Capital Flows to Emerging Market Economies: A Brave New World?

Shaghil Ahmed and Andrei Zlate

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OUTLINE

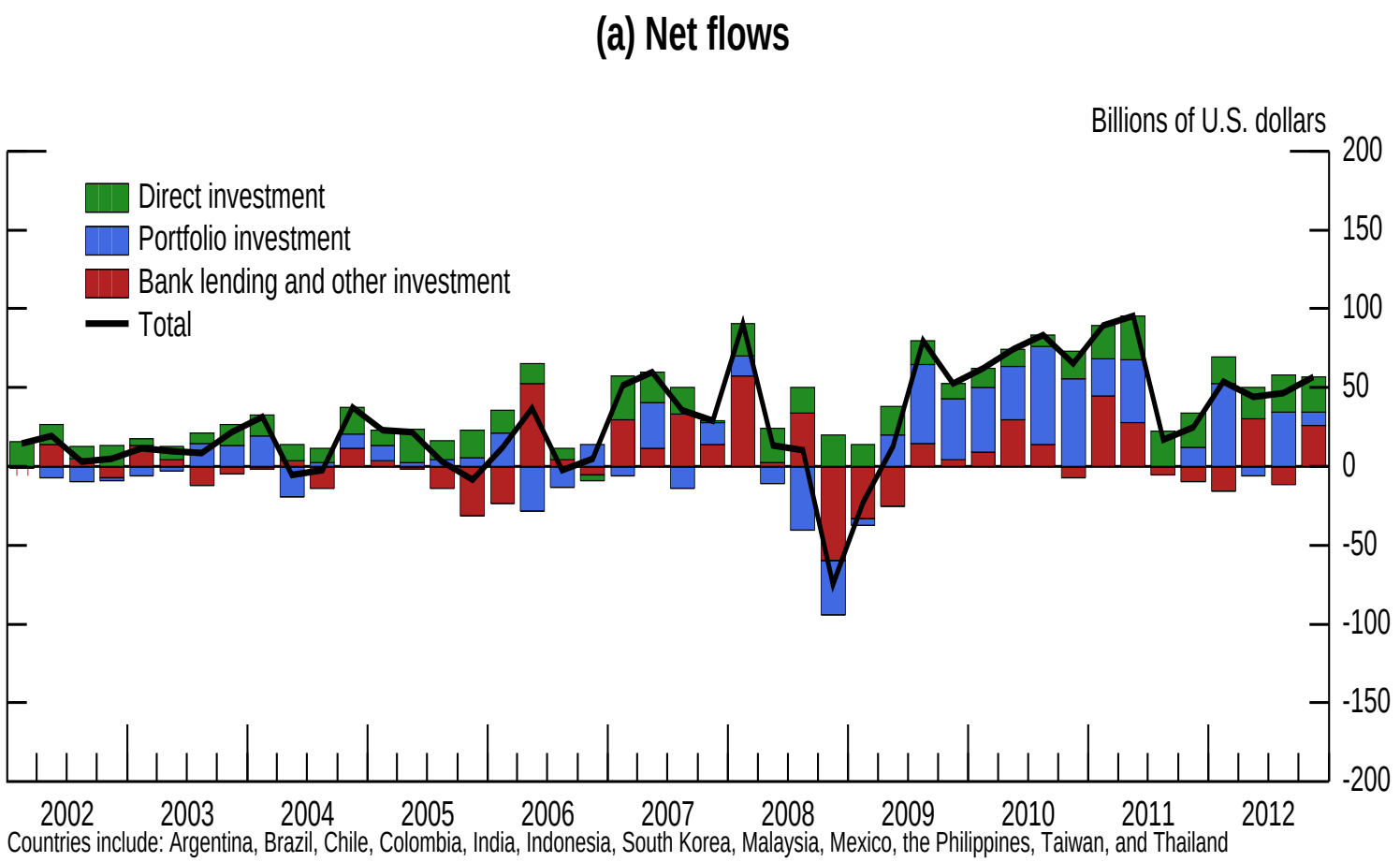
- Motivation
- Main Properties of Private EME Flows/Policy Responses
- Previous Literature/Our Work
- Empirical Model
- Results: Basic Model
- Results: Extended Model
- Results: Robustness
- Conclusions

MOTIVATION

- Large EME capital flows and their volatility pose policy challenges
- Policy tensions between EMEs and AEs
- Questions:
  - Main drivers?
  - Is post-crisis period different?
  - Have recent capital controls been effective?
  - Are flows exacerbated by limited flexibility of exchange rates?
  - Effects of unconventional U.S. monetary expansion?

Net private inflows have been volatile, although FDI has been relatively stable

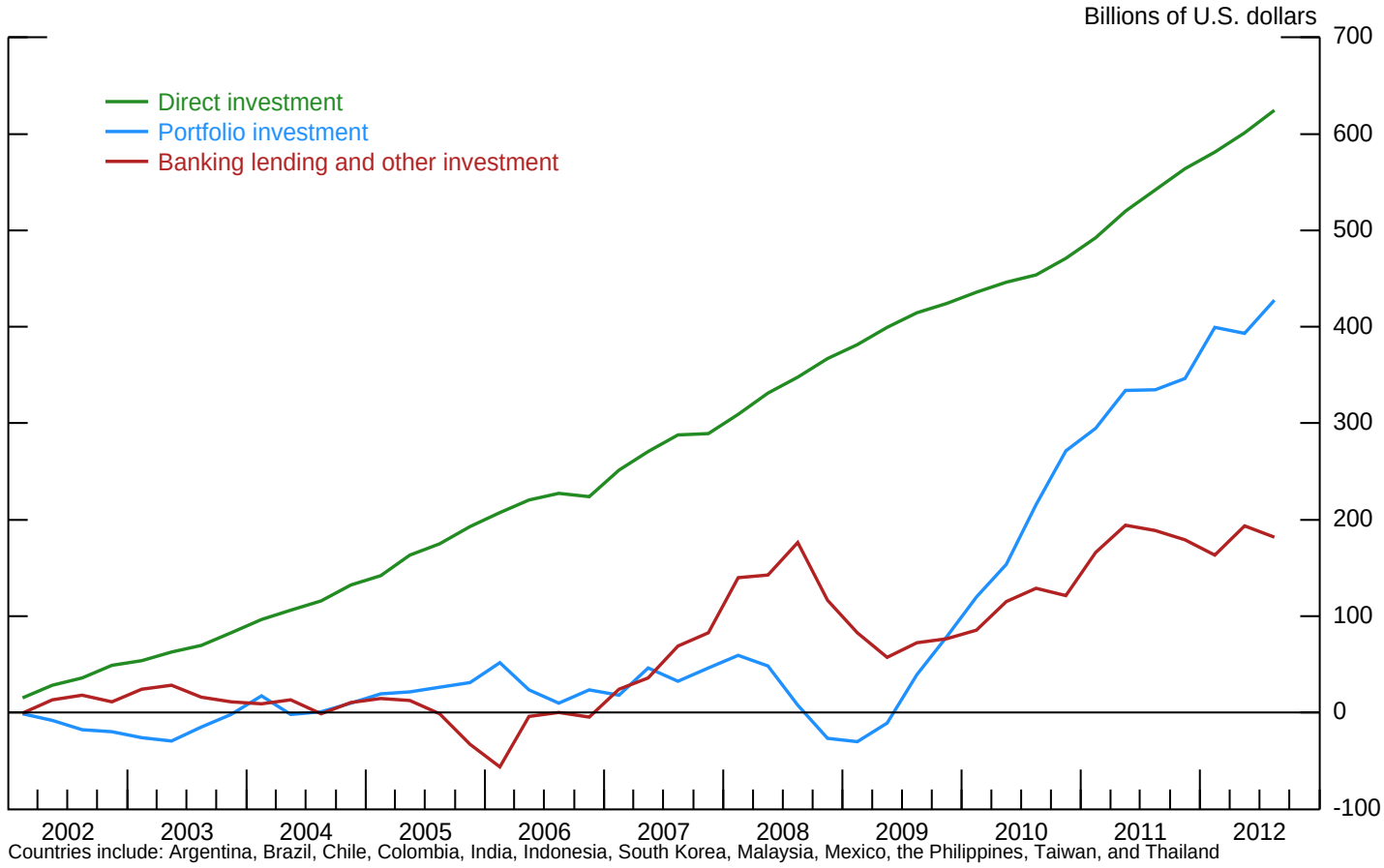
PROPERTIES



Pre-crisis run-up concentrated in banking flows, post-crisis run-up in portfolio flows

PROPERTIES

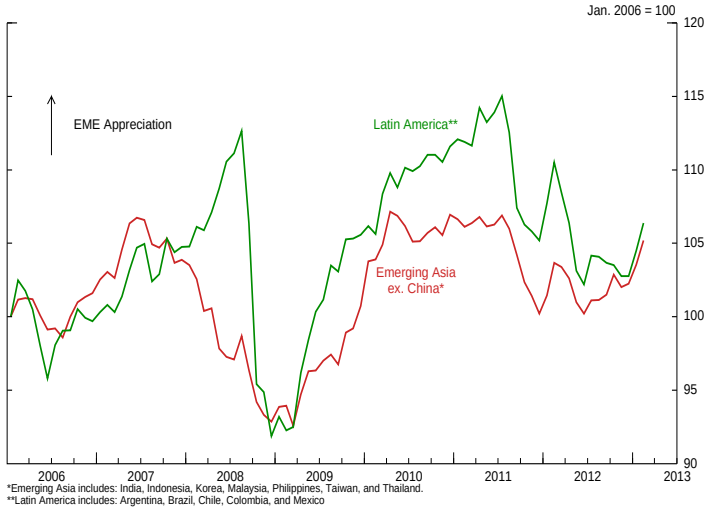
Cumulative Net Inflows



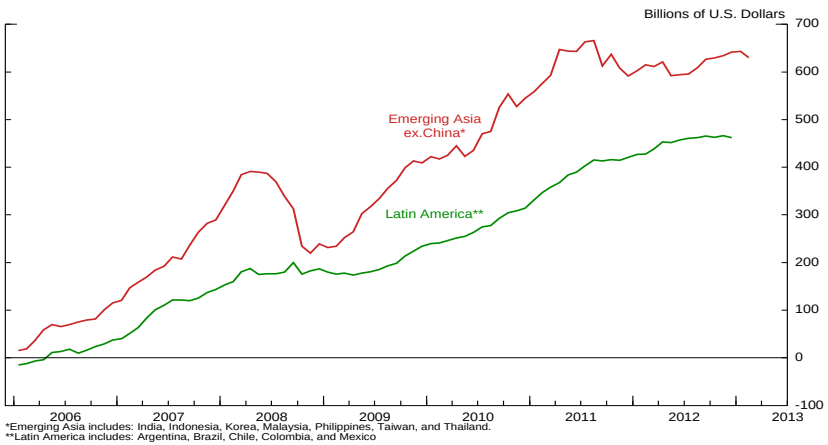
REER appreciations occurred post-crisis, but policymakers also appeared to intervene

POLICY RESPONSES

REER



Reserves Accumulation since 2005



- Tempered policy rate increases
- Several EMEs also used macroprudential measures and capital controls

PREVIOUS LITERATURE

- Surges
  - Ghosh et al (2012)
    - A variety of factors important
  - Forbes and Warnock (2012)
    - Global risk aversion matters a lot…
    - …but global interest rates/liquidity do not
    - Capital controls not effective
- Common Component
  - Byrne and Fiess (2011)
    - U.S. interest rate crucial determinant
    - Human capital and quality of institutions also matter
- Exchange Rate Regime
  - Ghosh et al (2012)
    - Conditional on surge, magnitude of surge smaller the more flexible the exchange rate
- Effects of U.S. LSAPs
  - Fratzcher et al (2012)
    - LSAP announcement and actual B/S changes significantly affect flows to EME-dedicated funds

OUR WORK

- Not identifying "surges"
  - Common model with unusual changes in explanatory variables and structural breaks
  - See also IMF (2011a), Arias et al (2012)
- Economic importance of different factors
- Post-crisis period v. pre-crisis period
- New data set of capital controls since 2009
- Use direct measure of intervention
  - Malloy (2013)
- U.S. LSAPs effects on BOP flows
- Net inflows

- Panel, quarterly BOP data from 12 major emerging Asian and Latin American economies over sub-periods from 2002:Q1 to 2012:Q2.
- For *NPI*, alternatively use total net private inflows or portfolio net inflows

EMPIRICAL MODEL

$$\frac{NPI_{it}}{Y_{it}} = \alpha_0 + \sum_{i=1}^{n-1} \alpha_0 D_i \; + \beta' X_{it} + \gamma_1 RA_t + \gamma_2 CC_{it} + \varepsilon_{it}$$

$$X_{it} = \begin{pmatrix} g_{it} - g_t^{AE} \\ R_{it} - R_t^{US} \\ \sum_{k=1}^{8} INTV_{i,t-k} \,/Y_{it} \\ USLSAPS_t \end{pmatrix}$$

$$\frac{NPI_{it}}{Y_{it}} = \alpha_0 + \sum_{i=1}^{n-1} \alpha_0 D_i \; + \beta_1 (g_{it} - g_t^{AE}) + \beta_2 \left(R_{it} - R_t^{US}\right) + \beta_3 \left(\frac{\sum_{k=1}^{8} INTV_{i,t-k}}{Y_{it}}\right) + \beta_4 USLSAPS_t + \gamma_1 RA_t + \gamma_2 CC_{it} + \varepsilon_{it}$$

Several factors important in driving EME net capital inflows

RESULTS: BASIC MODEL

Determinants of Net Private Capital Inflows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	**Total net inflows/NGDP**				**Portfolio net inflows/NGDP**			
Interval:	2002q1 – 2008q2		2009q3 – 2012q2		2002q1 – 2008q2		2009q3 – 2012q2	
Model:	OLS	FE	OLS	FE	OLS	FE	OLS	FE
growth_diff_eme-ae	0.48***	0.43***	0.34***	0.53***	0.17*	0.045	0.060	0.19
	(0.12)	(0.13)	(0.13)	(0.14)	(0.091)	(0.095)	(0.13)	(0.13)
policy_rate_diff_eme-us	0.22***	0.0047	0.63***	0.70*	0.16***	-0.055	0.34**	0.58
	(0.073)	(0.16)	(0.14)	(0.38)	(0.055)	(0.11)	(0.14)	(0.35)
vix	-0.060	-0.036	-0.12	-0.12	-0.095**	-0.075**	-0.13	-0.13*
	(0.051)	(0.052)	(0.084)	(0.079)	(0.038)	(0.037)	(0.083)	(0.072)
Constant	-0.40	-2.59*	0.93	-0.66	0.43	-0.45	2.42	2.19
	(1.09)	(1.53)	(2.09)	(2.28)	(0.83)	(1.09)	(2.07)	(2.07)
Observations	312	312	144	144	312	312	144	144
R-squared	0.063	0.154	0.158	0.319	0.046	0.227	0.055	0.357

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

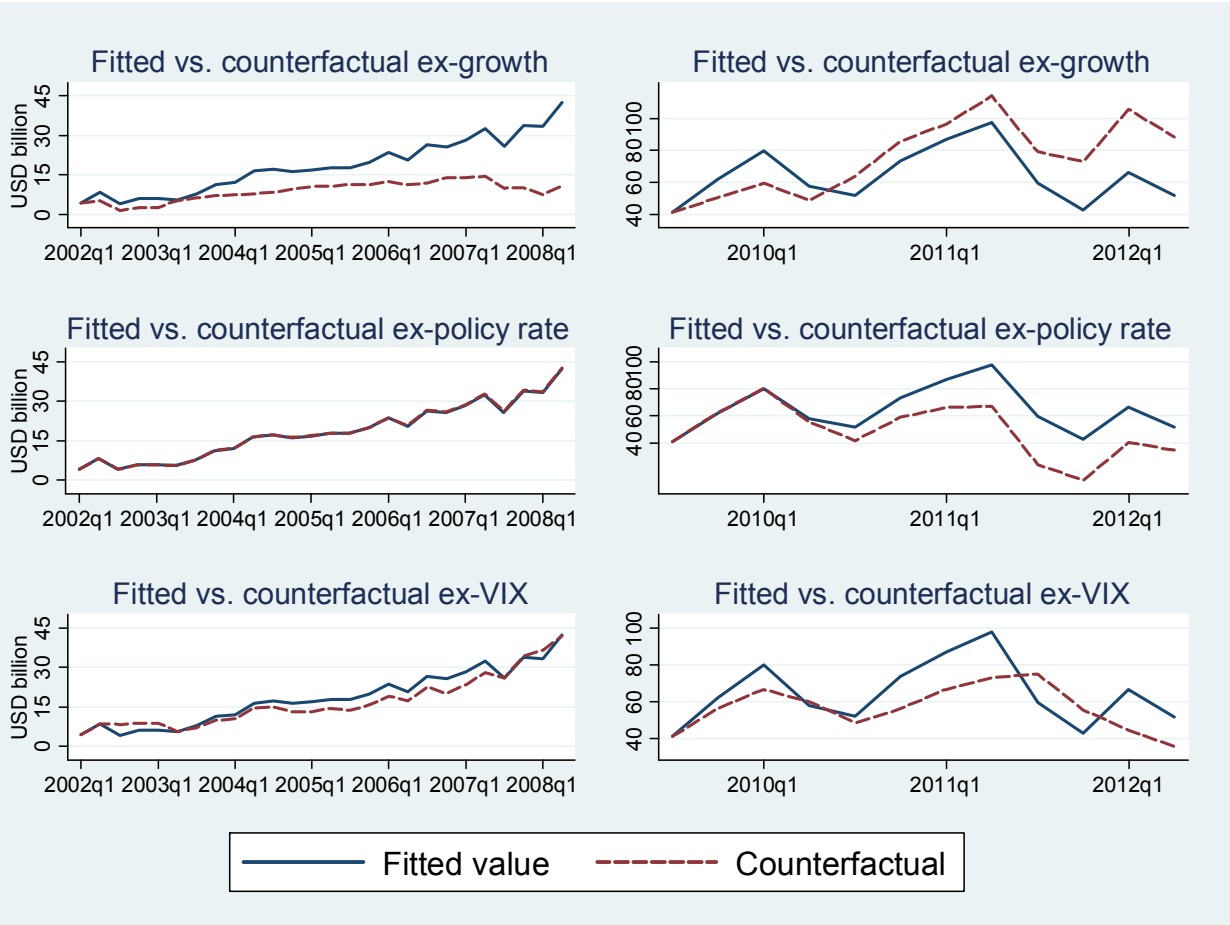
*Economies included are India, Indonesia, Malaysia, the Philippines, South Korea, Taiwan, and Thailand from emerging Asia and Argentina, Brazil, Chile, Colombia, and Mexico from Latin America.

- Main determinants of total net inflows are growth differentials and policy rate differentials
- Global risk aversion important in explaining portfolio flows and policy rate differentials also matter; growth differentials matter for pre-crisis period

Growth differentials, policy rate differentials, and global risk aversion economically important in post-crisis period; policy rate differential not important in pre-crisis period

RESULTS: BASIC MODEL

Total Net Inflows

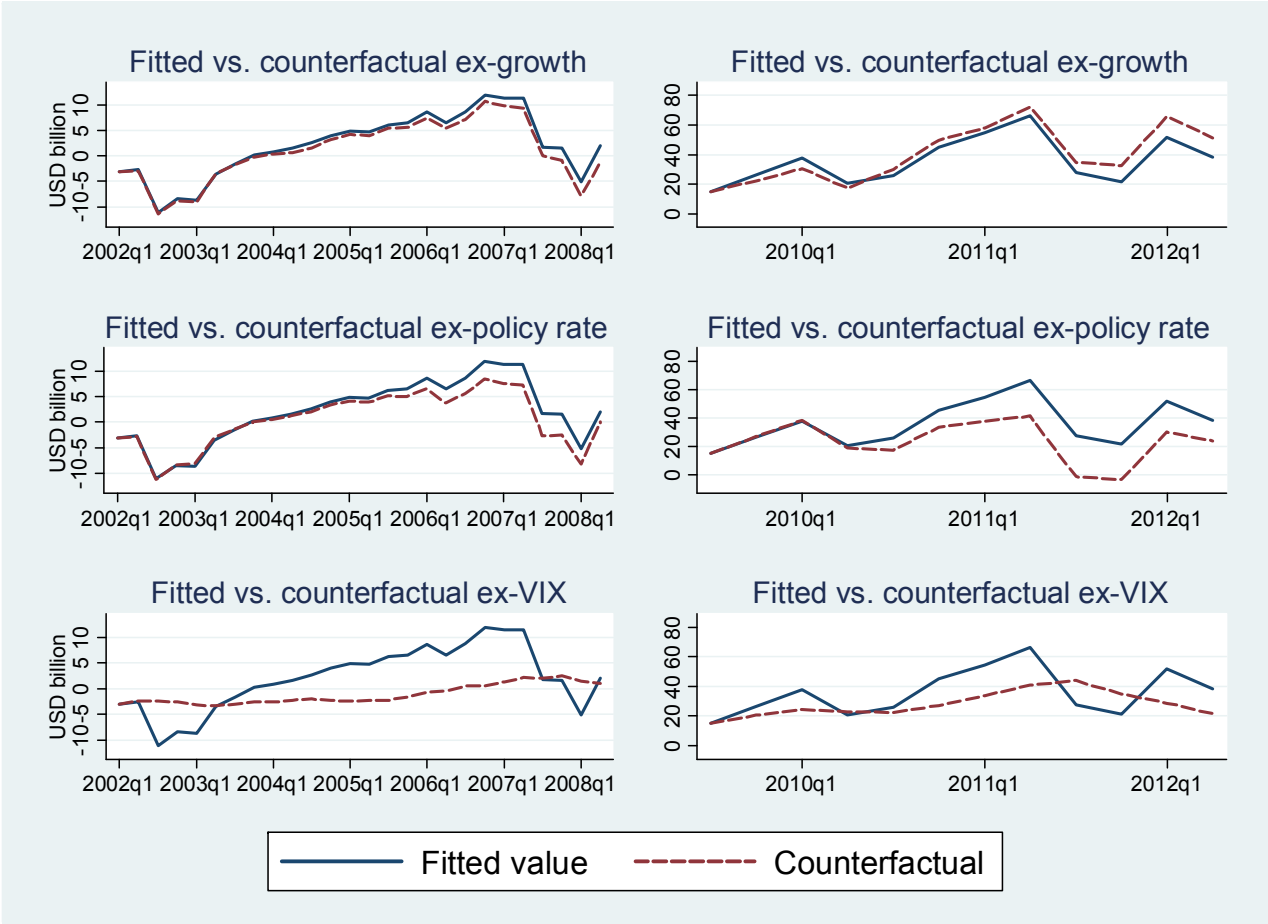


Note: The fitted values and counterfactuals are based on the model with country fixed effects, estimated separately for the periods 2002:Q1-2008:Q2 and 2009:Q2 to 2012:Q2. The counterfactuals are the fitted values obtained under the assumption that a particular determinant was equal to its initial value for each interval.

For portfolio flows, global risk aversion appears to be most economically important factor, although policy rate differentials and growth differentials also matter

RESULTS: BASIC MODEL

Portfolio Net Inflows

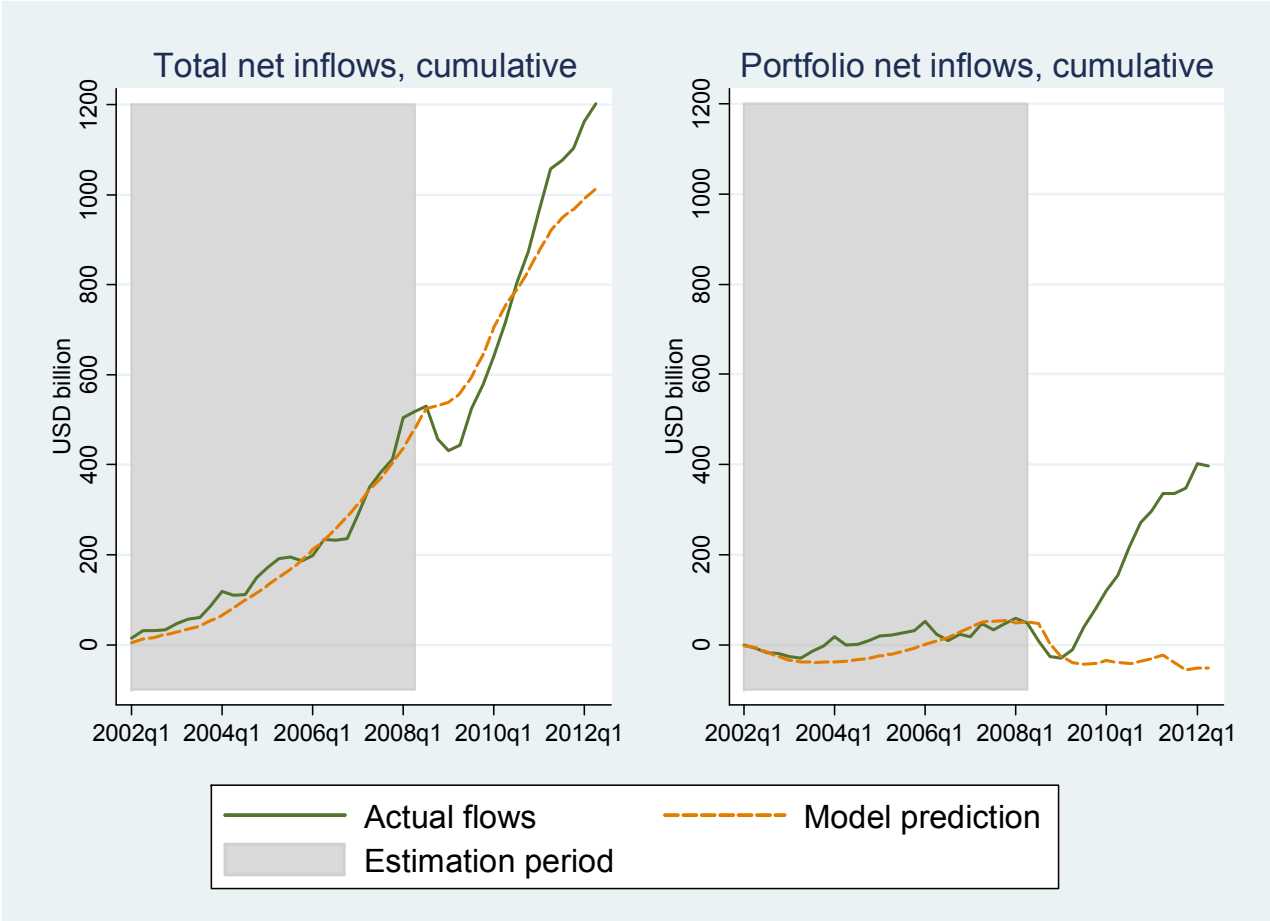


Note: The fitted values and counterfactuals are based on the model with country fixed effects, estimated separately for the periods 2002:Q1-2008:Q2 and 2009:Q2 to 2012:Q2. The counterfactuals are the fitted values obtained under the assumption that a particular determinant was equal to its initial value for each interval.

Total cumulative net inflows have been somewhat higher in the post-crisis period than the pre-crisis model would predict, but sea-change in behavior of cumulative net portfolio inflows

RESULTS: BASIC MODEL

Shifting Behavior of Net Inflows since 2008-09



Note: The model predictions are based on results from the model with fixed effects estimated over the period from 2002:Q1 to 2008:Q2, with the results reported in Table 3.

Net inflows significantly more sensitive to policy rate differentials in post-crisis period; sensitivity to risk aversion also higher, but not statistically significant

RESULTS: BASIC MODEL

Structural Break Tests for the Determinants of Net Inflows

	(1)	(2)	(3)	(4)
Dependent variable:	**Total net inflows/NGDP**		**Portfolio net inflows/NGDP**	
Interval:	2002q1 – 2012q2		2002q1 – 2012q2	
Model:	OLS	FE	OLS	FE
growth_diff_eme-ae	0.48***	0.43***	0.17*	0.045
	(0.11)	(0.12)	(0.092)	(0.094)
policy_rate_diff_eme-us	0.22***	0.0047	0.16***	-0.055
	(0.069)	(0.15)	(0.056)	(0.11)
Vix	-0.060	-0.036	-0.095**	-0.075**
	(0.048)	(0.048)	(0.039)	(0.037)
post-crisis * growth_diff _eme-ae	-0.14	0.095	-0.11	0.15
	(0.19)	(0.21)	(0.15)	(0.16)
post-crisis * policy_diff_eme-us	0.41**	0.69	0.17	0.63*
	(0.18)	(0.49)	(0.15)	(0.37)
post-crisis * vix	-0.061	-0.086	-0.030	-0.053
	(0.11)	(0.11)	(0.090)	(0.082)
post-crisis	1.33	-2.75	2.00	-2.45
	(2.69)	(4.21)	(2.19)	(3.19)
Constant	-0.40	1.42	0.43	2.81
	(1.02)	(2.32)	(0.83)	(1.76)
Observations	456	456	456	456
R-squared	0.097	0.204	0.070	0.286

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: *post-crisis* is an indicator variable that equals 1 for the period 2009:Q3-2012:Q2. The fixed effects, when included (columns (2) and (4)), are allowed to vary across the pre-crisis and post-crisis periods. *Economies included are the same as in table 3.

Novel database of capital control measures introduced by EMEs since global financial crisis—collected from local press releases and news bulletins

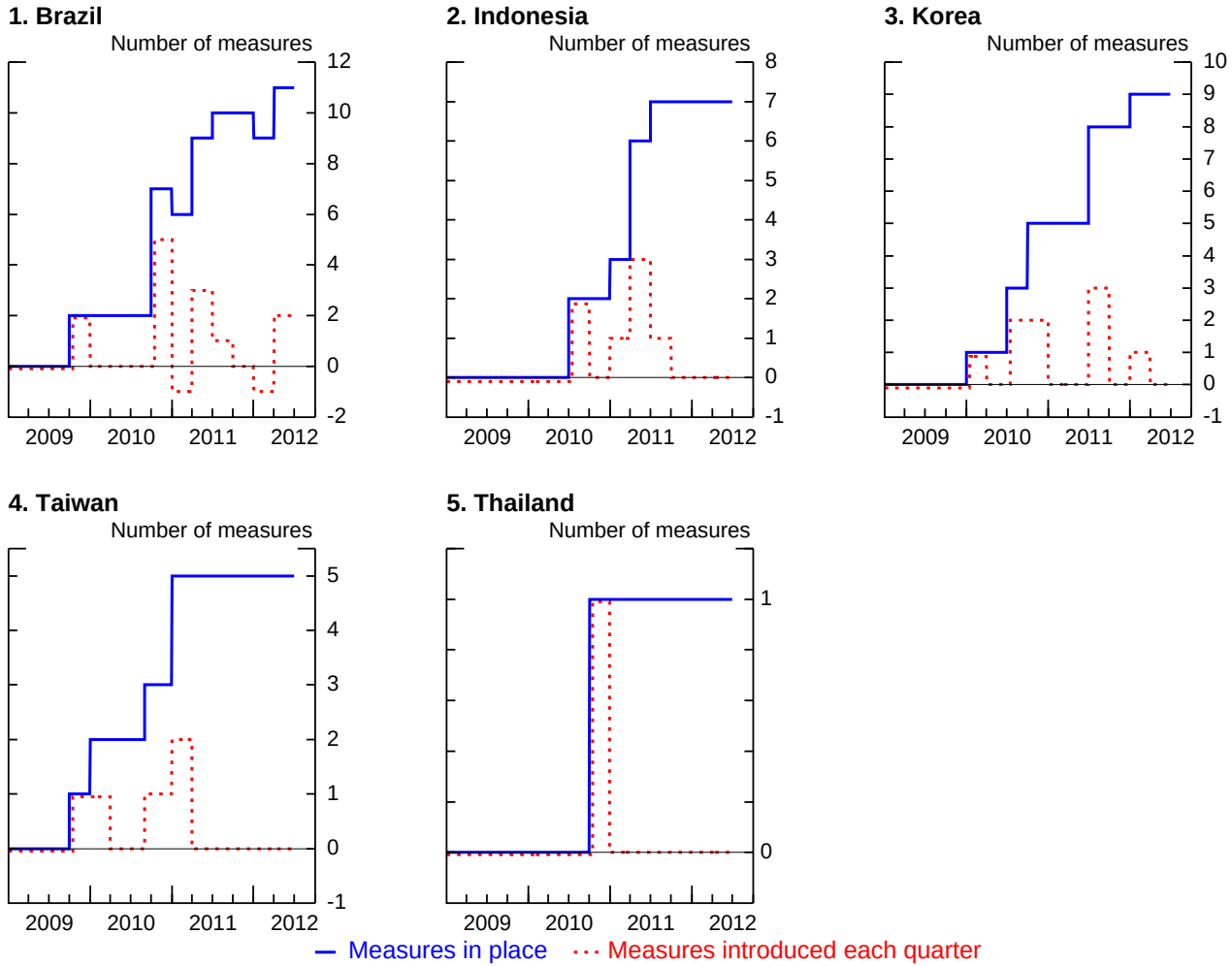
EXTENDED MODEL: CAPITAL CONTROLS

Capital Control Measures introduced by EMEs since 2009

	Restrictions on portfolio flows		Restrictions on banking flows		
Country	**Tax on foreign investments**	**Restrictions by asset type or maturity**	**Tax on short-term external borrowing**	**Quantitative limits on banks' FX exposure**	**Required reserves on FX liabilities**
Brazil	Oct, Nov 09[R], Oct, Dec 10[R], Jul, Dec 2011[R]		Mar-Apr-Jul-Aug 11, Mar- Jun-Dec 12		Jan, Jul 11, Dec 12
Indonesia		Mar, Jun 10, Apr 11		Jun, Dec 10	Dec 10[R]
South Korea	Nov 10[R], Jan 12[R]	Jul 11	Apr 11	Nov 09[D], Jan 10, Jun 10[D], Jun 11[D], Nov 12[D]	
Taiwan		Nov 09[R], Nov 10[R]		Dec 10[D]	Jan, Dec 10[R]
Thailand	Oct 10[R]				

Database used to construct two variables on capital controls—number of measures in place and number of new measures introduced in any given quarter

EXTENDED MODEL: CAPITAL CONTROLS



Capital control measures introduced in recent years have exerted a significant dampening effect on net private inflows

EXTENDED MODEL: CAPITAL CONTROLS

Effectiveness of Capital Control Measures introduced since 2009

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	**Total net inflows/NGDP**				**Portfolio net inflows/NGDP**			
Interval:	2009q3 – 2012q2				2009q3 – 2012q2			
Model:	OLS	FE	OLS	FE	OLS	FE	OLS	FE
growth_diff_eme-ae	0.23*	0.43***	0.30**	0.50***	-0.029	0.090	0.036	0.18
	(0.13)	(0.15)	(0.13)	(0.14)	(0.13)	(0.13)	(0.13)	(0.13)
policy_diff_eme-us	0.84***	0.84**	0.83***	0.90**	0.51***	0.72**	0.48***	0.82**
	(0.14)	(0.39)	(0.15)	(0.40)	(0.15)	(0.35)	(0.15)	(0.36)
Vix	-0.13	-0.13*	-0.12	-0.12	-0.13	-0.13*	-0.12	-0.13*
	(0.080)	(0.078)	(0.082)	(0.079)	(0.081)	(0.070)	(0.083)	(0.071)
capital_controls_in_place	-0.54***	-0.44**			-0.44***	-0.45**		
	(0.15)	(0.21)			(0.15)	(0.19)		
new_capital_controls			-0.43	-0.37			0.057	-0.076
			(0.50)	(0.53)			(0.51)	(0.48)
l_new_capital_controls			-0.43	-0.36			-0.77	-0.96*
			(0.51)	(0.55)			(0.51)	(0.50)
l2_new_capital_controls			-0.97*	-0.79			-0.98*	-1.05**
			(0.52)	(0.56)			(0.52)	(0.50)
l3_new_capital_controls			-1.26**	-1.04*			-0.59	-0.59
			(0.53)	(0.55)			(0.53)	(0.49)
Constant	1.54	-0.00087	1.04	-0.51	2.93	2.86	2.37	2.14
	(2.01)	(2.27)	(2.04)	(2.27)	(2.02)	(2.05)	(2.05)	(2.05)
Observations	144	144	144	144	144	144	144	144
R-squared	0.234	0.342	0.226	0.345	0.113	0.385	0.102	0.393

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note: *capital_controls_in_place* is the number of capital control measures introduced since 2009 that are in place in any given quarter. *new_capital_controls* is the number of new capital control measures introduced in a given quarter (*l, l2, l3* indicate lagged values). *Economies included are the same as in table 3.

Lagged FX purchases had a positive and statistically significant effect on net capital inflows during the pre-crisis period

EXTENDED MODEL: FX INTERVENTION

Effect of FX Intervention on Net Inflows

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	**Total net inflows/NGDP**		**Portfolio net inflows/NGDP**		**No. of capital controls in place**
Interval:	2002q1 – 2008q2		2002q1 – 2008q2		2009q3 – 2012q2
Model:	OLS	FE	OLS	FE	FE
growth_diff_eme-ae	0.32*	0.22	0.16	0.0044	
	(0.17)	(0.21)	(0.11)	(0.13)	
policy_diff_eme-us	0.11	0.062	0.11*	0.053	
	(0.082)	(0.16)	(0.055)	(0.10)	
vix	-0.061	-0.043	-0.071**	-0.053	
	(0.051)	(0.051)	(0.034)	(0.033)	
fx_intervention	0.085	0.45**	-0.13	0.20*	0.20**
	(0.15)	(0.18)	(0.10)	(0.12)	(0.095)
trend					0.35***
					(0.048)
Constant	0.94	-3.60**	0.81	-3.89***	-71.3***
	(1.22)	(1.82)	(0.82)	(1.17)	(9.79)
Observations	234	234	234	234	108
R-squared	0.024	0.127	0.056	0.220	0.731

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

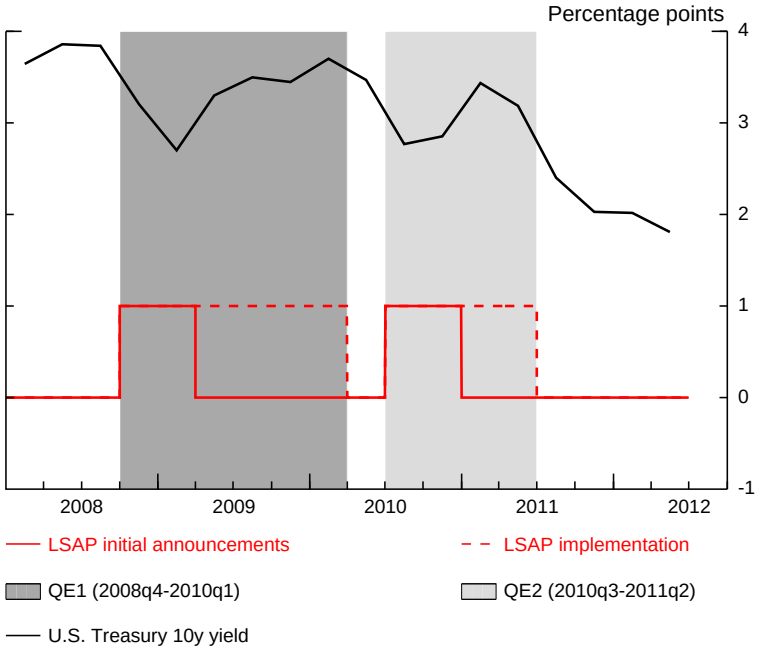
Note: *fx_intervention* is the extent of net foreign exchange intervention, expressed in U.S. dollars, cumulated over the previous 8 quarters (i.e. lagged t-1 to t-9), expressed as a percent of contemporaneous quarterly nominal GDP expressed in the same units. Since flows on the left hand side are also normalized by the same nominal GDP, the coefficient on *fx_intervention* in columns (1)-(4) has the interpretation of the effect on capital flows in billions of dollars of a $1 billion net FX intervention over the previous two years. Data on intervention generously provided by Matt Malloy—see Malloy (2013) for a description. *Economies included are the same as in table 3.

- Not able to identify positive intervention effect on inflows in post-crisis period…
- …partly because intervention related to other determinants such as capital controls

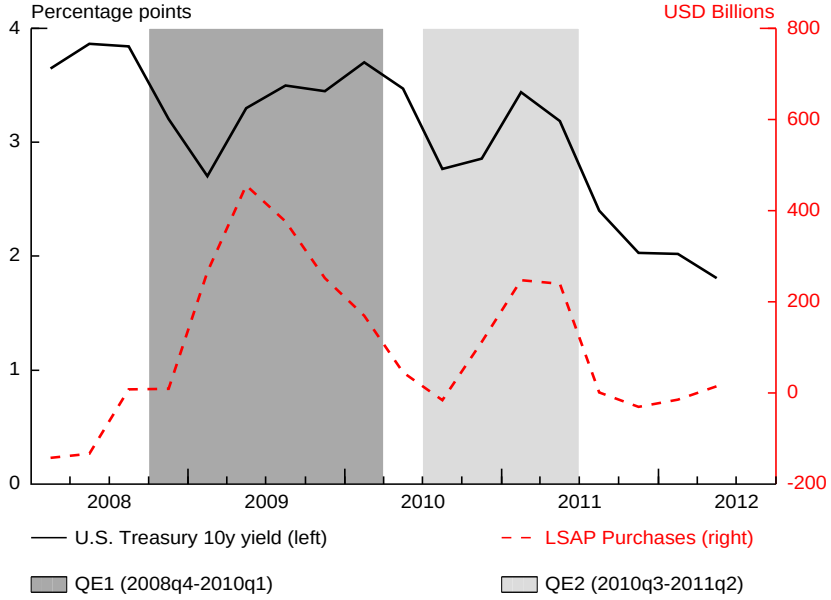
LSAP indicator variables and U.S. 10-yr Treasury yield changes attributable to LSAPs used to estimate effect of U.S. unconventional monetary expansion on flows

EXTENDED MODEL: U.S. LSAPS

LSAP indicator variables



LSAP purchases



- Regress 10-yr U.S. Treasury yields on LSAPS one quarter ahead
- Difference between yield and estimate of what it would be without LSAPs = change in yield attributable to LSAPs

Portfolio net inflows were unusually higher (and statistically significantly) in periods when LSAPs announced or in place; total net inflows not statistically significantly higher

EXTENDED MODEL: U.S. LSAPS

Behavior of Net Inflows during LSAP events

Dependent variable:	(5)	(6)	(7)	(8)
	Portfolio net inflows/NGDP			
Model:	OLS	FE	OLS	FE
Interval:	2002q1 – 2012q2			
d_lsap_announcements	1.51*	1.44*		
	(0.87)	(0.82)		
d_lsap_implementation			1.26*	1.19*
			(0.69)	(0.65)
growth_diff_eme-ae	0.17*	0.094	0.19**	0.11
	(0.094)	(0.097)	(0.094)	(0.098)
policy_rate_diff_eme-us	0.16***	0.045	0.17***	0.054
	(0.058)	(0.10)	(0.058)	(0.10)
vix	-0.093**	-0.086**	-0.080**	-0.074**
	(0.037)	(0.035)	(0.037)	(0.036)
crisis * growth_diff_eme-ae	-0.36*	-0.41**	-0.39**	-0.45**
	(0.19)	(0.18)	(0.19)	(0.18)
crisis * policy_diff_eme-us	0.18	0.24	0.19	0.24
	(0.21)	(0.20)	(0.21)	(0.20)
crisis * vix	-0.0014	-0.00069	-0.0089	-0.0076
	(0.039)	(0.037)	(0.041)	(0.039)
post-crisis * growth_diff_eme-ae	-0.16	-0.060	-0.24	-0.14
	(0.15)	(0.15)	(0.16)	(0.16)
post-crisis * policy_diff_eme-us	0.38**	0.26	0.36**	0.24
	(0.16)	(0.16)	(0.16)	(0.16)
post-crisis * vix	0.044	0.048	0.038	0.042
	(0.041)	(0.040)	(0.042)	(0.040)
capital_controls_in_place	-0.42***	-0.34**	-0.40**	-0.32**
	(0.15)	(0.16)	(0.15)	(0.16)
Constant	0.38	0.31	0.062	0.063
	(0.76)	(0.99)	(0.77)	(0.99)
Observations	504	504	504	504
R-squared	0.095	0.216	0.096	0.216

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: *d_lsap_announcements* is an indicator variable equal to 1 for the quarters in which the initial announcements of LSAPs, so-called "QE1" and "QE2," and the decisions to continue them were made (2008:Q4, 2009:Q1, 2010:Q3 and 2010:Q4*). d_lsap_implementation* is equal to 1 for the entire duration of the "QE1" and "QE2" programs (2008:Q4-2010:Q1 and 2010:Q3-2011:Q2). *Economies included are the same as in table 3.

Lower 10-yr U.S. Treasury yields or decreases in these attributed to LSAPs statistically significantly increase portfolio net inflows, but not total net inflows

EXTENDED MODEL: U.S. LSAPS

Effect of LSAPs through U.S. 10-yr Treasury Yield

Dependent variable:	(5)	(6)	(7)	(8)
	Portfolio net inflows/NGDP			
Model:	OLS	FE	OLS	FE
Interval:	2002q1 – 2012q2			
treas_10yr_us	-0.64	-0.86**		
	(0.44)	(0.44)		
treas_10yr_us * crisis	-1.36**	-1.23**		
	(0.59)	(0.55)		
treas_10yr_us * post-crisis	0.66	0.70		
	(0.49)	(0.47)		
lsap_purchases_effect			-2.35*	-2.18*
			(1.31)	(1.24)
growth_diff_ae	0.16*	0.062	0.22*	0.12
	(0.095)	(0.098)	(0.13)	(0.15)
policy_rate_diff_us	0.16***	-0.0097	0.18***	0.064
	(0.058)	(0.11)	(0.064)	(0.11)
Vix	-0.11***	-0.099***	-0.092**	-0.084*
	(0.039)	(0.037)	(0.045)	(0.043)
crisis * growth_diff	-0.25	-0.30	-0.42**	-0.46**
	(0.20)	(0.19)	(0.21)	(0.20)
crisis * policy_diff	0.24	0.28	0.18	0.25
	(0.21)	(0.20)	(0.21)	(0.20)
crisis * vix	0.095*	0.082	-0.0071	-0.0082
	(0.055)	(0.052)	(0.048)	(0.046)
post-crisis * growth_diff	-0.20	-0.083	-0.23	-0.12
	(0.17)	(0.16)	(0.18)	(0.18)
post-crisis * policy_diff	0.34**	0.19	0.36**	0.26
	(0.16)	(0.17)	(0.16)	(0.17)
post-crisis * vix	-0.048	-0.058	0.053	0.052
	(0.074)	(0.069)	(0.046)	(0.045)
no_meas_ext	-0.44***	-0.39**	-0.40**	-0.33**
	(0.15)	(0.16)	(0.16)	(0.16)
Constant	3.55	4.31**	0.14	1.10
	(2.16)	(2.14)	(0.86)	(1.72)
Observations	504	504	468	468
R-squared	0.106	0.227	0.093	0.216

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Note: *lsap_purchases_effect* is the difference between the actual 10-year U.S. Treasury bond yield and an estimate of what the yield would have been without LSAPs. To construct this effect, we regress the 10-year U.S. Treasury bond yields on Fed purchases one quarter ahead over the period 2003:Q1-2012:Q2 and subtract from the fitted value the estimated constant and error terms. *Economies included are the same as in table 3.

Results fairly robust qualitatively to alternatives, but some important differences

ROBUSTNESS

- Adding smaller economies in emerging Asia and Latin America
  - Polciy rate differential effects less robust
- Adding emerging European economies and allowing regional effects
  - Differences across regions are found
- Using Credit Suisse's GRAI instead of VIX
  - Nearly same results found
- Using gross inflows instead of net
  - Importance of risk aversion and recent capital controls is reinforced…
  - …but in some specifications, growth and policy rate differentials less important

CONCLUSIONS

- Consistent with previous studies, net capital flows to EMEs determined by several factors: growth differentials, policy rate differentials, global risk aversion
  - All three variables about equally important in post-crisis period…
  - …but in pre-crisis period, growth differentials matter more for total net inflows and risk aversion for portfolio net inflows
- Pre-crisis model applied to post-crisis period underpredicts net inflows, esp. portfolio inflows
  - Sensitivity of portfolio flows to policy rate differentials and to risk aversion has increased

CONCLUSIONS

- Capital control measures introduced in recent years appear to have been effective
- Pre-crisis experience suggests FX intervention brings more inflows later
  - Cannot identify such an effect in the post-crisis period
  - Could be due to correlation of intervention with other determinants (e.g. intervention followed by capital controls)
- Statistically significant effects of unconventional U.S. monetary expansion on EME portfolio net inflows
  - But U.S. unconventional policy only one among several important determinants of portfolio inflows
  - Effect on total net inflows not significant, suggesting such policies mainly affect composition of flows