2011 constructed by Lane and Milesi-Ferretti (2007).
4. Numbers in parentheses are standard errors.

Source: Authors' calculations.

Finally, we investigate the role of government policies such as macroprudential measures and capital controls. We use the new database constructed by Forbes, Fratzscher and Straub (2013). The database contains detailed information on weekly changes in macroprudential measures, controls on capital inflows, and capital outflows for 60 countries between 2009 and 2011. Our dummy variables, *macroprudential*, and *capital controls*, take the value of one if the developing country adopted any macroprudential measures and capital controls, respectively, in 2009–2011. We distinguish between capital controls for capital inflows and outflows so that there are two dummy variables for capital controls, *capital controls (inflows)* and *capital controls (outflows)*.

The results in Table 8 show that the coefficients of *macroprudential* and *capital controls (inflows and outflows)* are all negative except for one case, suggesting the possibility that both measures actually worked to constrain further deterioration. However, no coefficient is statistically significant even at 10% level. Hence even if they may have worked, the impact is still far from certain. Instead our results suggest that, as argued by EG (2013), it would be better to use the macroprudential policies as preemptive measures. In particular, they can be effective in limiting the appreciation of the real exchange rate and restraining domestic credit expansion. Our results are also consistent with the broader literature that finds no evidence that capital controls are helpful in stabilizing the exchange rate.

**Table 8: Factors Associated with Exchange Rate Depreciation
(macroprudential policies and capital controls included), April–August 2013**

Dependent Variable	Percent Change in Nominal Exchange Rate				
	[1]	[2]	[3]	[4]	[5]
Increase in current account deficit, 2010–12	0.018*** [0.006]	0.018*** [0.006]	0.018*** [0.006]	0.018*** [0.006]	0.018*** [0.006]
Average annual %change in real exchange rate, 2009–2012	-0.746*** [0.124]	-0.751*** [0.131]	-0.721*** [0.128]	-0.765*** [0.126]	-0.743*** [0.125]
Increase in credit to GDP ratio, 2009–2012	0.040 [0.038]	0.038 [0.041]	0.062 [0.038]	0.034 [0.040]	0.050 [0.039]
Log of portfolio liability, 2011	-0.335 [0.222]	-0.345 [0.232]	-0.151 [0.211]	-0.349 [0.232]	-0.199 [0.211]
Reserves/M2, 2012	3.820* [2.090]	3.845* [2.186]	4.700** [2.143]	3.049 [2.050]	3.075 [2.080]
Inflation (CPI), 2012	0.184* [0.099]	0.185* [0.103]	0.174* [0.101]	0.180* [0.102]	0.176* [0.103]
Capital flows (QE1)		0.157 [0.364]	0.396*** [0.137]		
Capital flows (QE2)		0.390 [0.735]		0.677*** [0.206]	
Capital flows (QE3)		0.132 [0.368]			0.540*** [0.187]
Capital flows (QE1~ QE3)	0.219*** [0.061]				
Macroprudential	-0.192 [0.949]	-0.055 [1.140]	-0.624 [0.887]	0.004 [0.992]	-1.014 [0.924]

continued on next page

Table 8 continued

Dependent Variable	Percent Change in Nominal Exchange Rate				
	[1]	[2]	[3]	[4]	[5]
Capital controls (Outflows)	-1.542 [1.123]	-1.569 [1.193]	-1.502 [1.146]	-1.584 [1.160]	-1.103 [1.177]
Capital controls (Inflows)	-0.584 [1.317]	-0.631 [1.372]	-0.308 [1.355]	-0.544 [1.365]	-0.167 [1.363]
R ²	0.837	0.837	0.821	0.816	0.801
Observations	44	44	46	46	48

***, **, and * denotes the significance levels of 1%, 5%, and 10%, respectively; CPI = consumer price index; GDP = gross domestic product; QE = quantitative easing.

Notes:

1. The dependent variable is the exchange rate depreciation experienced by the developing country between the end of April and the end of August 2013.
2. An increase in nominal and real exchange rates represents depreciation.
3. Portfolio liability refers to the stock of external portfolio liability in 2011 constructed by Lane and Milesi-Ferretti (2007).
4. Capital flows are defined as the sum of loans, bonds, and equity flows.
5. Macroprudential and capital controls (outflows and inflows) are dummy variables that take 1 if the developing country adopted any macroprudential measures and capital controls, respectively, between 2009–2011.
6. We use the new database constructed by Forbes Fratzscher and Straub (2013) that carries detailed information on weekly changes in macroprudential measures, controls on capital inflows, and capital outflows from 2009 to 2011 for 60 countries.
7. Numbers in parentheses are standard errors.

Source: Authors' calculations.

V. CONCLUDING OBSERVATIONS

During the GFC, advanced economies embarked on massive unconventional monetary expansions, epitomized by the US Fed's three rounds of QE, to support financial stability and economic growth. An important spillover effect of QE is the expansion of potentially destabilizing capital flows into developing countries. Going forward, there are widespread concerns that QE tapering may trigger financial instability in those countries. The financial turbulence suffered by many developing countries, including some in Asia, in May 2013, has fueled such concerns. The central objective of our paper is to empirically investigate this important issue by (1) examining the effect of QE on capital flows into developing Asia, and (2) analyzing the different factors which influence the effect of QE tapering on financial instability in order to identify the most significant factors.

Our empirical analysis yields a number of interesting findings. We find that capital flows into developing countries during QE periods are comparable to those before the GFC. In particular, our analysis reconfirms earlier studies which find that QE1 had a much larger effect on capital flows than QE2 or QE3. We also find that while bank loans dominated the flows before the GFC, they shrank and other types of flows, (i.e., FDI, bonds, and equity) took center stage after the GFC. In line with EG (2013), we find that economic fundamentals such as foreign reserves, GDP growth, and government budget deficit did not affect exchange rate depreciation during QE tapering. One economic fundamental which did lead to depreciation was inflation. Domestic credit expansion, a new variable we introduced, had a significant effect on depreciation. When we separate out actual capital flows from financial market liquidity, only capital flows have a significant effect. Capital controls and macroprudential policies have the right sign but are insignificant.

A number of policy lessons emerge from our empirical findings. For one, there is no evidence that Asian countries were hit harder than other parts of the world. Therefore, the region is not especially vulnerable to monetary policy shocks from advanced economies. A significant effect of

inflation and domestic credit expansion on exchange rate depreciation during the tapering talk underlines the importance of prudent monetary policy in reducing vulnerability to such shocks. Lax monetary conditions seem to magnify the effect of capital inflows on real exchange rate appreciation. Capital flows in the form of bank loans and equity seem to be particularly destabilizing. While our evidence does not support the direct effectiveness of macroprudential measures, they can still be useful preemptive measures that limit the appreciation of the real exchange rate and restrain domestic credit expansion. For example, Bruno and Shin (2013) find that the Republic of Korea's adoption of macroprudential measures in 2010 reduced the sensitivity of capital inflows to global conditions.

APPENDIX

Appendix A1: Sample of Economies

Albania	Indonesia	Nigeria
Argentina	Israel	Pakistan
Armenia	Jamaica	Paraguay
Bangladesh	Jordan	Peru
Bosnia and Herzegovina	Kazakhstan	Philippines
Brazil	Kenya	Poland
Bulgaria	Korea, Republic of	Romania
Cape Verde	Kyrgyz Republic	Russian Federation
Chile	Latvia	Seychelles
Colombia	Lebanon	South Africa
Costa Rica	Lesotho	Sri Lanka
Croatia	Lithuania	Suriname
Czech Republic	Macedonia, FYR	Tanzania
Dominican Republic	Malaysia	Thailand
Egypt	Mauritius	Tunisia
Georgia	Mexico	Turkey
Ghana	Moldova	Uganda
Guatemala	Mongolia	Ukraine
Honduras	Morocco	Uruguay
Hungary	Mozambique	Venezuela, Rep. Bol.
India	Nicaragua	

Note: The sample starts to include developing economies covered by Lim, Mohaparta and Stocker (2014) and adds other emerging economies in Eichengreen and Gupta (2013). However, we drop Hong Kong, China and Singapore as they are financial city centers and not considered as developing economies. We also end up dropping some economies for reasons of data availability.
Source: Authors' compilation.

Appendix A2: Definitions of Variables and Data Sources

Variables	Description and Construction	Data Source
Gross capital inflows	Sum of changes in foreign holdings of direct investment, equity, debt securities, and debt instruments	IMF's IFS database
3M US treasury bill rate	Rate on the 3-month US treasury bill	FRED
Yield curve	Difference between yields on 10-year US bonds and 3-month bills	FRED; Datastream
Interest rate differential	Difference between real interest rates of the sample developing country and the US	IMF's IFS database; Datastream
VIX	Index of implied volatility of S&P 500 index	Chicago Board Options Exchange
GDP	Gross domestic product (GDP) in nominal US dollars; For countries with missing quarterly GDP, we use interpolated annual data	IMF's IFS database; World Bank's World Development Indicators
GDP growth rate for developing countries	Aggregate sample developing year-on-year growth rate	IMF's IFS database; World Bank's World Development Indicators
GDP growth rate for high-income countries	Aggregate GDP of high-income countries, year-on-year growth rate	IMF's IFS database; World Bank's World Development Indicators
Country rating	Overall risk rating score	Datastream
Percent change in nominal exchange rate	Log difference in nominal exchange rate (National currency per US dollar) between April–August 2013	IMF's IFS database
Increase in current account deficit, 2010–2012	Difference in current account deficit between 2010–2012	World Bank's World Development Indicators
Average annual %change in real exchange rate 2009–2012	$[\text{Log nominal exchange rate M12 2012 (IFS)} * \text{CPI of US M12 2012 (IFS)} / \text{CPI of each country M12 2012 (IFS)} - \text{Log nominal exchange rate M1 2009 (IFS)} * \text{CPI of US M1 2009 (IFS)} / \text{CPI of each country M1 2009 (IFS)}] / 3$	IMF's IFS database
Increase in credit to GDP 2009–2012	Increase in domestic credit to private sector (% of GDP) between 2009–2012	World Bank's World Development Indicators
Log of average inflows of bond, equity, loans 2010–2012	$\text{Log}[\text{mean equity and investment fund shares (IFS, US dollars)} + \text{debt securities (IFS, US dollars)} + \text{debt instruments (IFS, US dollars)}]$	IMF's IFS database
Log of portfolio liability 2011	Sum of portfolio equity and portfolio debt security	Lane and Milesi-Ferretti dataset
Reserves/M2, 2012	Inverse of money and quasi money (M2) to total reserves ratio	World Bank's World Development Indicators
Real GDP 2012, percent change	GDP growth (annual %)	World Bank's World Development Indicators
Inflation (CPI) 2012	Inflation, consumer prices (annual %)	World Bank's World Development Indicators
Exchange rate regime 2012	De facto exchange rate regime classification	IMF's AREAER
Rule of law 2012	Rule of law: estimate (WGI)	World Bank's Worldwide Governance Indicators

Source: Authors' compilation.

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Capital Flows during Quantitative Easing and Aftermath

Experiences of Asian Countries

The United States quantitative easing (QE) triggered massive expansions of capital flow into developing Asia, raising concerns about financial instability consequences. The paper examines the effect of QE on capital flows and scrutinizes factors that influence the effect of QE tapering on financial instability. The findings suggest that QE did lead to large capital inflows which, with credit expansion, magnified the effect of the QE tapering announcement on the region's financial instability. While there is no evidence that macroprudential policies directly reduced the effect of QE tapering, they can nevertheless be useful preemptive measures.

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