International Transmission of Monetary Shocks

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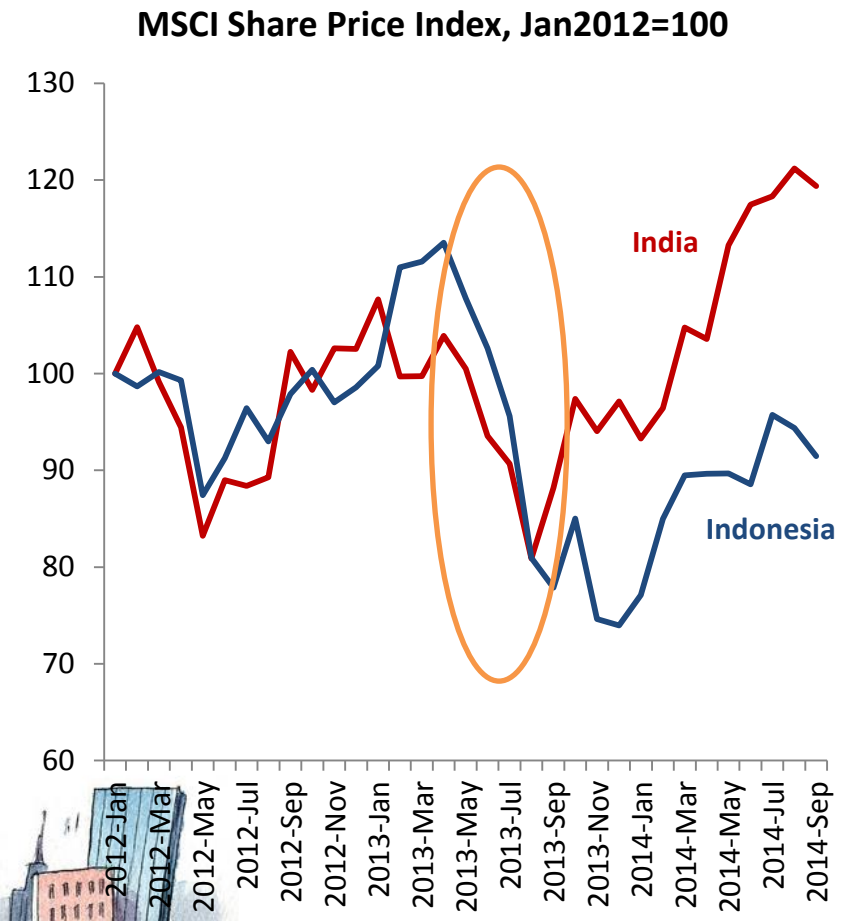
Based on joint research with Shang-Jin Wei

Background

- The tapering talk in May 2013 triggered jitters in the financial markets of emerging economies such as India and Indonesia



Do Developing Countries Have to Import US Monetary Policies?

- Supposed "corollary" of the trilemma:
  - Flexible exchange rate regimes produce monetary policy autonomy
  - Capital controls are ineffective

Alternative views

- Calvo and Reinhart, QJE, 2002
  - "Fear of floating"
- H. Tong and S.J. Wei, RFS, 2011
  - The nominal exchange rate regime does not make a difference to the transmission of global financial crisis to developing countries
- H. Rey, Jackson Hole presentation, 2013
  - Capital flows are highly correlated regardless of nominal exchange rate regime.

Competing recommendations:

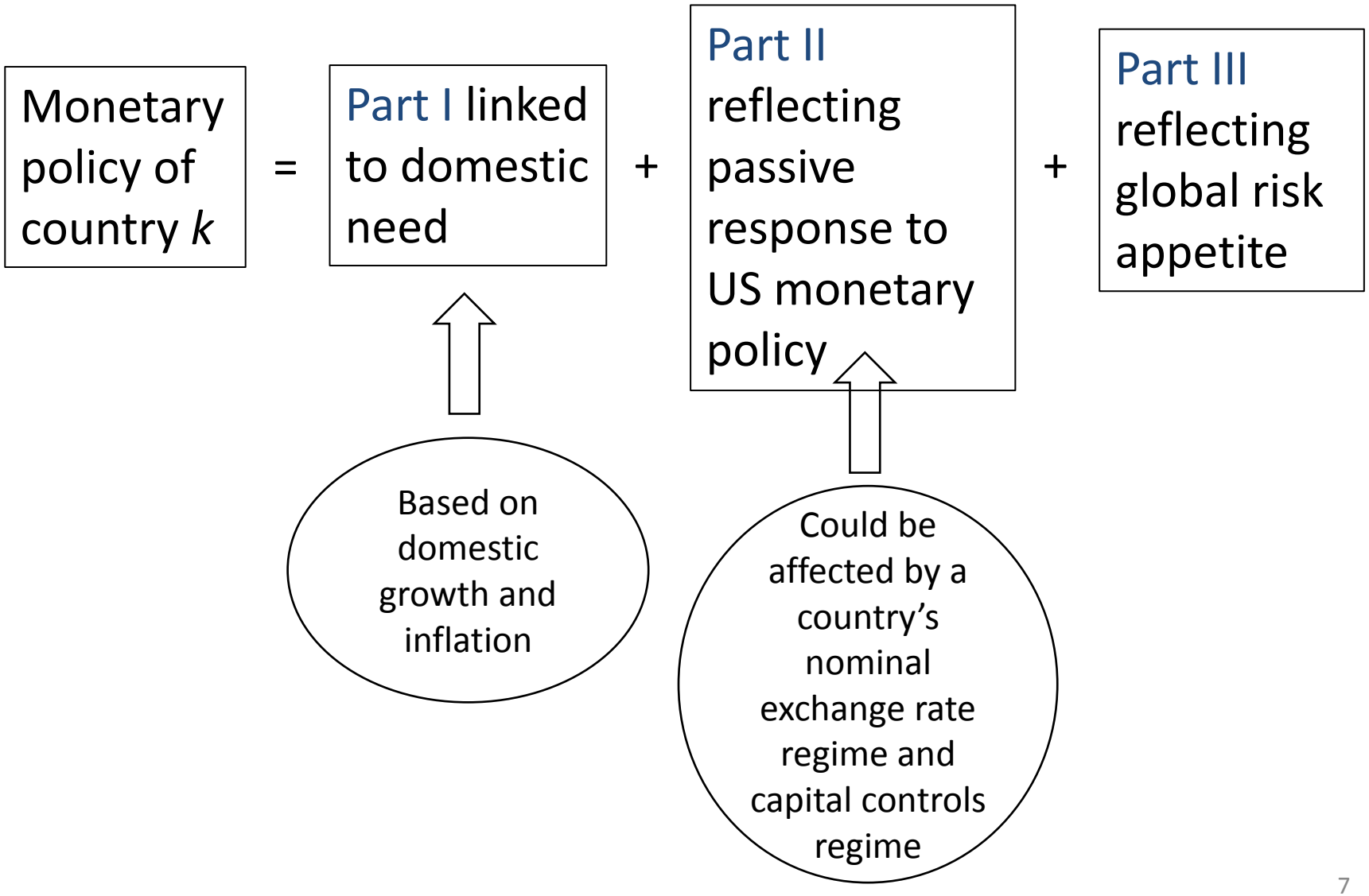
- For emerging markets: prioritize exchange rate flexibility (e.g., IMF's Article IV reports on the People's Republic of China, 2014) since capital controls are leaky (Edwards, 2012) and costly (e.g., Wei and Zhang, 2007)
- Only capital controls confer real monetary autonomy (Tong and Wei (2011), Chinn and Wei (2013), and Rey (2013)

Empirical investigation

- Does a flexible exchange rate regime really confer monetary policy autonomy?

- Capital control or flexible exchange rate regime, which one is more effective?

The methodology for the investigation



The Baseline Model

(1) $\Delta i_{i,t}^{p} = \lambda i_{i,t-1}^{p} + \gamma_1 \Delta r_{i,t}^{P*} + \gamma_2 \Delta r_t^{US} + \delta VIX_t + \varepsilon_{i,t}.$

- $\gamma_1 \Delta r_{i,t}^{P*}$: a desired change based on purely domestic factors;
- $\gamma_2 \Delta r_t^{US}$: an "involuntary" change, responding to a US rate change;
- VIX_t : an indicator of the state of the financial cycle (Chicago Board Options Exchange Equity Option Volatility Index)

(2) $\Delta r_{i,t}^{P*} = \tilde{c} + \widetilde{\phi_1} * \Delta GDP\ growth_{i,t} + \widetilde{\phi_2} * \Delta Inflation_{i,t} + \widetilde{e_{i,t}}$

(3) $\boldsymbol{\gamma_2 = \beta_1 D_{fixed.NC} + \beta_2 D_{fixed.C} + \beta_3 D_{flex.C} + \beta_4 D_{flex.NC},}$

The model used for estimations

$$\Delta i_{i,t}^{p} = c + \lambda i_{i,t-1}^{p} + \phi_1 * \Delta \text{GDP growth}_{i,t} + \phi_2 * \Delta Inflation_{i,t}$$

$$+\beta_1 D_{fixed\ .NC} \Delta r_{i,t}^{US} + \beta_2 D_{fixed\ .C} \Delta r_{i,t}^{US} + \beta_3 D_{flex\ .C} \Delta r_{i,t}^{US}$$

$$+\beta_4 D_{flex\ .NC} \Delta r_{i,t}^{US} + \delta VIX_t + e_{i,t}$$

The Lower-bound Episodes

$$(1)\,\Delta i_{i,t}^{p} = \lambda i_{i,t-1}^{p} + \gamma_1 \Delta r_{i,t}^{P*} + \gamma_2 \Delta r_t^{US\#} + \delta \Delta VIX_t + \varepsilon_{i,t},$$

$$(2)\,\Delta r_t^{US\#} = \begin{cases} \Delta r_t^{US}, & r_t^{US*} > Lower\ Bound \\ \Delta r_t^{US*}, & r_t^{US*} = Lower\ Bound \end{cases},$$

$$(3)\ r_t^{US*} = \theta_1 + \theta_2 log M_t + \theta_3 log Y_t + \epsilon_t.$$

(4)

$$L = \prod_{i=1}^{N} \left(\phi\left(\frac{\Delta i_{i,t}^{p} - \left(\lambda i_{i,t-1}^{p} + \gamma_1 \Delta r_{i,t}^{P*} + \gamma_2 \Delta r_t^{US} + \delta \Delta VIX_t \right)}{\sigma_\varepsilon} \right) \left(1 - \Phi\left(\frac{0 - (\theta_1 + \theta_2 log M_t + \theta_3 log Y_t)}{\sigma_\epsilon} \right) \right) \right)^{Y_i}$$
$$\left(\phi\left(\frac{\Delta i_{i,t}^{p} - \left(\lambda i_{i,t-1}^{p} + \gamma_1 \Delta r_{i,t}^{P*} + \gamma_2 (\theta_2 \Delta log M_t + \theta_3 \Delta log Y_t) + \delta \Delta VIX_t \right)}{\gamma_2 \sigma_{\epsilon_t - \epsilon_{t-1}} + \sigma_\varepsilon} \right) \Phi\left(\frac{0 - (\theta_1 + \theta_2 log M_t + \theta_3 log Y_t)}{\sigma_\epsilon} \right) \right)^{1 - Y_i},$$

where $Y_i = 1$, if $r_t^{US*} > Lower\ Bound$; $Y_i = 0$, otherwise.

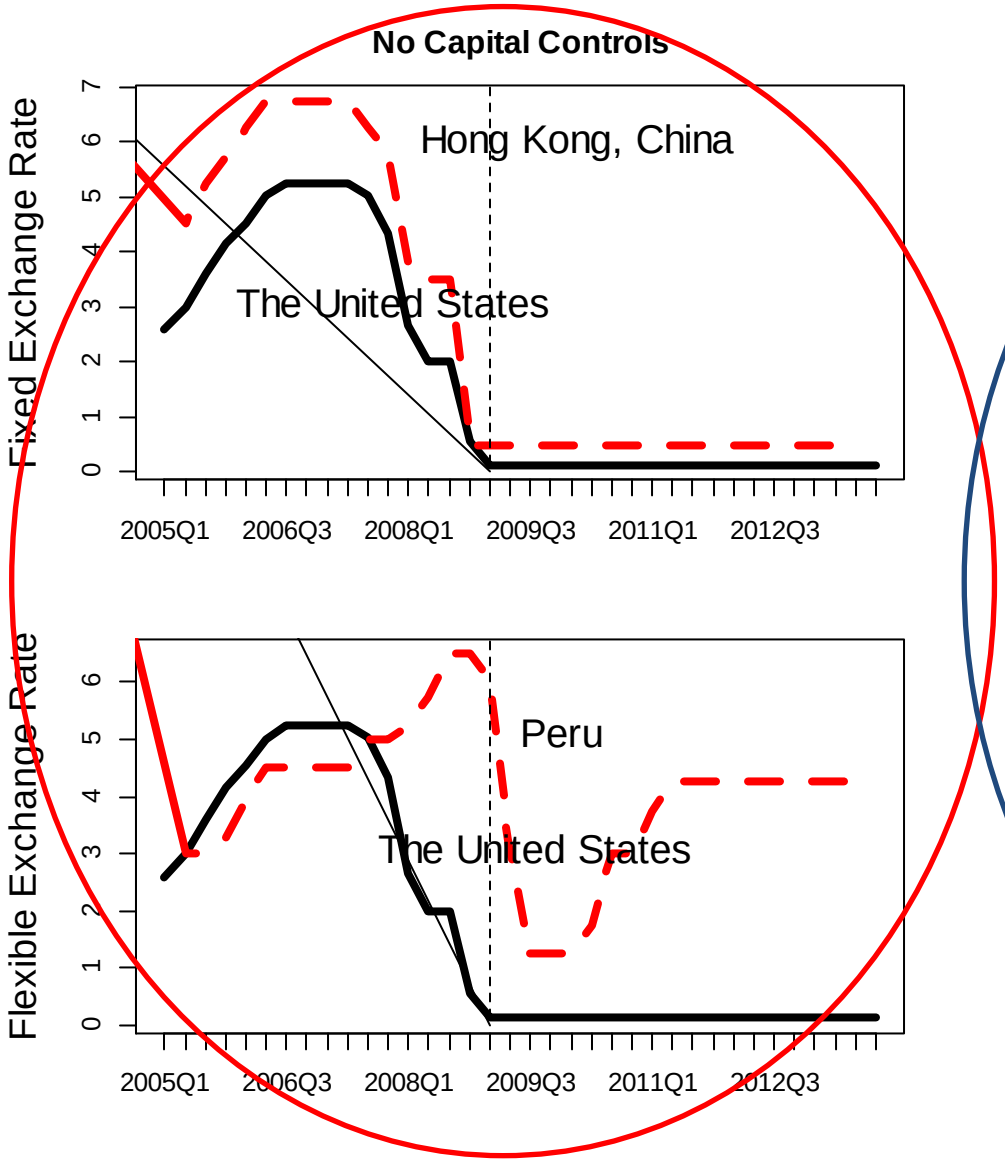
Data

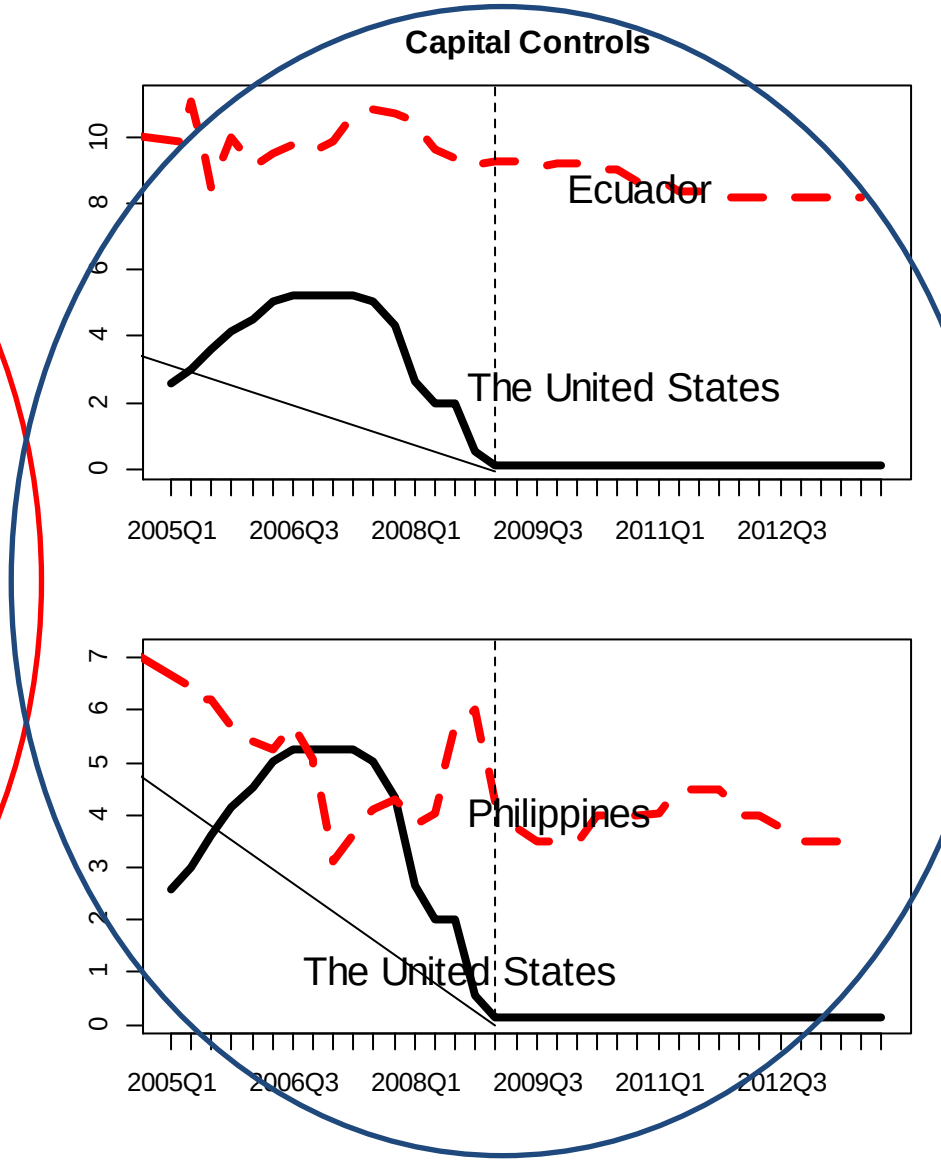
- Forecasts of GDP growth and Inflation are from WEO (semiannually) starting from 1990;
- Policy interest rate: monetary policy rate and discount rate (when monetary policy rate is not available);
- Capital Control Index: 1–Chinn-Ito financial openness index;
- Nominal Exchange Rate regime: ReInhart and Rogoff (2012) exchange rate regime classifications;
- Include Germany to represent euro zone countries.

Hypothesis and Analysis

Table 1 Combinations of exchange rate regimes and capital control scenarios and the coefficients on foreign policy influence

	No Capital Controls	Capital Controls
Fixed Exchange Rate Regime	$\boldsymbol{\beta_1}$	β_2
Flexible Exchange Rate Regime	$\boldsymbol{\beta_4}$	β_3

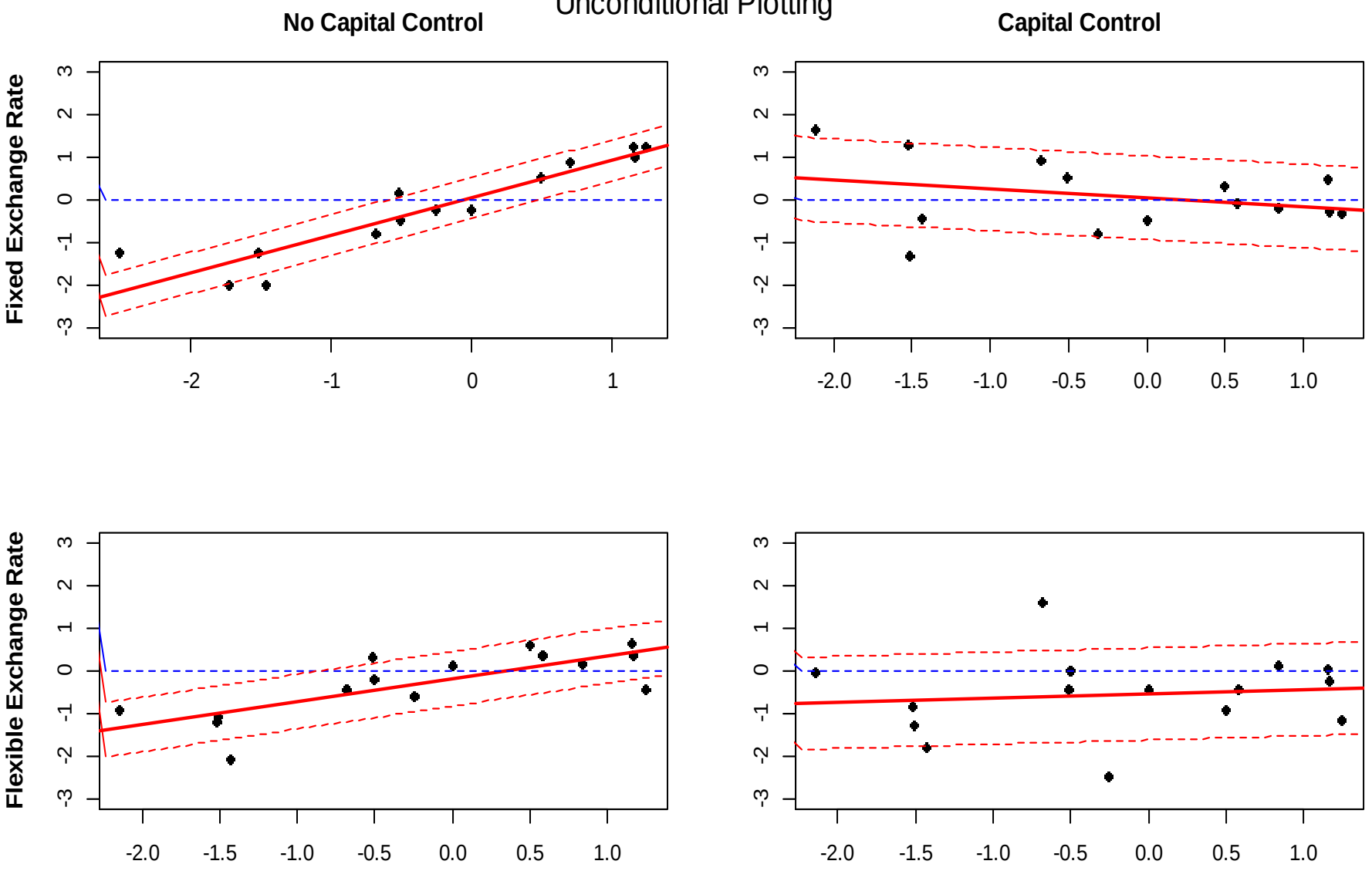




Without autonomy

With autonomy

Unconditional Plotting



Main findings

- With a fixed exchange rate and no capital controls: An increase in the US interest rate by 100 basis points is followed by an increase in the interest rate by 65 basis points on average;
- Flex rate and no capital controls: an increase in interest rate by 45 bps. (still no monetary policy autonomy)
- With capital controls: domestic interest rate is uncorrelated with the US rate -> autonomy

Table 3 Coefficient estimates for baseline model for different periods

		Short-term 1990–2009 (1)	Short-term 1990–1998 (2)	Short-term 1999–2009 (3)	Long-term 1999–2009 (4)
$i^{p}_{i,t-1}$	λ	**–0.048***	–0.007	**–0.110***	**–0.068***
$\Delta GDP\ growth_{i,t}$	ϕ_1	0.096	0.237	0.041	**0.064***
$\Delta Inflation_{i,t}$	ϕ_2	0.**329***	0.134	**0.413***	**0.162***
$D_{fixed\ .NC}\Delta r^{US}_{i,t}$	β_1	0.**649***	0.402	**0.654***	**0.680***
$D_{fixed\ .C}\Delta r^{US}_{i,t}$	β_2	0.034	1.998	–0.249	0.34
$D_{flex\ .NC}\Delta r^{US}_{i,t}$	β_3	**0.450***	0.492	**0.497***	**0.407***
$D_{flex\ .C}\Delta r^{US}_{i,t}$	β_4	0.029	0.008	0.063	0.12
ΔVIX_t	δ	0.23	0.086	0.176	0.14
F test: $\beta_2 = \beta_4$		1.33	1.26	**6.48***	0.00
F test: $\beta_4 = \beta_3$		**4.07***	0.82	**5.79***	2.62
Adj. R-squared		0.09	0.000	0.30	0.20
No. of Obs.		827	295	532	301

* Significant at 10%.

Robustness Check

Table 4. Coefficient estimates using different exchange rate regimes and capital controls indexes

		Re-defining capital controls		Re-defining the exchange rate regime		Using pre-assigned Taylor Rule	
		Short-term (1)	Long-term (2)	Short-term (3)	Long-term (4)	Short-term (5)	Long-term (6)
$i^{p}_{i,t-1}$	λ	**–0.109***	**–0.067***	**–0.11***	**–0.068***	**–0.111***	**–0.068***
$\Delta GDP\ growth_{i,t}$	ϕ_1	0.038	**0.065***	0.041	**0.064***	**0.128**[1]	**0.057**[2]
$\Delta Inflation_{i,t}$	ϕ_2	**0.416***	**0.160***	**0.413***	**0.162***	**0.384**[1]	**0.170**[2]
$D_{fixed\ .NC}\Delta r^{US}_{i,t}$	β_1	**0.558***	**0.667***	**0.654***	**0.680***	**0.571***	**0.680***
$D_{fixed\ .C}\Delta r^{US}_{i,t}$	β_2	**–0.659***	0.10	–0.249	0.340	–0.311	0.360
$D_{flex\ .NC}\Delta r^{US}_{i,t}$	β_3	**0.322***	**0.402***	**0.497***	**0.407***	**0.441***	**0.411***
$D_{flex\ .C}\Delta r^{US}_{i,t}$	β_4	0.005	–0.09	0.063	0.12	0.005	0.13
ΔVIX_t	δ	0.17	0.14	0.176	0.14	0.148	0.14
Adj. R-squared		0.29	0.20	0.30	0.20	0.30	0.20
No. of Obs.		532	301	532	301	532	301

Imposed-parameter Taylor rule: $\Delta r^{P*}_{i,t} = 0.5 * \Delta GDP\ growth_{i,t} + 1.5 * \Delta Inflation_{i,t}$

Table 5 Coefficient estimates for four groups of countries using SUR

		Fixed exchange rate without capital controls	Fixed exchange rate with capital controls	Flexible exchange rate without capital controls	Flexible exchange rate with capital controls
Panel A: Short-term Policy Rate					
$i^{p}_{i,t-1}$	λ	0.011	**–0.056***	**–0.118***	**–0.118***
$\Delta GDP\ growth_{i,t}$	ϕ_1	**0.075***	**0.075***	**0.075***	**0.075***
$\Delta Inflation_{i,t}$	ϕ_2	**0.26***	**0.26***	**0.26***	**0.26***
$\Delta r^{US}_{i,t}$	β	**0.669***	**–0.204***	**0.434***	0.047
ΔVIX_t	δ	**–0.55***	0.238	0.059	**0.504***
Panel B: Long-term Government Bond Yield					
$i^{p}_{i,t-1}$	λ	**–0.144***	0.01	–0.02	**–0.093***
$\Delta GDP\ growth_{i,t}$	ϕ_1	**0.066***	**0.066***	**0.066***	**0.066***
$\Delta Inflation_{i,t}$	ϕ_2	**–0.047***	**–0.047***	**–0.047***	**–0.047***
$\Delta r^{US}_{i,t}$	β	**0.830***	**0.406***	**0.414***	0.15
ΔVIX_t	δ	–0.14	**0.387***	0.05	**0.607***

Table 6. Extended analysis with the lower-bound episodes (1999–2012)

		Using OLS est. as the initial values (1)	Initial values in (1) + SE*1 (2)	Iv(1) – SE *1 (3)	Initial values (OLS estimate) (4)
$i^{p}_{i,t-1}$	λ	**–0.11***	**–0.11***	**–0.11***	**–0.11***
$\Delta GDP\ growth_{i,t}$	ϕ_1	0.04	0.04	0.04	0.03
$\Delta Inflation_{i,t}$	ϕ_2	**0.39***	0.39*	0.39*	0.39*
$D_{fixed\ .NC}\Delta r^{US}_{i,t}$	β_1	**0.65***	**0. 66***	**0.65***	**0.66***
$D_{fixed\ .C}\Delta r^{US}_{i,t}$	β_2	–0.23	–0.23	–0.23	–0.23
$D_{flex\ .NC}\Delta r^{US}_{i,t}$	β_3	**0.5***	**0.5***	**0.5***	**0.5***
$D_{flex\ .C}\Delta r^{US}_{i,t}$	β_4	0.06	0.06	0.06	0.06
ΔVIX_t	δ	**0.25***	**0.25***	**0.25***	**0.28***
σ_ε		**1.78***	**1.78***	**1.78***	1.78
$logM_t$	θ_2	–11.75	–4.48	–11.74	–24.89
$logY_t$	θ_3	11.05	4.21	11.04	33.16
σ_{ϵ_t}		0.39	0.15	0.39	1.08
Log L at optimal		–1305.351	–1305.278	–1305.35	–

Conclusions

- For the pre-QE episode, a flexible exchange rate does not reliably deliver monetary policy independence, but capital controls do
- In open economies, a flexible exchange rate regime can help in keeping short-term policy rates less affected by US monetary policy changes, compared to those on a fixed exchange regime
- However, for the QE episode, the responses of peripheral countries' policy rates to the money-supply-approximated monetary policy of the US are much lower