

STERILIZED FOREIGN EXCHANGE INTERVENTIONS UNDER INFLATION TARGETING

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Two Questions

- EME central banks with IT frameworks and sterilized intervention in FX market:
- Do they?
- Should they?

Arguments Pro: Excessive Movements in the Exchange Rate Costly

- Pass-through from exchange rate to inflation typically higher in EMEs. Beyond effect on inflation, exchange rate volatility also costly because:
- Currency mismatches on domestic balance sheets
 - ▣ Sharp depreciations can lead to widespread distress and bankruptcy
- Overvaluation also poses risk
 - ▣ Dutch disease. Dislocations between tradable and nontradable sectors particularly costly in EMEs (financial vulnerabilities)

Arguments Con: Serious ITers Float

- Textbook IT would call for completely ignoring the exchange rate (beyond its effect on inflation).
- Advanced economies that invented IT, were (and largely remain) pure floaters
- Having two targets (inflation, exchange rate) will undermine credibility of the inflation target

Do EME ITers care about the exchange rate?

Interest Rate Rules

- Estimate Taylor Rules for IT EMEs. Estimate rule for target real policy rate (i – Inflation Target). Controls include:
 - Lagged Dependent Variable
 - Consensus Forecast for inflation (over next 4 quarters) – Inflation Target
 - Change in Real Effective Exchange Rate
 - Output Gap (Deviation from rolling HP Trend)
 - Dummy for Global Financial Crisis (2008Q4-2009Q2)

Taylor Rules in EME ITERS: Panel Results

Table 1. Taylor Rules in Emerging Market Country Inflation Targeters: Panel Regression ^{1/}

	Dependent Variable: policy rate - inf. target		
	(1)	(2)	(3)
Lagged (policy rate - inflation target)		0.854 *** [0.020]	0.870 *** [0.023]
Expected inflation - inflation target	1.328 *** [0.209]	0.462 *** [0.059]	0.441 *** [0.047]
Change in REER			-0.040 *** [0.012]
Lagged output gap			0.120 *** [0.030]
Dummy for Global Financial Crisis	0.820 * [0.414]	-0.933 ** [0.361]	-0.977 ** [0.353]
Country Fixed Effects	YES	YES	YES
Observations	654	640	640
R-squared	0.250	0.887	0.899
Number of Countries	15	15	15

^{1/} Standard errors in brackets. *, ** and *** denote statistical significance at the 10, 5 and 1 percent level, respectively. REER is defined such that an increase denotes an appreciation of the currency.

Taylor Rules in EME Iters: Panel Results

- Iters increase the target real policy rate in response to higher expected inflation (consistent with IT framework)
- A 10 percent REER appreciation lowers the policy rate by 0.40 percentage points
 - ▣ Effect over and above any impact of the exchange rate on expected inflation
- Policy rate also responds to output gap
 - ▣ A 1 percent output gap persisting for four quarters would raise the policy rate by 0.40 percentage points
- Dummy on Global Financial Crisis points to sharp reduction in policy rates

Sterilized Intervention

Table 2. Change in Reserves as a function of change in REER ^{1/}

	Change in Reserves	
	IT	Non-IT
Change in REER	0.252 ** [0.088]	0.564 ** [0.195]
Dummy for Global Financial Crisis	-1.948 [2.167]	-12.301 ** [4.454]
Country Fixed Effects	YES	YES
Observations	646	520
R-squared	0.031	0.054
Number of Countries	15	10

^{1/} Standard errors in brackets. *, ** and *** denote statistical significance at the 10, 5 and 1 percent level, respectively. REER is defined such that an increase denotes an appreciation of the currency.

Sterilized Intervention

- Estimates suggest a 10 percent appreciation is associated with a 2.5 percent increase in reserves among ITers and 5.6 percent among comparison non-ITers
- One way to quantify the degree of intervention is the ratio: $\sigma_{\text{Reserves}} / (\sigma_{\text{Reserves}} + \sigma_{\text{REER}})$
- That ratio is 0.61 for EME ITers, which is fairly comparable to a ratio of 0.76 for non-ITers.

Should ITers intervene in FX market?

A Simple Argument

- If the central bank cares about the exchange rate (competitiveness/balance sheet reasons)
- Having two instruments allows it to better achieve its twin targets (inflation/output gap; and exchange rate)

Some Pitfalls/Questions

- Suppose sterilized FX intervention does not work—argument is predicated on 2 instruments
- Will the central bank with 2 instruments be necessarily better off? (forward-looking wage-setters; c.f. Rogoff (1985))
- Can the e-rate target undermine credibility of inflation target?
- Does IT (compared to Discretion) make it more or less attractive to do FX?
- Does FX make IT more or less attractive compared to Discretion

Does Sterilized Intervention Work?

- Literature emphasizes two channels:
- Portfolio balance channel
 - ▣ Affects exchange rate by changing relative supply of domestic and foreign currency assets
 - ▣ Literature on intervention focusing on Advanced Economies tends to downplay this channel
 - ▣ But in Emerging Markets interventions can amount to significant share of local bond markets
- Signaling channel
 - ▣ Intervention affects expectations about future fundamentals (including stance of monetary policy)
 - ▣ Not clear a priori whether this channel should be stronger for EMs

Does Sterilized Intervention Work?

Table 3. Studies on Sterilized Intervention in Emerging Market Economies

Study	Country	Effectiveness on	
		Level	Volatility
Stone, Walker, and Yosuke (2009)	Brazil	Yes	Yes
Tapia and Tokman (2004)	Chile	Yes	
Mandeng (2003)	Colombia		Yes (mixed)
Kamil (2008)	Colombia	Yes (weak)	Yes
Holub (2004)	Czech Republic	Mixed	
Disyatat and Galati (2005)	Czech Republic	Yes (weak)	No
Barabás (2003)	Hungary	Mixed	
Pattanaik and Sahoo (2003)	India	Yes (weak)	Yes
Rhee and Song (1999)	Korea	Yes	
Domaç and Mendoza (2002)	Mexico and Turkey	Yes	Yes
Guimarães and Karacadag (2004)	Mexico and Turkey	Yes (weak)	Mixed
Abenoja (2003)	Philippines	Mixed	Yes (mixed)
Sangmanee (2003)	Thailand	No	
Adler and Tovar (2011)	Mainly Latin America	Yes	

IT with 2 instruments

Simple Open Economy Model

- Our key assumption is that UIP does not hold:
 - ▣ Capital Flows respond to the expected return differentials but at a finite pace

- Remaining equations are standard
- $$\Delta k_t = \gamma_r (r_t - r_t^* + (e_{t+1}^e - e_t))$$

Simple Open Economy Model

- Aggregate Demand depends on r and e :

$$y_t = -\varphi_r r_t - \varphi_e e_t - u_t$$

- Aggregate supply given by “surprise inflation”
Phillips curve:

$$y_t = \pi_t - \pi_t^e$$

- Current account depends on e and y :

$$ca_t = -\phi_e e_t - \phi_y y_t$$

Simple Open Economy Model

- BOP equation implies current account plus capital flows equal the change in reserves

$$ca_t + \Delta k_t = \theta \Delta R_t$$

- To simplify algebra, we assume :

$$\varphi_r = \phi_e = \gamma_r = \theta = 1 \quad \varphi_e = \phi_y = 0$$

Objective Function

- Central Bank cares about the square deviation of π , y , e and R from their steady-state

$$W = \text{Max}_{r,R} - \frac{1}{2} \{ (y - \bar{y})^2 + a(\pi)^2 + b(e)^2 + cR^2 \}$$

- IT modeled as a constraint that sets: $\pi = 0$
 - ▣ Similar to having lexicographic preferences
- IT CB free to smooth shocks to those variables (provided inflation target is met)

Key Results

- Discretionary policies suffer from inflationary bias
- IT eliminates inflationary bias, but less scope to smooth shocks to e (no divine coincidence)
 - ▣ With 1 instrument, r pinned down by inflation objective
 - ▣ With 2 instruments, some scope to smooth shocks to e , but more constrained than under discretion.
- Simple but tedious algebra allows us to compare welfare across regimes and number of instruments

Welfare Comparison

$$L_r^D = \frac{E}{2} \left\{ \left(\frac{-\tilde{b}(r^* + u)}{1+a+\tilde{b}} - \bar{y} \right)^2 + a \left((\bar{y}/a) - \frac{\tilde{b}(r^* + u)}{1+a+\tilde{b}} \right)^2 + \tilde{b} \left(\frac{(1+a)(r^* + u)}{1+a+\tilde{b}} \right)^2 \right\}$$

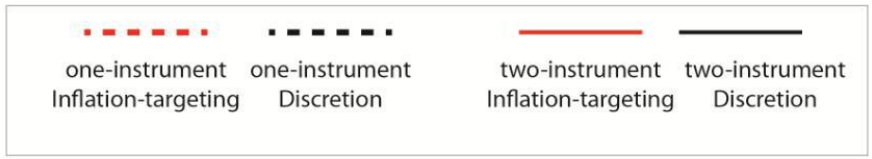
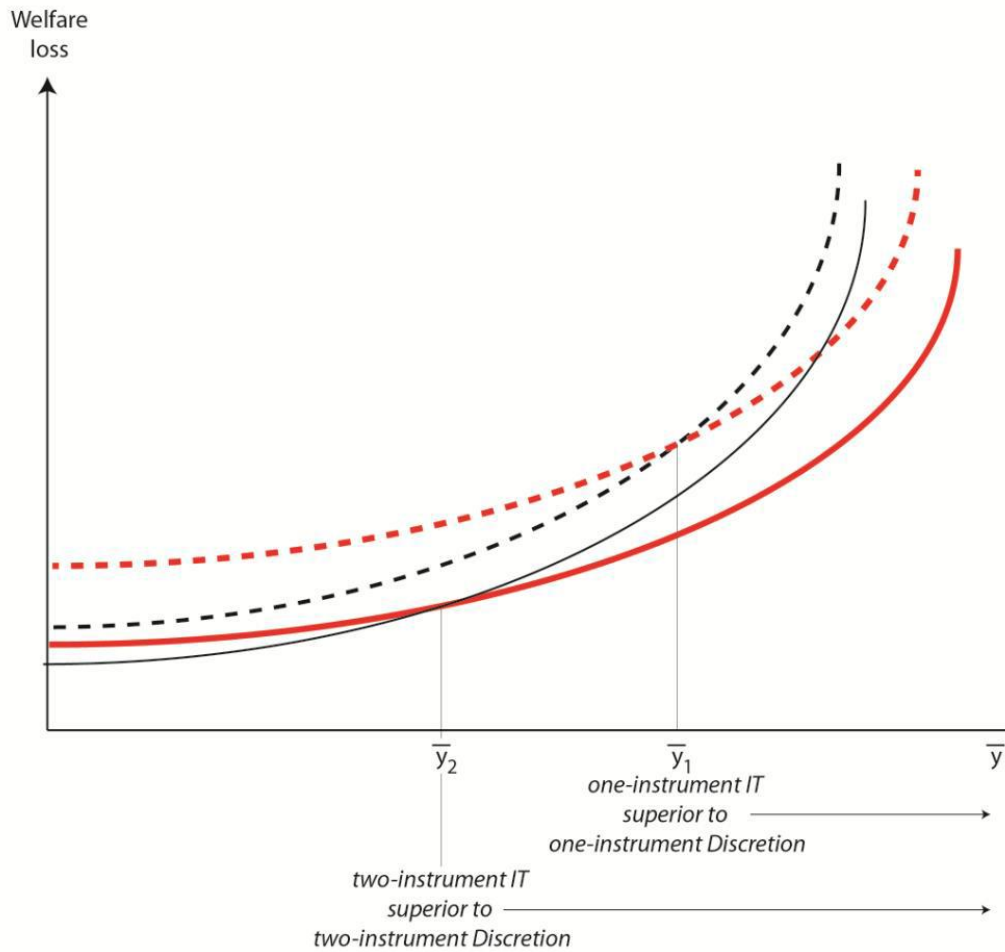
$$L_r^{IT} = \frac{E}{2} \left\{ \bar{y}^2 + \tilde{b}(r^* + u)^2 \right\}$$

$$L_{r,R}^D = \frac{E}{2} \left\{ \left(\frac{-\tilde{b}(u+r^*)}{((1+a)(1+\tilde{b}/c)+\tilde{b})} - \bar{y} \right)^2 + a \left((\bar{y}/a) - \frac{\tilde{b}(u+r^*)}{((1+a)(1+\tilde{b}/c)+\tilde{b})} \right)^2 \right. \\ \left. + \tilde{b} \left(\frac{(1+a)(u+r^*)}{((1+a)(1+\tilde{b}/c)+\tilde{b})} \right)^2 + c \left(\frac{-(1+a)(\tilde{b}/c)(r^* + u)}{((1+a)(1+\tilde{b}/c)+\tilde{b})} \right)^2 \right\}$$

$$L_{r,R}^{IT} = \frac{1}{2} \left\{ \bar{y}^2 + \tilde{b} \left[\frac{c(u+r^*)}{\tilde{b}+c} \right]^2 + c \left[\frac{\tilde{b}(u+r^*)}{\tilde{b}+c} \right]^2 \right\}$$

Welfare Comparison

- Discretion vs IT:
 - ▣ Discretion more likely to dominate if shocks are large
 - ▣ IT more likely to dominate when inflationary bias large
- 1 vs 2 instruments:
 - ▣ Move from 1 to 2 instruments improves welfare under both regimes
 - ▣ But gain larger under IT, where additional flexibility provided by second instrument is particularly important given IT constraint
- Contrary to conventional wisdom, FX Intervention “supports” IT



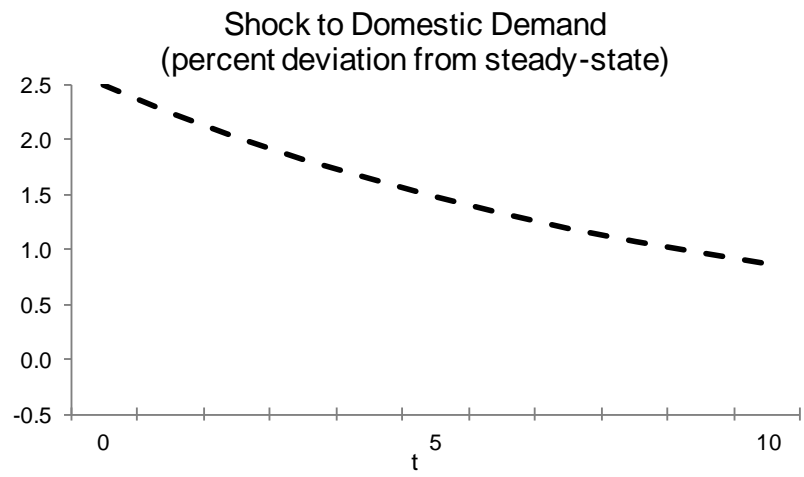
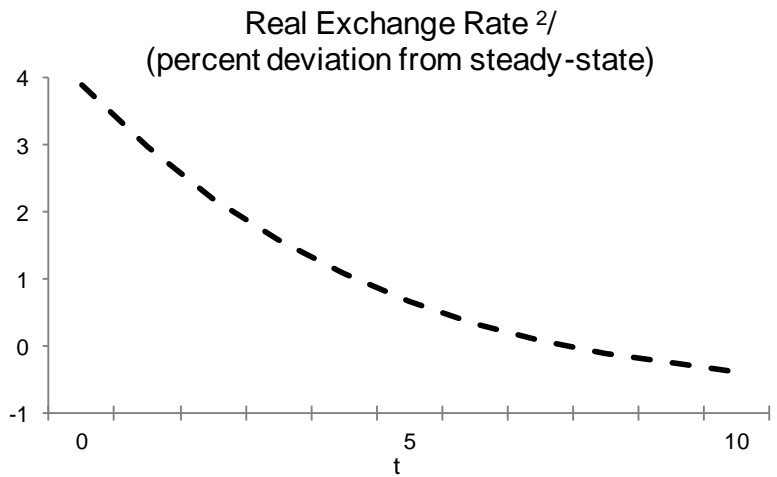
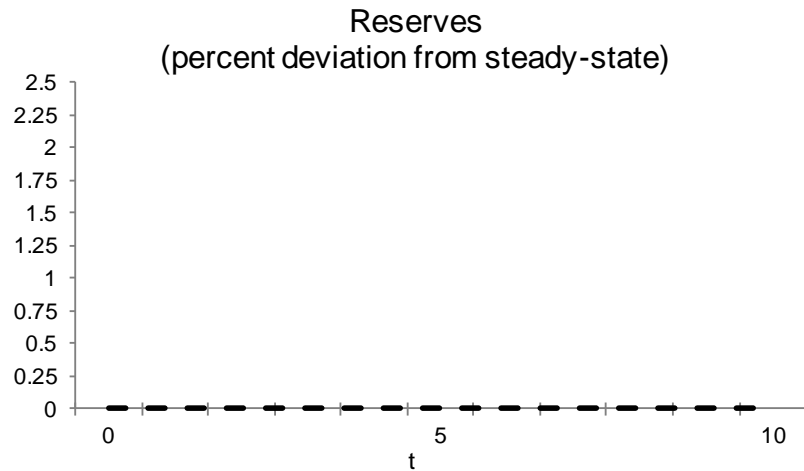
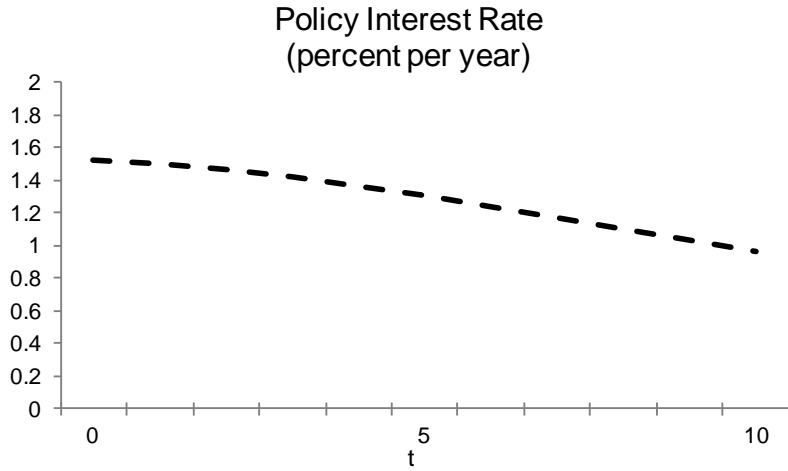
Some Pitfalls/Questions

- Suppose sterilized FX intervention does not work—argument is predicated on 2 instruments
- Will the central bank with 2 instruments be necessarily better off? (forward-looking wage-setters; c.f. Rogoff (1985)—yes
- Can the e-rate target undermine credibility of inflation target?—*no* (but...)
- Does IT (compared to Discretion) make it more or less attractive to do FX?—*more attractive*
- Does FX make IT more or less attractive compared to Discretion—*more attractive*

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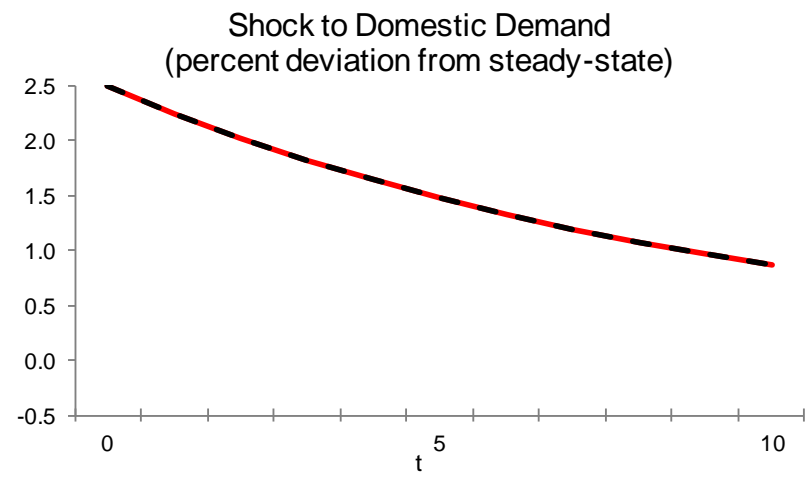
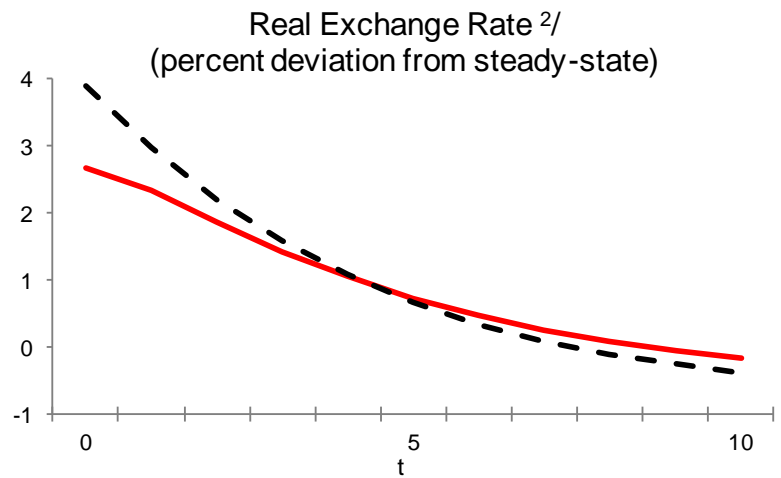
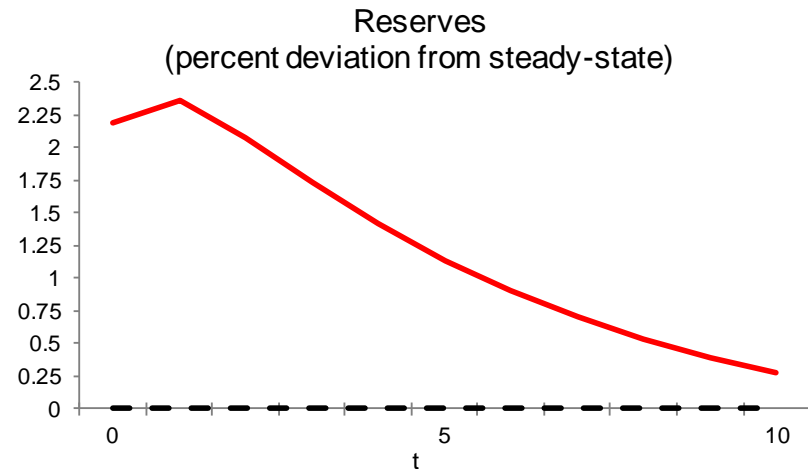
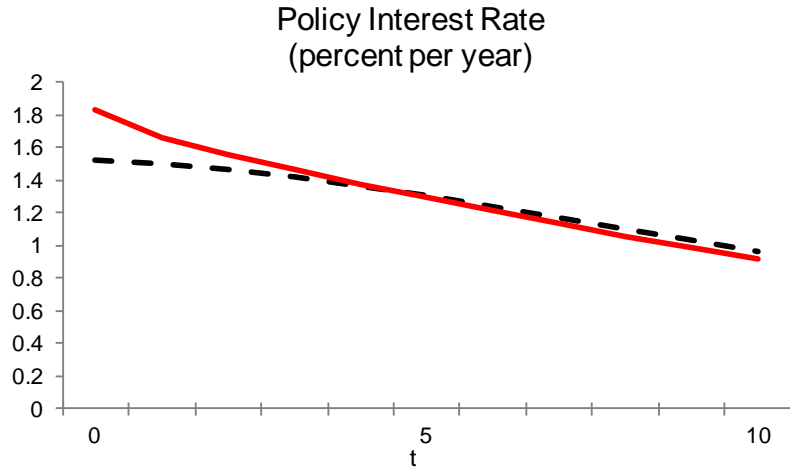
Dynamic Version

Using Two Instruments to Respond to a Demand Shock



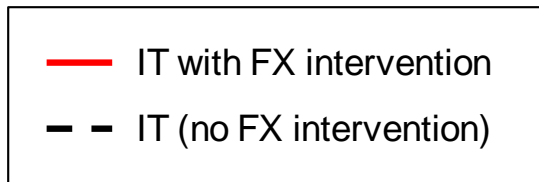
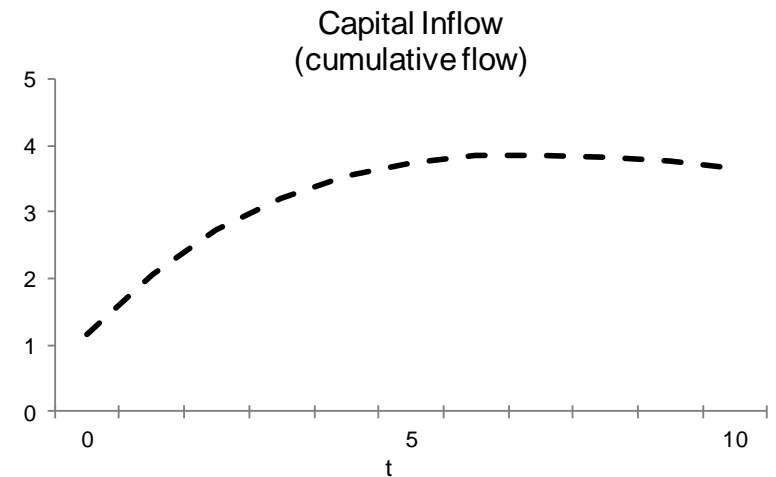
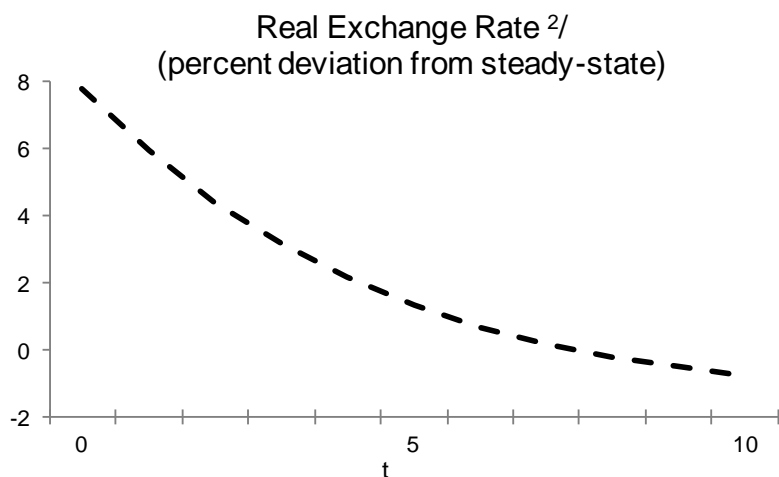
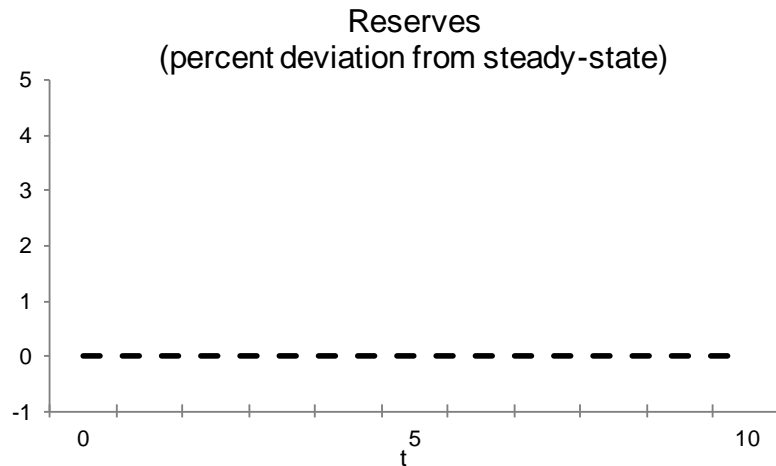
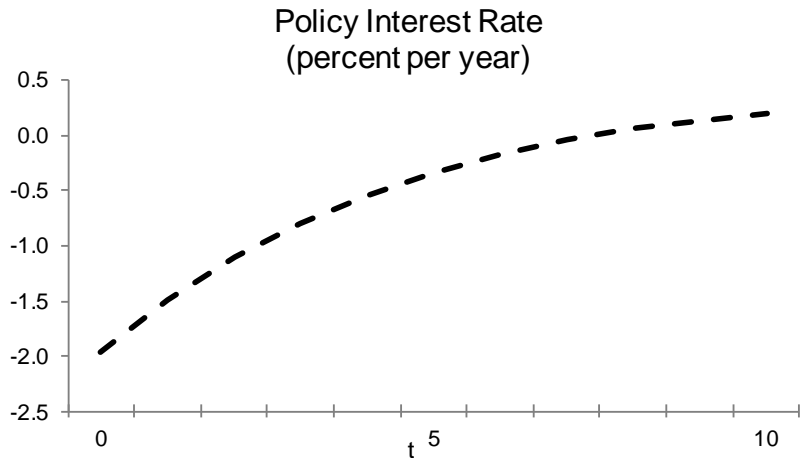
— IT with FX intervention
- - IT (no FX intervention)

Using Two Instruments to Respond to a Demand Shock

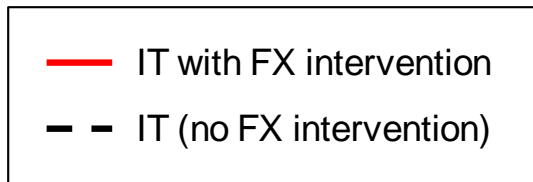
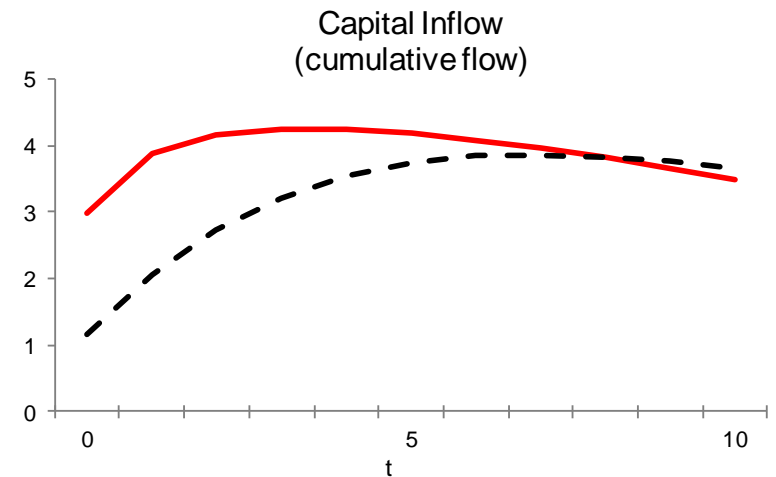
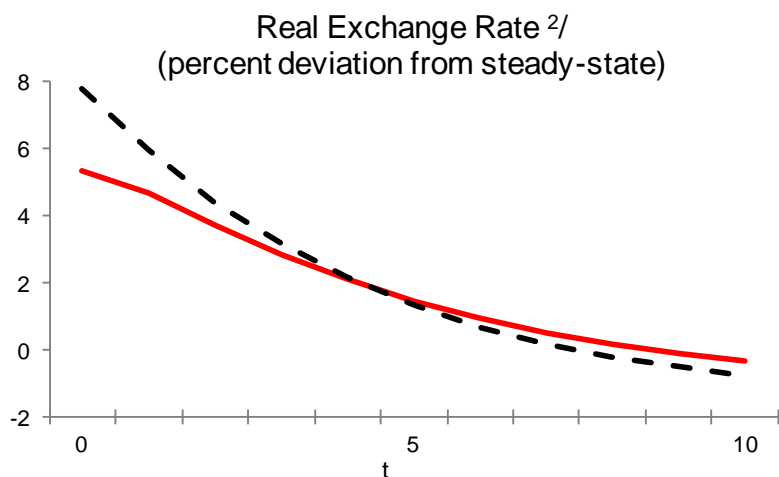
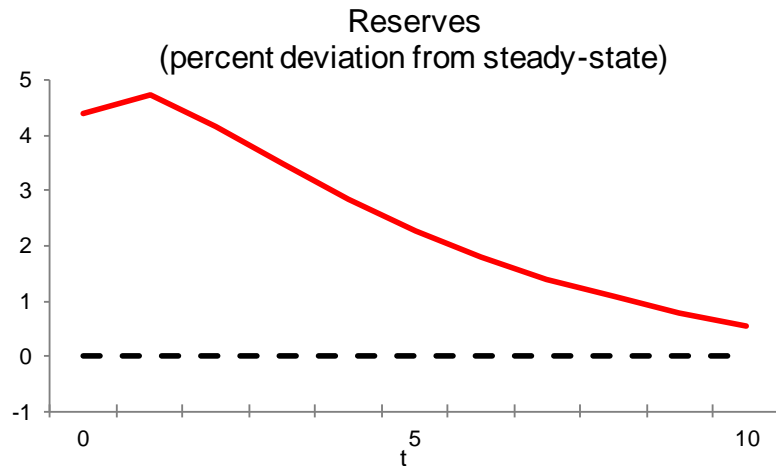
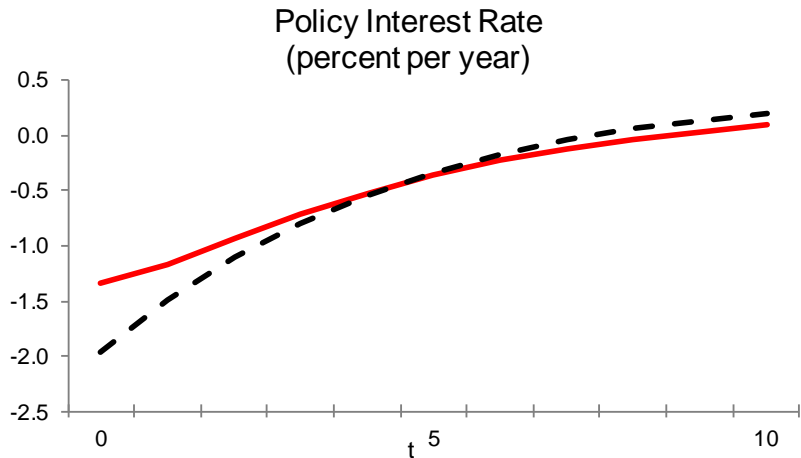


— IT with FX intervention
- - IT (no FX intervention)

Using Two Instruments to Respond to a Capital Inflow Shock



Using Two Instruments to Respond to a Capital Inflow Shock



Additional Insights from Dynamics

- Role of FX intervention diminishes in γ_r

$$\Delta k_t = \gamma_r (r_t - r_t^* + (e_{t+1}^e - e_t))$$

- Relative role of FX intervention diminishes in persistence of inflow shock
- Even one-sided shock (i.e., inflows that eventually die away) results in two-way intervention

Conclusions

Key Takeaways

- “Benign neglect” of the exchange rate may not be an option for EMEs
- There is no reason why caring about the exchange rate (and output) is inconsistent with an IT framework provided these are subordinated to delivering the inflation objective
- FX Intervention can actually strengthen the case for IT by providing more room to smooth shocks within a framework that benefits from non-inflationary bias credibility
- But...What if central bank constrained in use of the policy interest rate? Will FX intervention increase or decrease CB's (limited) credibility?