Capital Flows During Quantitative Easing and Aftermath: Experiences of Asian Countries

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Introduction

- Unconventional Monetary Policy – QE
  - One potential spillover effect is destabilizing global capital flows
- The paper looks at 62 emerging economies including 6 Asian countries: India, Indonesia, South Korea, Malaysia, Philippines, and Thailand.

Main Objectives

1) **Examine the effect of QE on capital flow to developing countries especially in Asia.**
   - Section 1: Capital Flows into Developing Asian “During QE”
   - Section 2: Experiences of Individual Asian Countries
2) **analyzing the different factors which influence the effect of QE tapering on financial instability in order to identify the most significant factors**
   - Section 3: Impact of QE Tapering
3) **Conclusion**

Section 1 - Capital Flows into Developing Asian "During QE"

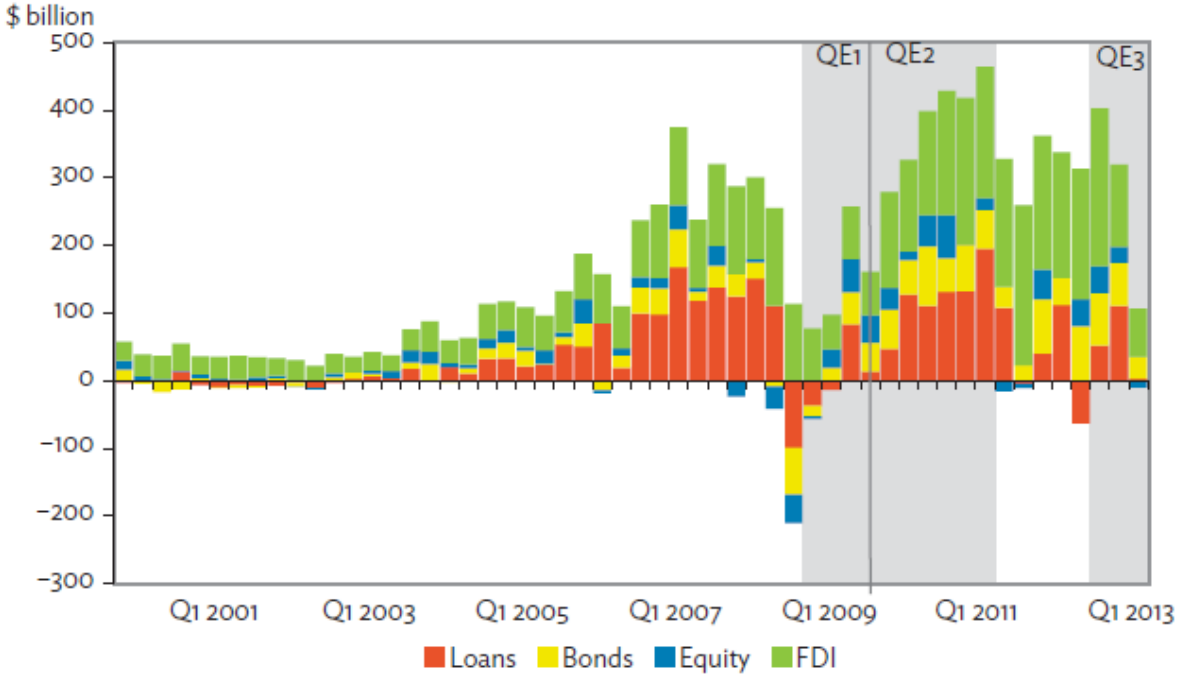
Empirical Looks on the Capital flows' behavior and QE impact on the Flows

Capital Flows into Developing Asian "During QE"

- One potential side effect of 3 rounds of QE:
  - Increasing in global liquidity and global financial flows
- Observations:
  - Same behavior fo the flows across markets
  - Components of the flows changed before and after crisis
  - For the 6-Asian countries, they faced larger flows particularly during QE1 and in the form of equity

Capital Flows into Developing Asian "During QE"

Figure 1: Quarterly Capital Inflows, Q1 2000–Q2 2013

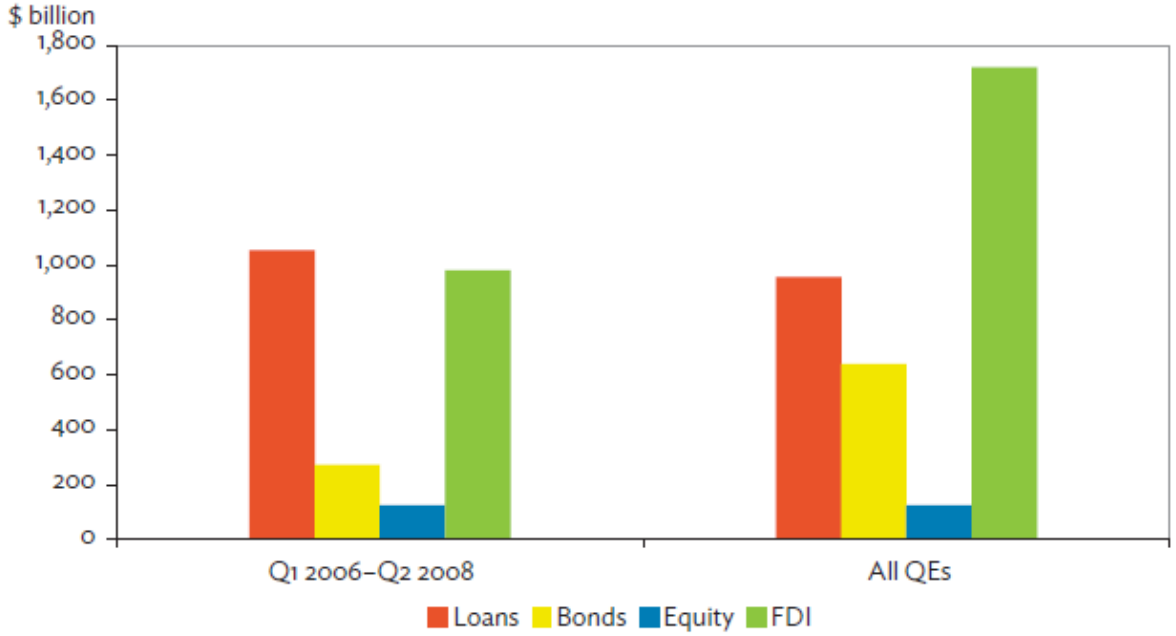


FDI = foreign direct investment, QE = quantitative easing.
Note: Cumulative capital inflows are the sum of quarterly capital inflows during the period before the global financial crisis (Q1 2006–Q2 2008) and during the three QE periods (Q1 2009–Q3 2010, Q4 2010–Q2 2011, and Q4 2012–Q2 2013).
Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

comparable level of flows before and after crisis

Capital Flows into Developing Asian "During QE"

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



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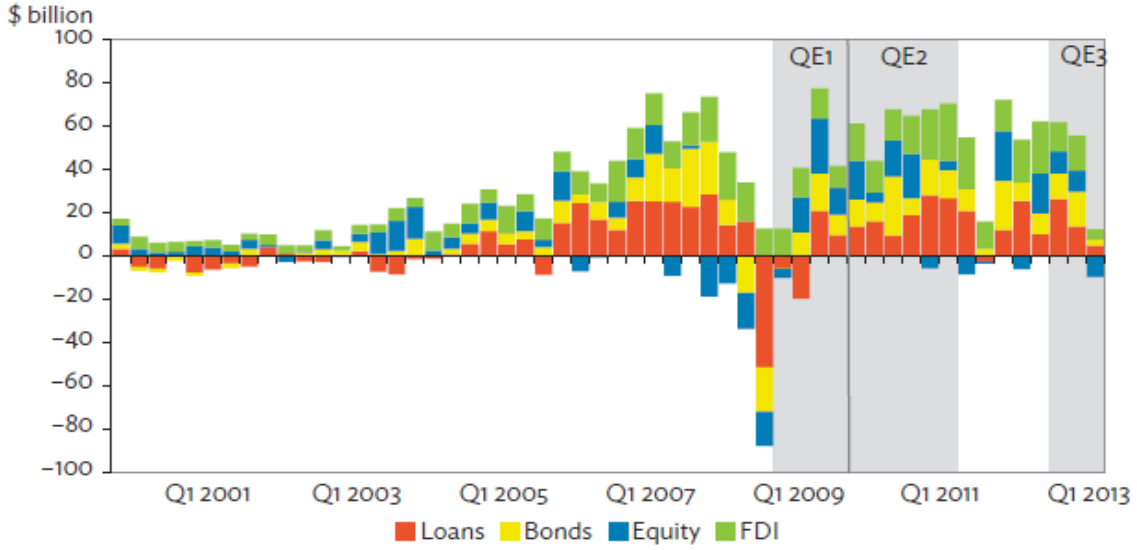
Source: Authors' calculations based on data from International Financial Statistics CD-ROM, December 2013.

change in flows component (less in loan)

Capital Flows into Developing Asian "During QE"

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



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Notes:

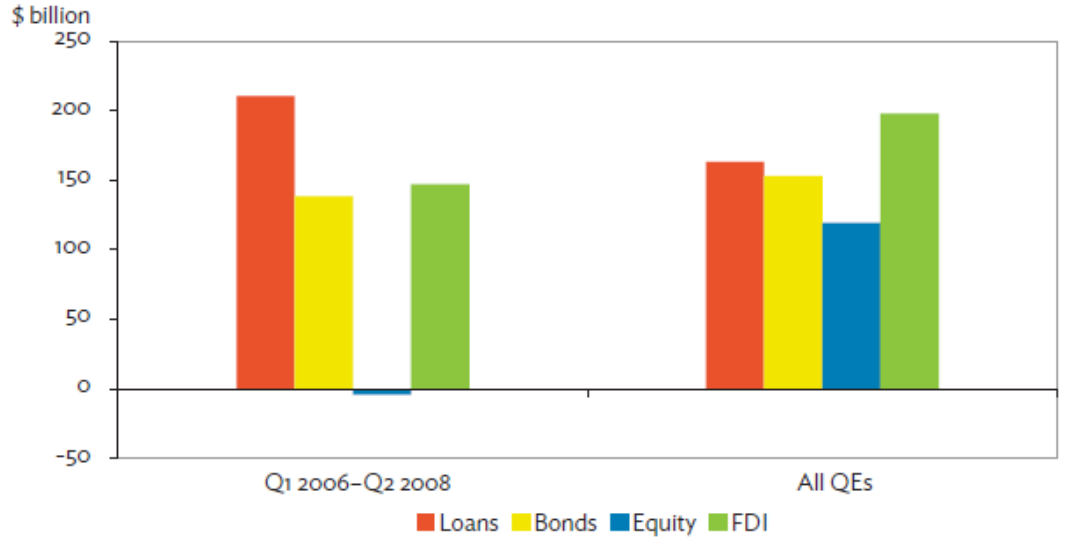
1. Cumulative capital inflows are the sum of quarterly capital inflows during the period before the global financial crisis (Q1 2006–Q2 2008) and during the three QE periods (Q1 2009–Q3 2010, Q4 2010–Q2 2011, and Q4 2012–Q2 2013).
2. Six Asian countries include India, Indonesia, the Republic of Korea, 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.

same observation as overall sample

Capital Flows into Developing Asian "During QE"

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



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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).
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same observation as overall sample

Capital Flows into Developing Asian "During QE"

- Next - QE Impact on Capital Flows
- QE's Impact Decomposition

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

  - FI - The Capital Flows into Emerging Countries
  - L_{it} - Liquidity Channel (3-month T-bill) - λ
  - PB_{it} - Portfolio Balance Channel (Yield spread) - π
    - Yield Curve – Short-term and long-term US bond spread
    - Interest Rate Differential – spread of US and emerging market rate
  - C_{it} - Confidence Channel (VIX) - γ
  - QE_t - QE period dummy- the residual effect of QE - θ

Capital Flows into Developing Asian "During QE"

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

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

Capital Flows into Developing Asian "During QE"

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

	Loans		Bonds		Equity		FDI	
Dependent Variable	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Lagged inflows	0.331***	0.331***	0.319***	0.326***	0.305***	0.307***	0.314***	0.310***
	[0.021]	[0.021]	[0.023]	[0.023]	[0.023]	[0.023]	[0.021]	[0.021]
All QEs	1.340***		0.673***		0.673***		−0.198	
	[0.316]		[0.156]		[0.132]		[0.154]	
QE1		1.319***		1.063***		0.932***		−0.517***
		[0.367]		[0.181]		[0.151]		[0.180]
QE2		1.536***		0.302		0.407**		−0.056
		[0.464]		[0.230]		[0.193]		[0.226]
QE3		1.045*		−0.144		0.062		0.740**
		[0.620]		[0.298]		[0.260]		[0.301]
3M US treasury bill rate	0.371*	0.366*	−0.128	−0.143	−0.363***	−0.375***	0.095	0.113
	[0.192]	[0.193]	[0.094]	[0.094]	[0.077]	[0.078]	[0.089]	[0.089]
Yield curve	0.031	0.016	−0.233*	−0.296**	−0.481***	−0.525***	−0.027	0.033
	[0.239]	[0.241]	[0.119]	[0.120]	[0.100]	[0.101]	[0.113]	[0.114]
Interest rate differential	−0.001	−0.002	0.005	0.005	−0.002	−0.001	−0.003	−0.001
	[0.020]	[0.020]	[0.010]	[0.010]	[0.009]	[0.009]	[0.012]	[0.012]
VIX	−0.041**	−0.042**	−0.023***	−0.031***	−0.015**	−0.021***	−0.007	0.002
	[0.018]	[0.018]	[0.009]	[0.009]	[0.007]	[0.008]	[0.009]	[0.009]
ln GDP	3.500***	3.483***	−0.395	−0.433	0.935***	0.891***	3.616***	3.695***
	[0.815]	[0.816]	[0.367]	[0.367]	[0.314]	[0.315]	[0.389]	[0.389]
GDP growth rate for developing countries	0.073	−0.309	1.463	0.081	1.156	0.171	−1.754*	−0.302
	[1.901]	[2.056]	[0.906]	[0.990]	[0.766]	[0.839]	[0.906]	[0.978]
GDP growth rate for high-income countries	4.343	4.305	−0.094	2.416	−1.807	0.01	2.729	0.713
	[3.617]	[3.815]	[1.747]	[1.839]	[1.464]	[1.549]	[1.687]	[1.770]
Country rating	−0.031	−0.031	−0.029*	−0.034**	0.011	0.006	−0.007	−0.002
	[0.036]	[0.036]	[0.017]	[0.017]	[0.014]	[0.014]	[0.018]	[0.018]
Crisis	−0.041	−0.071	−0.387	−0.295	−0.430*	−0.362	0.222	0.181
	[0.558]	[0.562]	[0.273]	[0.275]	[0.231]	[0.233]	[0.268]	[0.268]

Capital Flows into Developing Asian "During QE"

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

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

Capital Flows into Developing Asian "During QE"

Table 3 continued

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

Asian Country experienced more capital flows in form of equity during QE1, and less of FDI during QE3

Section 2: Experiences of Individual Asian Countries

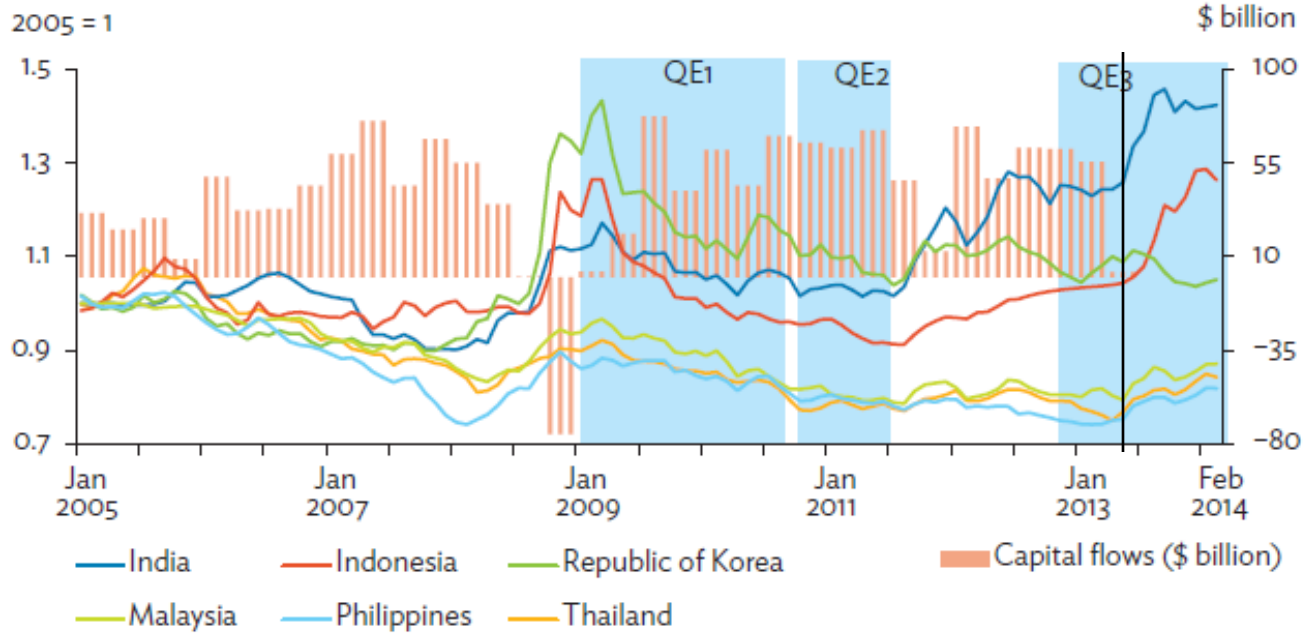
Effect of Capital Flows during QE and the beginning of tapering talk on:
Exchange Rate, Reserve Level and Stock Price

Experiences of Individual Asian Countries

- Corresponding to the increasing in capital inflows during QE, the exchange rate also decreases (domestic currency appreciated).
- We look at the behavior of:
  - Exchange Rate Index
  - Foreign Reserve Holding
  - Stock Price Index changes accordingly

Experiences of Individual Asian Countries

Figure 5: Exchange Rate Index in Asia-6: 2005–2014

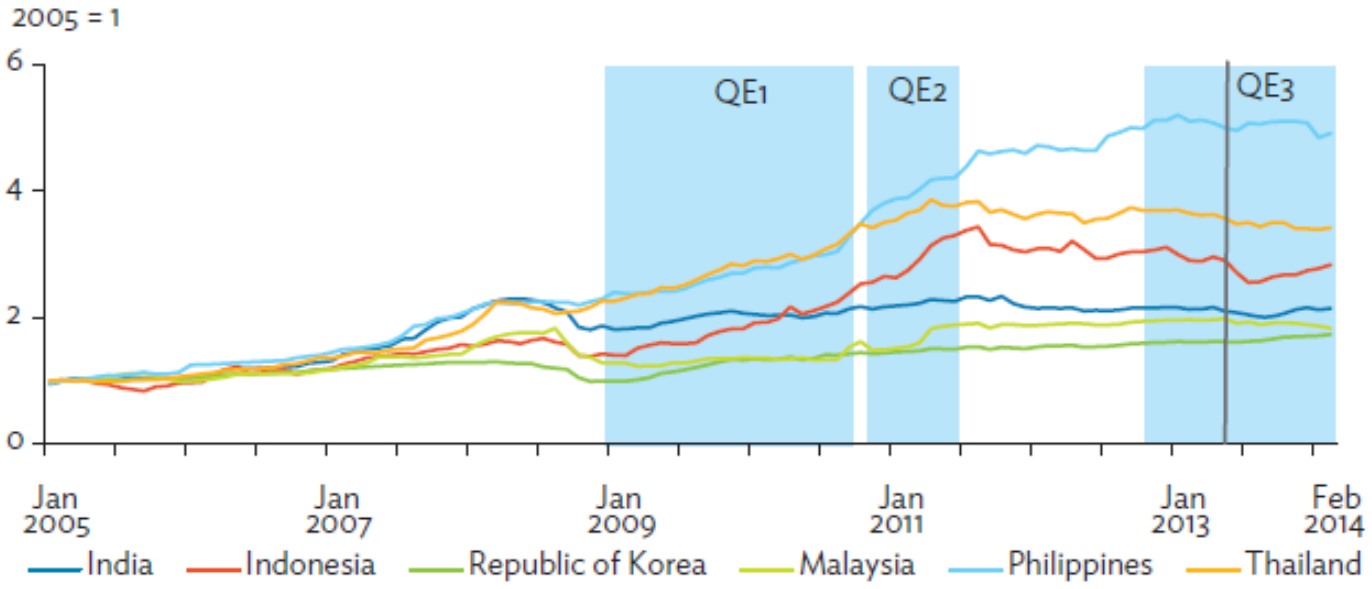


QE = quantitative easing.
Source: Authors' calculations based on data from Haver Analytics (accessed 20 March 2014).

Corresponding to Figure 3, Capital Flows and Domestic Exchange Rate

Experiences of Individual Asian Countries

Figure 6: Foreign Reserve Holdings in Asia-6: 2005–2014



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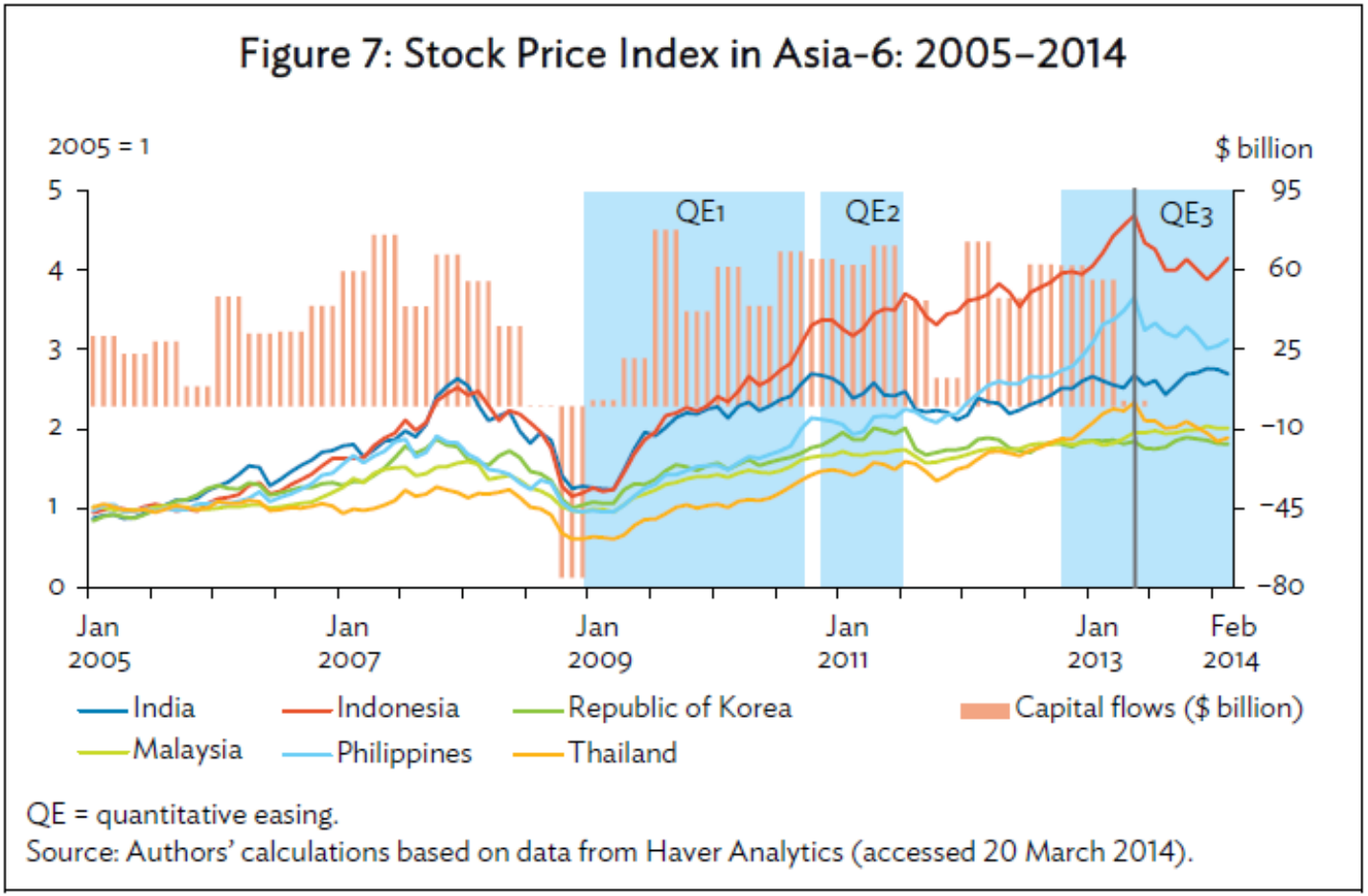
Source: Authors' calculations based on data from Haver Analytics (accessed 20 March 2014).

Reflecting the exchange rate intervention of Central Bank

Experiences of Individual Asian Countries



Co-movement of Exchange Rate and Stock Price index

Experiences of Individual Asian Countries

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.

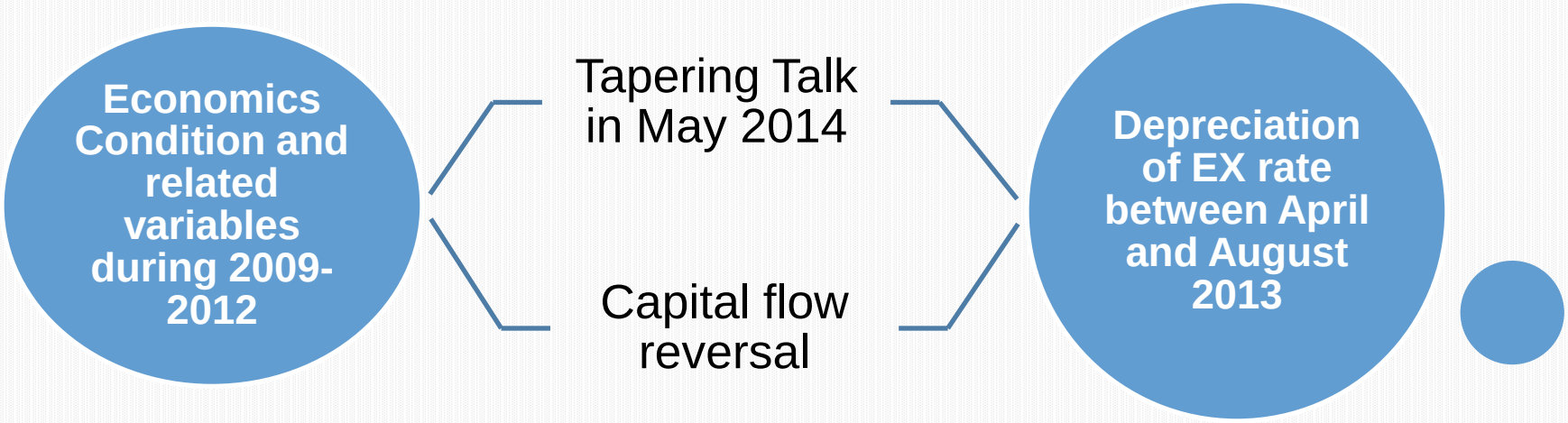
- **Overall**, relationship of exchange rate and stock price are not obvious for case of India, Indonesia and South Korea
- But in all 6 countries, we can clearly observe tighter (negative) relationship **during crisis and QE period**

Section 3: Impact of QE Tapering

May 2014: first talk of QE tapering – the almost end

Impact of QE Tapering

- First Tapering Talk in May 2013
  - Capital Flow Reversal led to rising Exchange Rate (domestic currency depreciation)
  - Currency Depreciation is the the proxy of Financial Instability (vulnerability to capital outflows)
- Investigation of the factors contributing to the currency depreciation and ultimately Financial Instability prior the tapering



Impact of QE Tapering

- So what we actually looking at is:

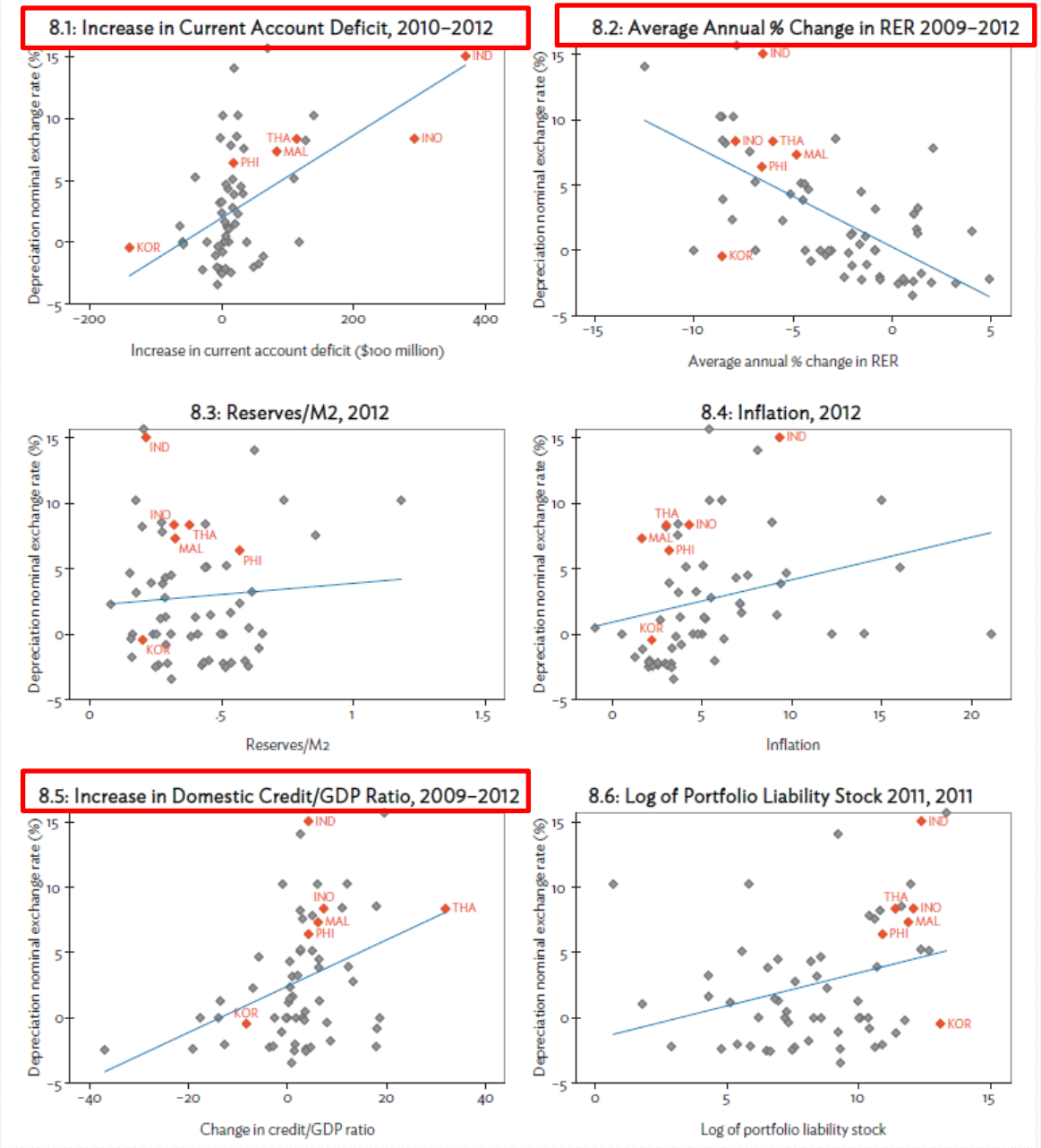
$$ERD_i = X_i\beta + \epsilon_i$$

- where X_i is countries-specific factors between 2009 to 2012 associated with exchange rate depreciation:
  1. **local market impact and loss of competitiveness**
     - current account deficit, real exchange rate appreciation, domestic credit expansion
  2. **Size of Financial Market**
     - Amount of Capital Flows
  3. **Economics Fundamental**
     - GDP Growth, Inflation, Foreign Reserves
  4. **Structural Variables**
     - Capital Market Openness, Institution Quality

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 (1)	0.023***	0.023***	0.024***	0.023***	0.025***	0.024***	0.026***	0.025***
	[0.005]	[0.005]	[0.005]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Average annual %change in real exchange rate, 2009–2012 (1)	−0.537***	−0.504***	−0.479***	−0.466***	−0.543***	−0.511***	−0.489***	−0.476***
	[0.116]	[0.115]	[0.114]	[0.119]	[0.116]	[0.117]	[0.115]	[0.120]
Increase in credit to GDP ratio, 2009–2012 (1)	0.097**	0.108***	0.083*	0.099**	0.099**	0.109***	0.085**	0.102**
	[0.040]	[0.040]	[0.041]	[0.043]	[0.040]	[0.040]	[0.042]	[0.043]
Log of average inflows of bond, equity, loans 2010–2012 (2)	0.438*	0.442*	0.224	0.549**	0.507*	0.481*	0.297	0.621**
	[0.257]	[0.250]	[0.304]	[0.272]	[0.269]	[0.262]	[0.314]	[0.283]
Reserves/M2, 2012 (3)	3.321	3.556	2.451	3.133	3.327	3.613	2.557	3.231
	[2.428]	[2.226]	[2.377]	[2.461]	[2.434]	[2.247]	[2.383]	[2.468]
Real GDP 2012, percent change (3)	0.031				0.049			
	[0.163]				[0.165]			
Inflation (CPI), 2012 (3)		0.164*				0.153		
		[0.094]				[0.097]		
Exchange rate regime, 2012 (4)			0.949**				0.941**	
			[0.463]				[0.464]	
Rule of law, 2012 (4)				−0.085				0.007
				[0.689]				[0.697]
Asia (5)					−1.299	−0.785	−1.393	−1.452
					[1.470]	[1.442]	[1.488]	[1.572]

Figure 8: Individual Economic Factors Associated with Exchange Rate Depreciation



Asian countries have similar behavior compare with other countries

Impact of QE Tapering

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

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

Impact of QE Tapering

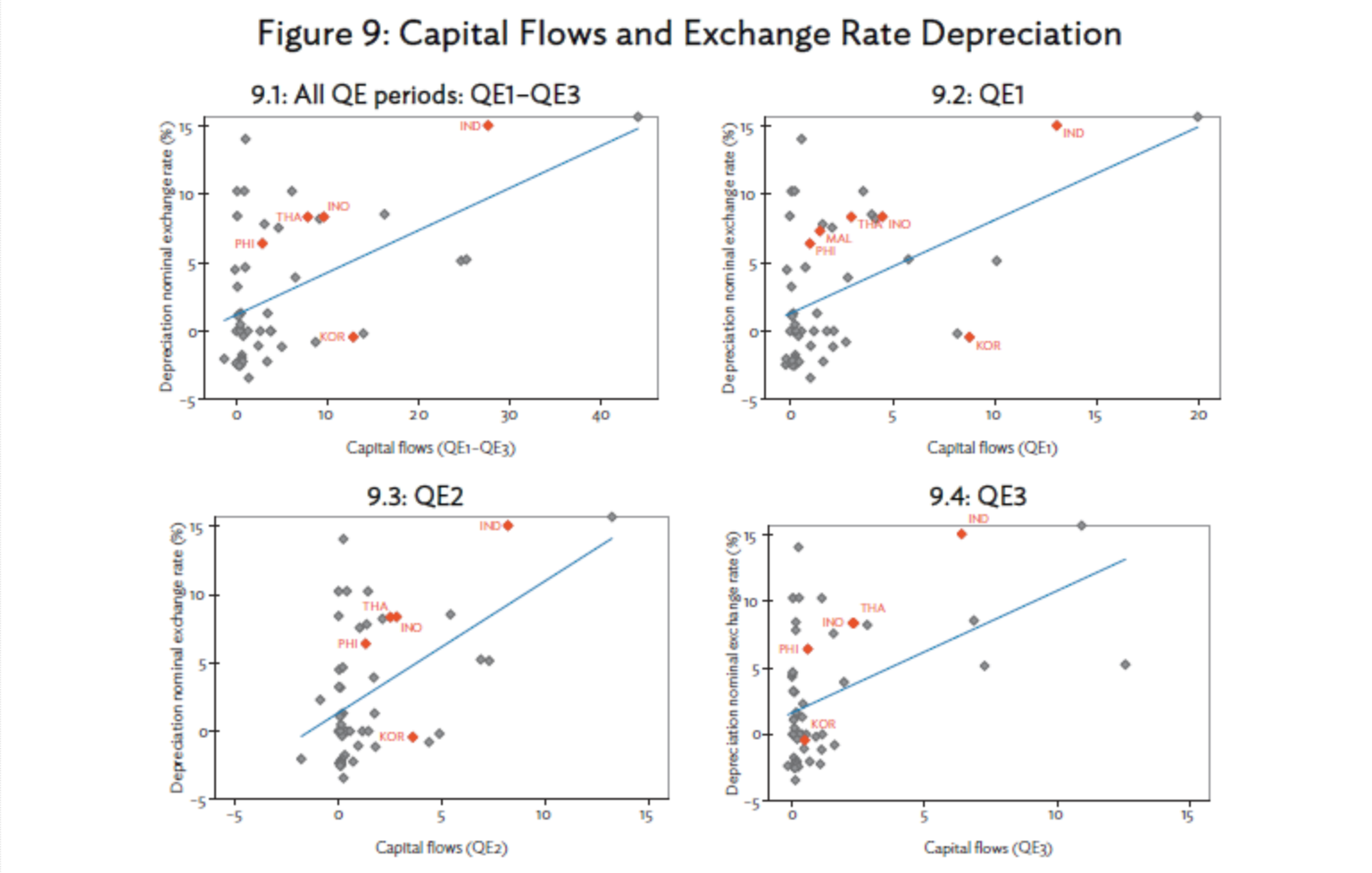


Figure 9.1 – 9.4 capture Table 6 regression result

- The more Flows during each QE rounds led to higher currency depreciation

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

Impact of QE Tapering

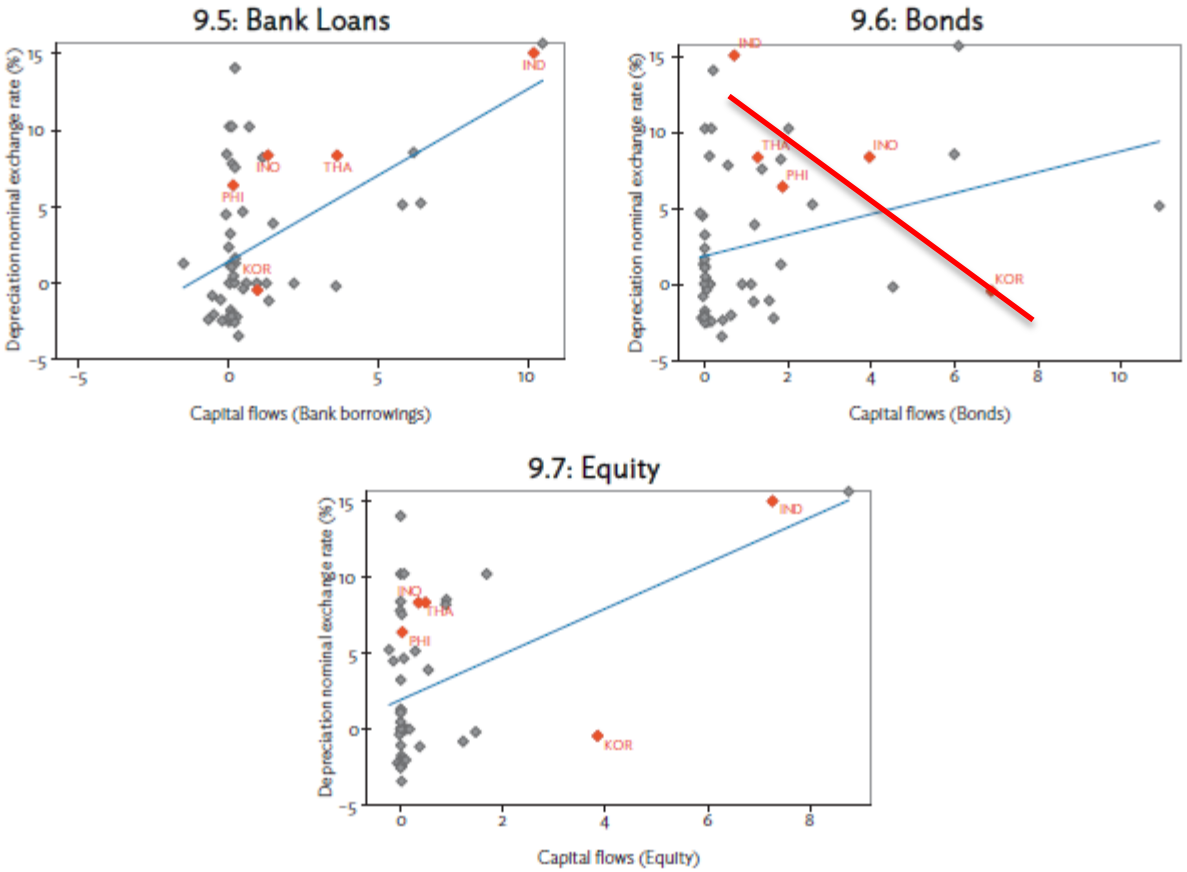


Figure 9.6. Look at the data of Asian Countries (red spots):

- Positive relationship of loan flows and the depreciation
- Negative relationship of bond flows and the depreciation.
- Unclear relationship between equity and the depreciation

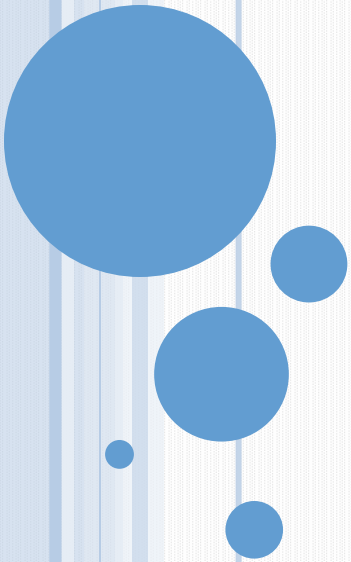
Table 8: Factors Associated with Exchange Rate Depreciation
(macroprudential policies and capital controls included), April–August 2013

	Percent Change in Nominal Exchange Rate				
Dependent Variable	[1]	[2]	[3]	[4]	[5]
Increase in current account deficit, 2010–12	0.018***	0.018***	0.018***	0.018***	0.018***
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]
Average annual %change in real exchange rate, 2009–2012	−0.746***	−0.751***	−0.721***	−0.765***	−0.743***
	[0.124]	[0.131]	[0.128]	[0.126]	[0.125]
Increase in credit to GDP ratio, 2009–2012	0.040	0.038	0.062	0.034	0.050
	[0.038]	[0.041]	[0.038]	[0.040]	[0.039]
Log of portfolio liability, 2011	−0.335	−0.345	−0.151	−0.349	−0.199
	[0.222]	[0.232]	[0.211]	[0.232]	[0.211]
Reserves/M2, 2012	3.820*	3.845*	4.700**	3.049	3.075
	[2.090]	[2.186]	[2.143]		
Inflation (CPI), 2012	0.184*	0.185*	0.174*		
	[0.099]	[0.103]	[0.101]		
Capital flows (QE1)		0.157	0.396*		
		[0.364]	[0.137]		
Capital flows (QE2)		0.390			
		[0.735]			
Capital flows (QE3)		0.132			0.540***
		[0.368]			[0.187]
Capital flows (QE1~ QE3)	0.219***				
	[0.061]				
Macroprudential	−0.192	−0.055	−0.624	0.004	−1.014
	[0.949]	[1.140]	[0.887]	[0.992]	[0.924]
Capital controls (Outflows)	−1.542	−1.569	−1.502	−1.584	−1.103
	[1.123]	[1.193]	[1.146]	[1.160]	[1.177]
Capital controls (Inflows)	−0.584	−0.631	−0.308	−0.544	−0.167
	[1.317]	[1.372]	[1.355]	[1.365]	[1.363]
R^2	0.837	0.837	0.821	0.816	0.801
Observations	44	44	46	46	48

expected signs of coefficient but not significant

Conclusion

- Effect of the QE on Capital flows
  - Comparable amount as before QE but component changed
  - QE1 has largest effect on capital flows and work through C and PB
- Experience by Asian countries during QE and Tapering
  - Asian experience higher flow in form of equity
  - Stock price increase correspondingly to Exchange Rate and Capital surge
  - Asian Countries were not hit harder than other places
- Factor contributing to vulnerability of the economy to Tapering
  - Domestic Credit Expansion
  - Capital flows during QE especially loans and equity types
- Policy Implication
  - Even though not significant but we could take the macro prudential and regulation as a preemptive measure



Thank You - Q&A