Inelastic Financial Markets and Foreign Exchange Interventions[1]

Paula Beltran Chang He

Washington Area International Finance Symposium (WAIFS)
October 11, 2024

[1] Beltran (PBeltranSaavedra2@imf.org): IMF He (changhe@virginia.edu): The University of Virginia.

Disclaimer: the views expressed herein are those of the authors and should not be attributed to the IMF, its executive board, or its management.

FX Interventions meet Inelastic Financial Markets

- Foreign Exchange (FX) interventions are widely used in emerging countries and can come in large magnitudes

FX Interventions meet Inelastic Financial Markets

- Foreign Exchange (FX) interventions are widely used in emerging countries and can come in large magnitudes
- Standard textbook macro-literature assumes perfectly elastic financial market (Mundell 1962; Obstfeld-Rogoff 1995; Gali-Monacelli 2005)

FX Interventions meet Inelastic Financial Markets

- Foreign Exchange (FX) interventions are widely used in emerging countries and can come in large magnitudes
- Standard textbook macro-literature assumes perfectly elastic financial market (Mundell 1962; Obstfeld-Rogoff 1995; Gali-Monacelli 2005)
- Asset-pricing literature suggests otherwise:
  - Domestic and foreign currency assets are ***not*** perfect substitutes (Rogoff 1984; Camanho-Hau-Rey 2022)
  - Financial market is ***not*** perfectly elastic (Shleifer 1986; Gabaix-Koijen 2022)

The Challenge in Identifying the Effects of FX Intervention

- **Research Question**: How effective are foreign exchange interventions at stabilizing exchange rates?

The Challenge in Identifying the Effects of FX Intervention

- **Research Question**: How effective are foreign exchange interventions at stabilizing exchange rates?
- Inherent endogeneity problem in estimating the effects of the intervention on exchange rates:
  - Classic demand-supply simultaneity that bias OLS

The Challenge in Identifying the Effects of FX Intervention

- **Research Question**: How effective are foreign exchange interventions at stabilizing exchange rates?
- Inherent endogeneity problem in estimating the effects of the intervention on exchange rates:
  - Classic demand-supply simultaneity that bias OLS
- A valid identification calls for a natural experiment that **exogenously** changes the demand on the **currency-composition** of government bonds

This Paper

Research Question:

- How effective are foreign exchange interventions at stabilizing exchange rates?

This Paper

Research Question:

- How effective are foreign exchange interventions at stabilizing exchange rates?

What we do:

- Leverage the mechanical rebalancings of the largest local-currency govt. bonds index for emerging countries

This Paper

Research Question:

- How effective are foreign exchange interventions at stabilizing exchange rates?

What we do:

- Leverage the mechanical rebalancings of the largest local-currency govt. bonds index for emerging countries
- Show the rebalancings resemble an exogenous currency demand shock in an inelastic financial market model

This Paper

Research Question:

- How effective are foreign exchange interventions at stabilizing exchange rates?

What we do:

- Leverage the mechanical rebalancings of the largest local-currency govt. bonds index for emerging countries
- Show the rebalancings resemble an exogenous currency demand shock in an inelastic financial market model
- Identify the elasticity of exchange rates and estimate the required size of FX intervention

This Paper: Preview of Results

- Currency demand shock moves exchange rates significantly:

This Paper: Preview of Results

- Currency demand shock moves exchange rates significantly:
  - One std. dev. of the shock ($\sim$ 0.6 bn. USD) moves exchange rate by 1.2% (median country)
  - Persistent effects on exchange rates for about 3 months

This Paper: Preview of Results

- Currency demand shock moves exchange rates significantly:
  - One std. dev. of the shock ($\sim$ 0.6 bn. USD) moves exchange rate by 1.2% (median country)
  - Persistent effects on exchange rates for about 3 months

- Evidence that supports models of **inelastic financial markets** where FX interventions are **effective** at stabilizing exchange rates (the "relaxed" Trilemma)

This Paper: Preview of Results

- Currency demand shock moves exchange rates significantly:
  - One std. dev. of the shock ($\sim$ 0.6 bn. USD) moves exchange rate by 1.2% (median country)
  - Persistent effects on exchange rates for about 3 months
- Evidence that supports models of **inelastic financial markets** where FX interventions are **effective** at stabilizing exchange rates (the "relaxed" Trilemma)
- Intervention twice more effective for free-floaters than peggers (or managed-floaters)
  - 1 % appreciation $\Leftrightarrow$ central bank sell foreign reserves worth 0.1% of GDP (average effect)

Outline

1 Introducing the Currency Demand Shock

2 Currency Demand Shocks in Inelastic Financial Market

3 FX Interventions in Inelastic Financial Markets

Government Bond Index (GBI) EM Global Diversified

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019
  - $\sim$ 90% of the funds in EPFR dataset that follows local-currency EM gov. bonds are tracking a GBI-EM index

performance R^2

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019
  - $\sim$ 90% of the funds in EPFR dataset that follows local-currency EM gov. bonds are tracking a GBI-EM index

performance R^2

- **Monthly rebalancings** by JP Morgan that caps country weight at 10%:

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019
  - $\sim$ 90% of the funds in EPFR dataset that follows local-currency EM gov. bonds are tracking a GBI-EM index

performance R^2

- **Monthly rebalancings** by JP Morgan that caps country weight at 10%:
  - Includes part of country's sovereign bonds outstanding ($Q_{c,t}$) into the index ($\hat{Q}_{c,t}$)

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019
  - $\sim$ 90% of the funds in EPFR dataset that follows local-currency EM gov. bonds are tracking a GBI-EM index

performance R^2

- **Monthly rebalancings** by JP Morgan that caps country weight at 10%:
  - Includes part of country's sovereign bonds outstanding ($Q_{c,t}$) into the index ($\hat{Q}_{c,t}$)
  - Caps country weight $\omega_{c,t}$ at 10% while $\sum_c \omega_{c,t} = 100\%$

Government Bond Index (GBI) EM Global Diversified

- The **largest** emerging market local-currency gov. bonds index:
  - Asset under management over 200 billion USD. in 2019
  - $\sim$ 90% of the funds in EPFR dataset that follows local-currency EM gov. bonds are tracking a GBI-EM index

performance R^2

- **Monthly rebalancings** by JP Morgan that caps country weight at 10%:
  - Includes part of country's sovereign bonds outstanding ($Q_{c,t}$) into the index ($\hat{Q}_{c,t}$)
  - Caps country weight $\omega_{c,t}$ at 10% while $\sum_c \omega_{c,t} = 100\%$
  - Currency demand shock ($\mu_{c,t}$) for rebalancing at my month t:

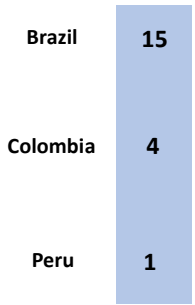
$$\mu_{c,t} = \frac{\left(\omega_{c,t}^{\text{before}} - \omega_{c,t}^{\text{after}}\right)}{\omega_{c,t}^{\text{after}}}$$

A simplified rebalancing example at 10% weight cap

$$\omega_{c,t}^{before} = \frac{P_{c,t}\,\widehat{Q}_{c,t-1}}{\sum_c P_{c,t-1}\,\widehat{Q}_{c,t-1}} \times \frac{1}{(1+r_t)} \qquad \omega_{c,t}^{after} = \frac{P_{c,t}\,\widehat{Q}_{c,t}}{\sum_c P_{c,t}\,\widehat{Q}_{c,t}}$$

A simplified rebalancing example at 10% weight cap

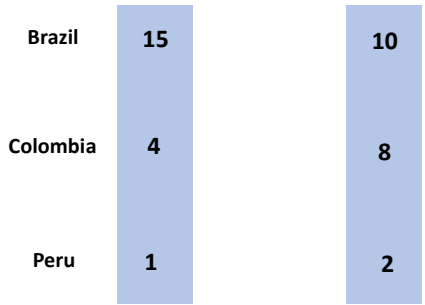
$$\omega_{c,t}^{before} = \frac{P_{c,t}\,\widehat{Q}_{c,t-1}}{\sum_c P_{c,t-1}\,\widehat{Q}_{c,t-1}} \times \frac{1}{(1+r_t)} \qquad \omega_{c,t}^{after} = \frac{P_{c,t}\,\widehat{Q}_{c,t}}{\sum_c P_{c,t}\,\widehat{Q}_{c,t}}$$



- Assume the remaining countries are all at 10% cap

A simplified rebalancing example at 10% weight cap

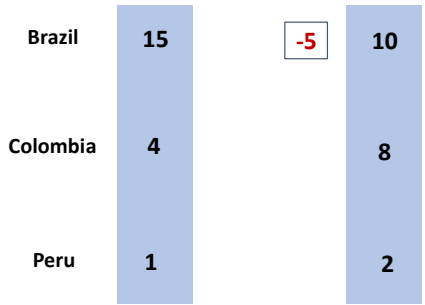
$$\omega_{c,t}^{before} = \frac{P_{c,t}\,\widehat{Q}_{c,t-1}}{\sum_c P_{c,t-1}\,\widehat{Q}_{c,t-1}} \times \frac{1}{(1+r_t)} \qquad \omega_{c,t}^{after} = \frac{P_{c,t}\,\widehat{Q}_{c,t}}{\sum_c P_{c,t}\,\widehat{Q}_{c,t}}$$



- Assume the remaining countries are all at 10% cap

A simplified rebalancing example at 10% weight cap

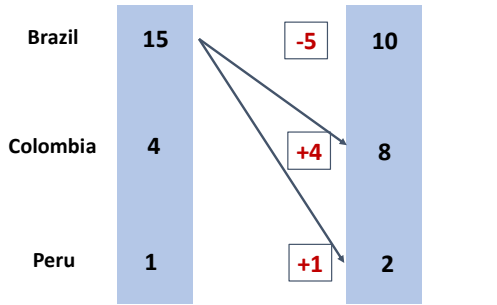
$$\omega_{c,t}^{before} = \frac{P_{c,t}\,\widehat{Q}_{c,t-1}}{\sum_c P_{c,t-1}\,\widehat{Q}_{c,t-1}} \times \frac{1}{(1+r_t)} \qquad \omega_{c,t}^{after} = \frac{P_{c,t}\,\widehat{Q}_{c,t}}{\sum_c P_{c,t}\,\widehat{Q}_{c,t}}$$



- Assume the remaining countries are all at 10% cap

A simplified rebalancing example at 10% weight cap

$$\omega_{c,t}^{before} = \frac{P_{c,t}\,\widehat{Q}_{c,t-1}}{\sum_c P_{c,t-1}\,\widehat{Q}_{c,t-1}} \times \frac{1}{(1+r_t)} \qquad \omega_{c,t}^{after} = \frac{P_{c,t}\,\widehat{Q}_{c,t}}{\sum_c P_{c,t}\,\widehat{Q}_{c,t}}$$



- Assume the remaining countries are all at 10% cap

A simplified rebalancing example at 10% weight cap

	$\omega_{c,t}^{before}$		$\omega_{c,t}^{after}$	$\mu_{c,t}$
Brazil	15	-5	10	-
Colombia	4	+4	8	1/2
Peru	1	+1	2	1/2

- We use the countries **not** at the cap for identification
- $\mu_{c,t} \equiv \frac{(\omega_{c,t}^{\text{before}} - \omega_{c,t}^{\text{after}})}{\omega_{c,t}^{\text{after}}} \perp$ macro-conditions

full dist. price corr. matrix

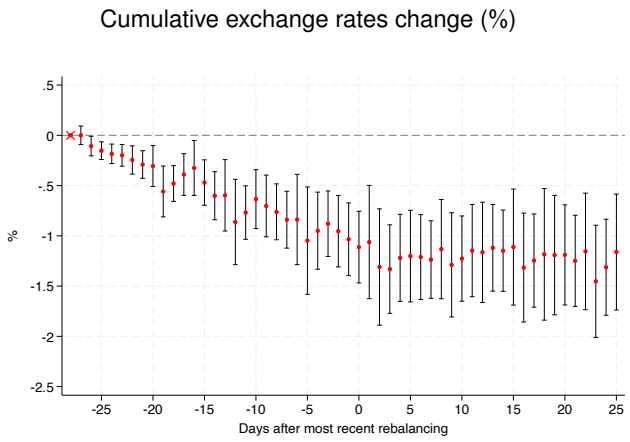
Outline

1 Introducing the Currency Demand Shock

2 Currency Demand Shocks in Inelastic Financial Market

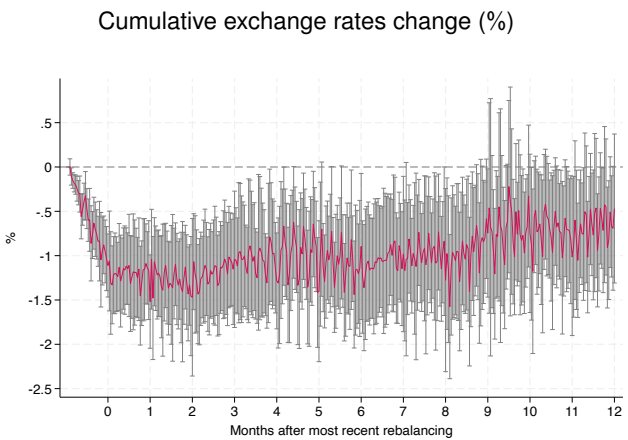
3 FX Interventions in Inelastic Financial Markets

Fact I: Demand shock moves exchange rates in the short run



- A one std. ↑ $\mu_{c,t}$ ($\sim$ 0.6 bn. USD) leads to 1.2% exchange rates appreciation
- $\Delta e_{c,t+d} = \beta_0 + \beta_\mu \, \mu_{c,t} + \phi \, X_{c,t} + \epsilon_{c,t}$
- $\Delta e_{c,t+d}$ in local currency per USD; d days since -28 days of rebal. date (0); $X_{c,t}$ is country and date FE.

Fact II: Demand shock effect on exchange rates is persistent



- Exchange rate responses are significant for at least 3 months
- $\Delta e_{c,t+m} = \beta_0 + \beta_\mu \ \mu_{c,t} + \phi \ X_{c,t} + \epsilon_{c,t}$
- $\Delta e_{c,t+m}$ in local currency per USD; m months from -1 month of first rebal; $X_{c,t}$ is country and date FE.

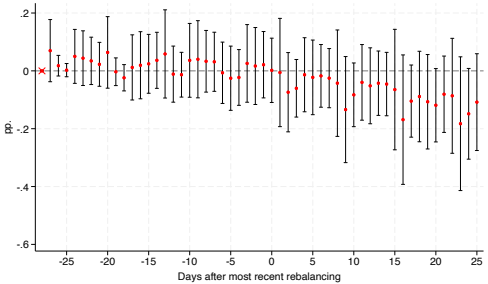
Fact III: Policy rates and Yields do not respond to the shock

- Policy rates/yields do not contaminate identification.

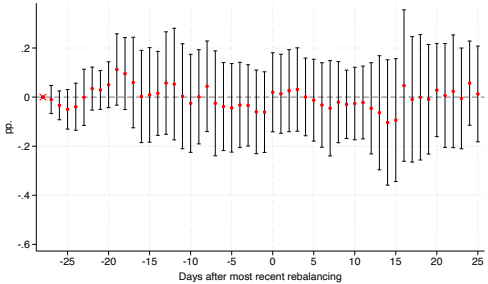
Fact III: Policy rates and Yields do not respond to the shock

- Policy rates/yields do not contaminate identification.

(a) Policy Rates



(b) Three-Month Deposit Yields



Fact IV: Floats are more responsive to the currency demand shocks

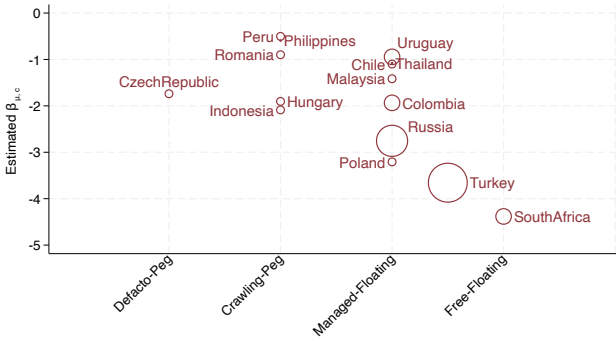
- $\Delta e_{c,t+d} = \beta_{0,c} + \beta_{\mu,c}\ \mu_{c,t} + \phi\ X_{c,t} + \epsilon_{c,t}$
- Country-specific response does not correlate with macro metrics show

Fact IV: Floats are more responsive to the currency demand shocks

- $\Delta e_{c,t+d} = \beta_{0,c} + \beta_{\mu,c}\ \mu_{c,t} + \phi\ X_{c,t} + \epsilon_{c,t}$
- Country-specific response does not correlate with macro metrics show
- Country-specific response strongly correlates with exchange rates regimes and volatility

Fact IV: Floats are more responsive to the currency demand shocks

- $\Delta e_{c,t+d} = \beta_{0,c} + \beta_{\mu,c}\ \mu_{c,t} + \phi\ X_{c,t} + \epsilon_{c,t}$
- Country-specific response does not correlate with macro metrics show
- Country-specific response strongly correlates with exchange rates regimes and volatility
  - ER volatility ↑, the more inelastic the market



Outline

1 Introducing the Currency Demand Shock

2 Currency Demand Shocks in Inelastic Financial Market

3 FX Interventions in Inelastic Financial Markets

Modeling Arbitrageurs' Holdings and FX Interventions

- Position of arbitrageurs in country c:

$$-d_{c,t} \;=\; \frac{1}{\lambda_{c,t}}\big(\mathbb{E}_t \Delta e_{c,t+1} \;-\; (i_{c,t} - i^*_{c,t}) - \underbrace{(\psi_{c,t} + \tau_{c,t})}_{\text{exog. UIP shock}}\big) \tag{1}$$

where risk-bearing capacity $\lambda_{c,t}(.) = \omega\ \sigma^2_{e_{c,t}}$

Modeling Arbitrageurs' Holdings and FX Interventions

- Position of arbitrageurs in country c:

$$-d_{c,t} = \frac{1}{\lambda_{c,t}}\left(\mathbb{E}_t \Delta e_{c,t+1} - (i_{c,t} - i^*_{c,t}) - \underbrace{(\psi_{c,t} + \tau_{c,t})}_{\text{exog. UIP shock}}\right) \quad (1)$$

where risk-bearing capacity $\lambda_{c,t}(.) = \omega\ \sigma^2_{e_{c,t}}$

- Market clearing conditions with FX intervention:

$$0 = \underbrace{b_{c,t}}_{\text{H/H holdings}} + \underbrace{f_{c,t}}_{\text{FX intervention}} + \underbrace{n_{c,t}}_{\text{noise traders}} + d_{c,t} \quad (2)$$

Modeling Arbitrageurs' Holdings and FX Interventions

- Position of arbitrageurs in country c:

$$-d_{c,t} = \frac{1}{\lambda_{c,t}}\left(\mathbb{E}_t \Delta e_{c,t+1} - (i_{c,t} - i^*_{c,t}) - \underbrace{(\psi_{c,t} + \tau_{c,t})}_{\text{exog. UIP shock}}\right) \quad (1)$$

where risk-bearing capacity $\lambda_{c,t}(.) = \omega\ \sigma^2_{e_{c,t}}$

- Market clearing conditions with FX intervention:

$$0 = \underbrace{b_{c,t}}_{\text{H/H holdings}} + \underbrace{f_{c,t}}_{\text{FX intervention}} + \underbrace{n_{c,t}}_{\text{noise traders}} + d_{c,t} \quad (2)$$

- $\Rightarrow \quad \mathbb{E}_t \Delta e_{c,t+1} = i_{c,t} - i^*_{c,t} + (\psi_{c,t} + \tau_{c,t}) + \underbrace{\lambda_{c,t}\left(b_{c,t} + n_{c,t} + f_{c,t}\right)}_{\text{endog. UIP shock}}$

Modeling Arbitrageurs' Holdings and FX Interventions

- Position of arbitrageurs in country c:

$$-d_{c,t} = \frac{1}{\lambda_{c,t}}\left(\mathbb{E}_t \Delta e_{c,t+1} - (i_{c,t} - i^*_{c,t}) - \underbrace{(\psi_{c,t} + \tau_{c,t})}_{\text{exog. UIP shock}}\right) \quad (1)$$

where risk-bearing capacity $\lambda_{c,t}(.) = \omega\ \sigma^2_{e_{c,t}}$

- Market clearing conditions with FX intervention:

$$0 = \underbrace{b_{c,t}}_{\text{H/H holdings}} + \underbrace{f_{c,t}}_{\text{FX intervention}} + \underbrace{n_{c,t}}_{\text{noise traders}} + d_{c,t} \quad (2)$$

- $\Rightarrow \quad \mathbb{E}_t \Delta e_{c,t+1} = i_{c,t} - i^*_{c,t} + (\psi_{c,t} + \tau_{c,t}) + \underbrace{\lambda_{c,t}\left(b_{c,t} + n_{c,t} + f_{c,t}\right)}_{\text{endog. UIP shock}}$

- Identify $\lambda_{c,t} = \frac{\partial e_{c,t}}{\partial n_{c,t}} = \frac{\partial e_{c,t}}{\partial f_{c,t}}$ = (counterfactual) required size of FXI to stabilize exchange rates

show $f \perp n$

Foreign Exchange Interventions and (Relaxed) Trilemma

- **Definition**: The “relaxed” Trilemma constraint states that it’s **possible** to have **all three** of the following simultaneously:
  1. An independent monetary policy (inward-focused)
  2. Free capital mobility (absence of capital control taxes)
  3. A managed exchange rate

Foreign Exchange Interventions and (Relaxed) Trilemma

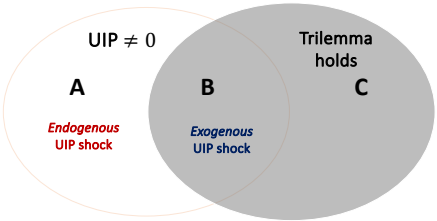
- **Definition**: The "relaxed" Trilemma constraint states that it's **possible** to have **all three** of the following simultaneously:
  1. An independent monetary policy (inward-focused)
  2. Free capital mobility (absence of capital control taxes)
  3. A managed exchange rate

- Under inelastic financial market (with endog. UIP), FX intervention serves as an additional policy instrument to stabilize exchange rates

- Even with free capital flows, a fixed exchange rate doesn't have to compromise monetary policy independence, **"relaxing" the Trilemma constraint**

data

Models of Trilemma Constraint and UIP



Model	Financial market	Papers
endogenous UIP shock	(imperfectly) inelastic	Gabaix and Maggiori (2015), Cavallino (2019), Itskhoki and Mukhin (2021), Fanelli and Straub (2021), Basu et al. (2023)
exogenous UIP shock	perfectly elastic	Devereux and Engel (2002), Farhi and Werning (2012), Jiang, Krishnamurthy and Lustig (2018)
classic trilemma (UIP = 0)	perfectly elastic	Mundell (1962), Dornbusch (1976), Obstfeld and Rogoff (1995), Gali and Monacelli (2005)

Summary of results: FXI much more Effective for Free-Floaters

- Average FX intervention required to induce 1 % exchange rate change

Average by ER regime group	ER Vol.	Required FXI	**FXI over GDP (%)**
crawling peg	0.13	0.33	0.13
managed floating	0.20	0.30	0.07
free floating/falling	0.43	0.198	0.04

Summary of results: FXI much more Effective for Free-Floaters

- Average FX intervention required to induce 1 % exchange rate change

Average by ER regime group	ER Vol.	Required FXI	**FXI over GDP (%)**
crawling peg	0.13	0.33	0.13
managed floating	0.20	0.30	0.07
free floating/falling	0.43	0.198	0.04

For example, the required FXI as % of GDP is *more than 3 times smaller* for South Africa (free-floater) than for Peru (crawling-pegger).

- A pegged exchange rates implies infinite risk-bearing capacity of the arbitrageurs as ER volatility is zero

Summary of results: FXI much more Effective for Free-Floaters

- Average FX intervention required to induce 1 % exchange rate change

Average by ER regime group	ER Vol.	Required FXI	**FXI over GDP (%)**
crawling peg	0.13	0.33	0.13
managed floating	0.20	0.30	0.07
free floating/falling	0.43	0.198	0.04

For example, the required FXI as % of GDP is *more than 3 times smaller* for South Africa (free-floater) than for Peru (crawling-pegger).

- A pegged exchange rates implies infinite risk-bearing capacity of the arbitrageurs as ER volatility is zero
- We are back to the model with perfectly elastic market where FXI doesn't work

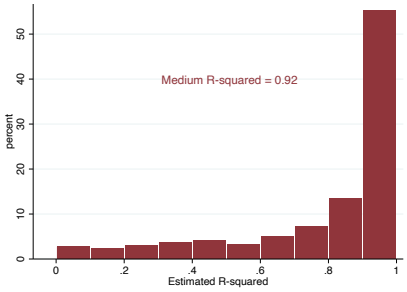
Conclusion

- We use a well-identified demand shock that exogenously changes the currency composition of government bonds.
- We show the shock moves exchange rates both in the short- and long-run and have heterogenous responses across countries.
- We identify the required size of FX intervention to stabilize exchange rates through a segmented financial market model.
- Our results contribute to the various literature including the FX intervention and asset demand and are informative to policy makers.

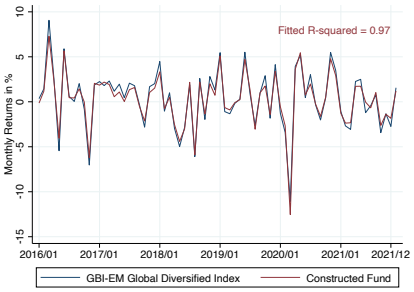
Appendix

Remark: How do the rebalancings move exchange rates?

- Rebalancings create large demand shocks on government bonds



(a) Histogram of fund performance R^2



(b) Weighted (by positions) average returns

Note: The left panel reports the histogram of estimated R-squared of regressing monthly fund returns from EPFR dataset on the returns of the index. The right panel reports returns of the weighted (by AUM) average returns of all mutual fund the EPFR dataset identified as closely tracking the index.

Back

Correlation matrix of sovereign bond price

Correlation matrix of sovereign bond prices across countries

	Argentina	Brazil	Chile	Colombia	Czech Republic	Hungary	Indonesia	Malaysia	Mexico	Peru	Phillippines	Poland	Romania	Russia	South Africa	Thailand	Turkey	Uruguay
Argentina	1	-0.8375	-0.8129	0.2588	0.5674	0.3118	0.6365	-0.6978	0.2861	-0.1942	0.1479	-0.7477	0.5894	0.1125	0.0567	-0.3082	0.6161	0.6515
Brazil	-0.8375	1	0.8259	0.136	0.0007	-0.16	0.1876	0.6409	-0.241	0.6052	0.3611	-0.0826	-0.6697	0.6915	-0.1826	0.3843	-0.2603	-0.1387
Chile	-0.8129	0.8259	1	-0.0893	-0.0991	0.2982	0.0205	0.7709	0.2172	0.5313	0.5934	0.5881	-0.0891	0.6214	-0.2868	0.6411	0.0394	-0.0867
Colombia	0.2588	0.136	-0.0893	1	0.0854	-0.6275	0.7322	0.3045	0.4828	0.6615	0.1472	-0.1345	-0.2691	0.4563	0.8199	-0.3833	0.5485	0.2267
Czech Republic	0.5674	0.0007	-0.0991	0.0854	1	0.5746	0.5731	-0.0654	0.2933	0.0762	0.1848	-0.0742	0.7641	0.0734	0.0455	0.0894	0.5688	0.3162
Hungary	0.3118	-0.16	0.2982	-0.6275	0.5746	1	-0.6249	-0.306	-0.117	-0.3587	0.2331	0.5308	0.6694	-0.4758	-0.5827	0.3045	-0.1248	-0.1467
Indonesia	0.6365	0.1876	0.0205	0.7322	0.5731	-0.6249	1	0.494	0.4165	0.605	0.1923	-0.2212	-0.058	0.4223	0.6708	-0.1097	0.4343	0.7759
Malaysia	-0.6978	0.6409	0.7709	0.3045	-0.0654	-0.306	0.494	1	0.3731	0.6203	0.5879	0.1779	-0.2167	0.6014	0.075	0.3943	0.1972	0.2707
Mexico	0.2861	-0.241	0.2172	0.4828	0.2933	-0.117	0.4165	0.3731	1	0.3078	0.5318	0.5108	0.5711	-0.09	0.5411	-0.057	0.7291	0.5352
Peru	-0.1942	0.6052	0.5313	0.6615	0.0762	-0.3587	0.605	0.6203	0.3078	1	0.5845	0.1084	-0.5196	0.6308	0.4414	-0.1035	0.3259	0.3149
Phillippines	0.1479	0.3611	0.5934	0.1472	0.1848	0.2331	0.1923	0.5879	0.5318	0.5845	1	0.6392	0.1009	0.3058	0.043	0.3197	0.4332	0.6155
Poland	-0.7477	-0.0826	0.5881	-0.1345	-0.0742	0.5308	-0.2212	0.1779	0.5108	0.1084	0.6392	1	0.4257	-0.3521	-0.1133	0.0005	0.2222	0.2845
Romania	0.5894	-0.6697	-0.0891	-0.2691	0.7641	0.6694	-0.058	-0.2167	0.5711	-0.5196	0.1009	0.4257	1	-0.7123	0.2355	0.1476	0.6135	0.7802
Russia	0.1125	0.6915	0.6214	0.4563	0.0734	-0.4758	0.4223	0.6014	-0.09	0.6308	0.3058	-0.3521	-0.7123	1	0.0026	0.1857	-0.0248	0.288
South Africa	0.0567	-0.1826	-0.2868	0.8199	0.0455	-0.5827	0.6708	0.075	0.5411	0.4414	0.043	-0.1133	0.2355	0.0026	1	-0.423	0.5578	0.0321
Thailand	-0.3082	0.3843	0.6411	-0.3833	0.0894	0.3045	-0.1097	0.3943	-0.057	-0.1035	0.3197	0.0005	0.1476	0.1857	-0.423	1	-0.0057	0.0783
Turkey	0.6161	-0.2603	0.0394	0.5485	0.5688	-0.1248	0.4343	0.1972	0.7291	0.3259	0.4332	0.2222	0.6135	-0.0248	0.5578	-0.423	1	0.2783
Uruguay	0.6515	-0.1387	-0.0867	0.2267	0.3162	-0.1467	0.7759	0.2707	0.5352	0.3149	0.6155	0.2845	0.7802	0.288	0.0321	0.0783	0.2783	1

Back1

Additional Regressions

Capital Controls and Macro-fundamentals are not Responsive to $\mu_{c,t}$

	(1) Capital controls	(2) GDP	(3) Consumption	(4) NFA	(5) Net exports	(6) Inflation
$\mu_{c,t}$	-0.0375	1.27	0.430	-1.040	0.285	-1.462
	(0.0289)	(0.357)	(6.540)	(0.880)	(2.984)	(0.9602)
Constant	0.523***	1.439***	2.214***	3.947***	0.466***	4.075***
	(0.00002)	(0.112)	(0.0533)	(0.00178)	(0.00543)	(0.0022)
Observations	1793	1247	1368	1992	1835	1956
R^2	0.9781	0.9199	0.9264	0.8637	0.1875	0.6451
Adjusted R^2	0.978	0.919	0.925	0.862	0.175	0.6401

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

back

Distribution of Currency Demand Shock

Distribution of the Currency Demand Shock ($\mu_{c,t}$ in %)

$\mu_{c,t}$, *including* observations at the 10% cap

Obs.	Mean	Std.	Min.	Max.	Median	90%	10%
2,197	-0.152	4.480	-15.627	21.192	-0.031	4.387	-5.371

$\mu_{c,t}$, *excluding* observations at the 10% cap

Obs.	Mean	Std.	Min.	Max.	Median	90%	10%
1,565	-0.162	4.844	-15.627	21.192	-0.156	4.686	-5.643

back

FXI are not responsive to the currency demand shock μ_{ct}

	Chile	Colombia	Czech Republic	Hungary	Indonesia	Malaysia	Peru
$\mu_{c,t}$	0.561	-0.418	13.58	3.262	-1.456	3.00	-2.455
	(0.324)	(0.253)	(9.501)	(2.192)	(1.280)	(1.970)	(1.508)
Const.	0.044^{***}	0.047^{***}	0.123	0.0384	0.035^{***}	0.006	0.096^{***}
	(0.00008)	(0.0002)	(0.057)	(0.019)	(0.002)	(0.009)	(0.002)
Obs.	90	127	42	132	81	64	130
R^2	0.762	0.186	0.471	0.194	0.478	0.218 y	0.3816
Adj. R^2	0.693	0.013	0.167	0.032	0.292	-0.071	0.254

	Philippines	Poland	Romania	Russia	South Africa	Thailand	Turkey	Uruguay
$\mu_{c,t}$	-0.194	6.642	2.071	0.272	0.241	4.067^{**}	0.294	3.086
	(0.462)	(8.425)	(1.479)	(0.955)	(0.394)	(1.393)	(0.651)	(1.983)
Const.	0.145^{***}	0.100^{*}	0.107^{***}	0.153^{***}	-0.016^{***}	0.103^{***}	-0.033^{**}	0.126
	(0.003)	(0.028)	(0.011)	(0.010)	(0.0003)	(0.004)	(0.010)	(0.045)
Obs.	120	45	89	111	62	118	72	39
R^2	0.4952	0.3026	0.2030	0.2832	0.4942	0.3603	0.3820	0.4659
Adj. R^2	0.381	-0.058	-0.016	0.114	0.299	0.220	0.156	0.118

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$

back

Connect Noise trader shocks with MIR

- Break noise trader positions into $\tilde{n}_{c,t}$ (GBI-EM index) and residual $\tilde{e}^{n}_{c,t}$:

$$n_{c,t} = \tilde{n}_{c,t} + \tilde{e}_{c,t}, \qquad \text{where} \quad \tilde{n}_{c,t} \perp \tilde{e}_{c,t}.$$

- At the rebalancing date, observe:

$$\tilde{n}_{c,t} = \tilde{\psi}_{c,t} R_{c,t} = \underbrace{\tilde{\psi}_{c,t} R_{c,t} - \left(\frac{\tilde{n}_{c,t-1}}{R_{c,t-1}}\right) R_{c,t}}_{\text{flows implied by rebalancings}} + \underbrace{\left(\frac{\tilde{n}_{c,t-1}}{R_{c,t-1}}\right) R_{c,t}}_{\text{market value buy-and-hold}}$$

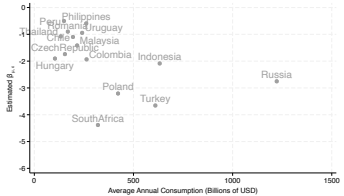
$$= \text{FIR}_{c,t} \quad + \quad \text{market value}^{BH}_{c,t},$$

- Estimated β_{μ_c} in OLS $\propto \dfrac{\partial e_{c,t}}{\partial n_{c,t}}$

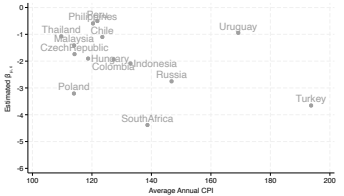
back

Country-specific β_{μ_c} do not correlate with Macro Fundamentals

(a) Annual Consumption

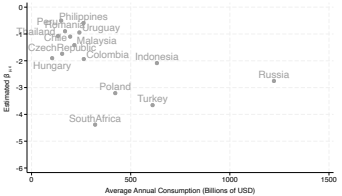


(b) Inflation (CPI Index)

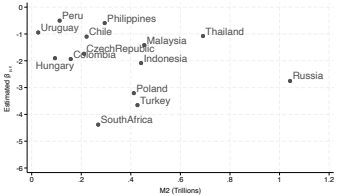


back

(c) NOMINAL GDP

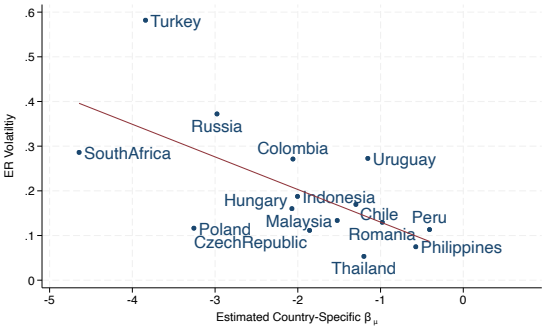


(d) M2 SUPPLY

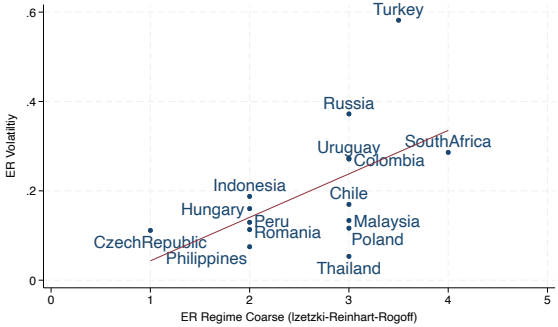


Exchange rates volatility strongly correlates with exchange rates response

- Exchange rates volatility strongly correlates with exchange rates response:



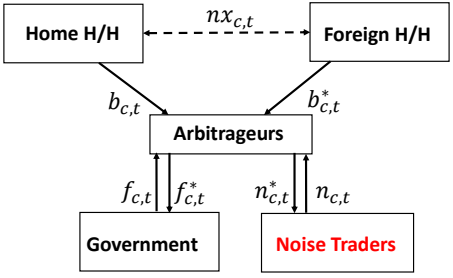
(a) ER Vol. against $\beta_{\mu c}$



(b) ER Vol. against Regime

back

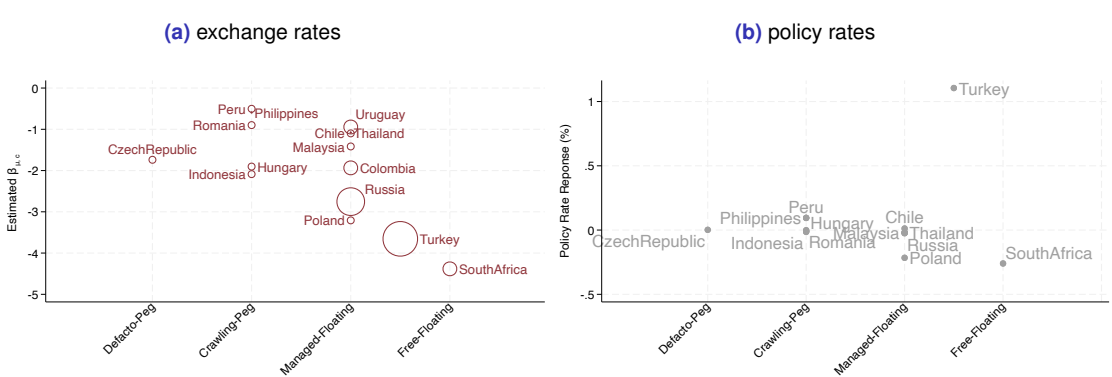
A model with endogenous UIP Deviation



- Segmented international bonds market for home and foreign h/h
- b_t = home h/h holdings; b_t^* = net foreign asset position of home h/h
- f_t, f_t^* = open market operations in home and foreign currency
- n_t, n_t^* = noise trader positions in home and foreign currency
  - noise traders subject to currency demand shocks ($\perp$ macro-condition)

Remark: Evidence on "Relaxed" Trilemma

- No direct policy tradeoffs between policy rates and exchange rates, regardless of the capital controls



Note: Scatter plot of country-specific exchange rates (left) and policy rates (right) response to MIR against the the exchange rates regime (from strict to relaxed) as classified by Ilzetzki, Reinhart and Rogoff (2021).

back