


Foreign Exchange Intervention, Capital Flows, and Liability Dollarization¹

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August 13, 2021

¹The views expressed in this paper are those of the authors and do not necessarily represent the views of Banco Central de Reserva del Perú. 

Introduction

Capital flows to emerging economies are beneficial, but they impose several challenges in dealing with them.

- Capital flows are driven by global factors
- Recipient emerging economy might feature liability dollarization
- Monetary policy alone might be an insufficient instrument to deal with capital flows fluctuations
- Concerns about the ability of conventional macroprudential to complement monetary policy
- Other tool widely used among emerging economies: Foreign Exchange Intervention (FXI).

Our research goals

- To analyze the role of FXI in dealing with global capital flows shocks
- Questions:
 - Is FXI an effective policy tool for dealing with global capital flows?
 - Is FXI a welfare-improving policy when deployed in response to global capital flows shocks?

What we do

- We estimate VAR model for a sample of small open economies to analyze empirically the interaction among global capital flows, FXI and liability dollarization.
- We develop a small open economy DSGE with financial frictions that imply a balance sheet channel linked to liability dollarization in the transmission of capital flow shocks.
- The DSGE model also features imperfect asset substitution between domestic and foreign bonds, which allows FXI to have real effects in the economy.

Preview of the main results

- We find that global capital flows shocks have substantial impact on output, inflation, and the real exchange rate.
- In economies with liability dollarization these estimated effects are amplified and they tend to use more FXI in response to capital flows shocks.
- Within the subsample of dollarized economies, empirical estimates suggest that sterilized FXI is highly effective.
- Real effects of capital flows are magnified when the liability dollarization is calibrated to the level observed in emerging economies
- We also find that optimal FX reserves accumulation is procyclical (*lean against the wind*) and largely reduce the welfare costs associated with capital flows shocks.
- Coherent with previous studies, using monetary policy rate that leans against the wind is ineffective to manage a capital inflows episode and, therefore, deploying FXI is clearly welfare-improving in dealing with these episodes.

Outline

- 1 Related literature
- 2 VAR model
- 3 A small open economy model with financial frictions, liability dollarization and FXI
- 4 Calibration
- 5 Simulations and welfare analysis
- 6 Concluding Remarks

Related Literature

- Theoretical developments to consider imperfect asset substitution and effectiveness of FXI: Cavallino (2019), Gabaix and Maggiori (2015), Chang et al (2015), Fanelli and Straub (2021), Fujiwara et al (2021).
- Empirical studies for understanding the systematic response of FXI to global capital flows shocks: Blanchard et al (2015), Kim (2003), Cavallino(2019).
- Theoretical works that include financial frictions and liability dollarization as factors that generate amplifications of external shocks in emerging economies: Cespedes et al (2005), Gertler et al (2007), Christiano et al (2010), and many more.

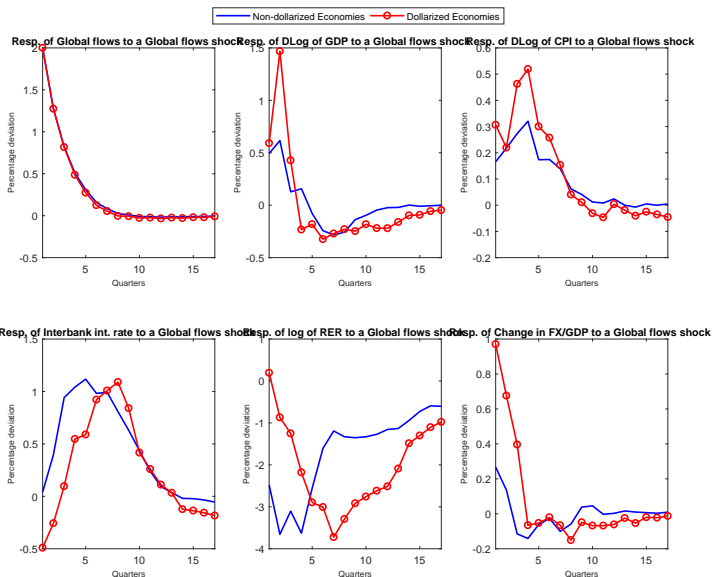
VAR model (1)

- For each country in the sample, we estimate a VAR model with 6 variables
 - global capital flows: gross capital flows to other countries (constructed according to Blanchard et al (2015)), and expressed as percentage of the sum of GDP of other countries.
 - Real GDP: expressed as log first difference
 - CPI: expressed as log first difference
 - short-term interest rate: expressed directly as percentage points
 - real effective exchange rate: expressed as the log of the effective index
 - stock of FX reserves: expressed as the change in the ratio of the stock to the trend GDP (HP filter).

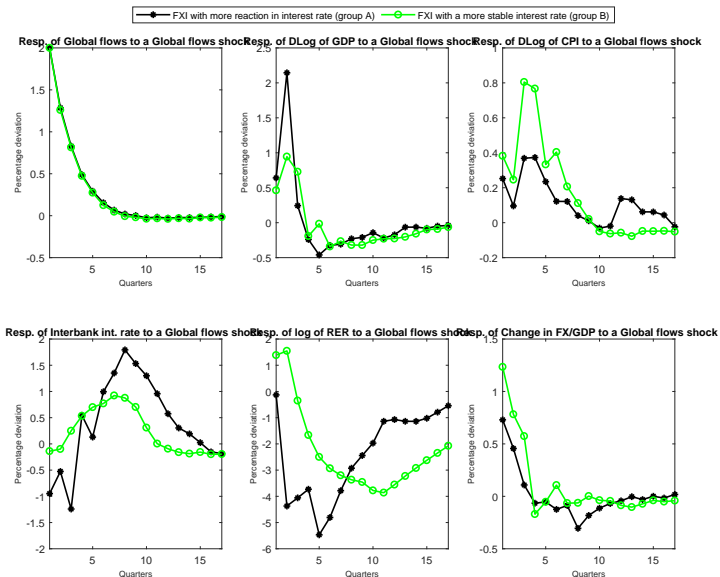
VAR model (2)

- 45 advanced and emerging economies (non-reserve currency countries)
- Quarterly data: 2000Q1–2018Q4
- Key specifications: global capital flows are exogenous for each country and behaves as AR(1) process; rest of variables keep the structure of VAR(3).
- We use data from Levy-Yeyati (2006) to separate the sample of dollarized and non-dollarized economies.
 - If a country has a average deposit dollarization of 20 percent or more is defined as a dollarized economy
- The responses are computed as median responses in each sample or sub-sample of countries.

Responses to global capital flows



Role of FXI in dollarized economies



Small Open Economy Model with Financial Frictions

- New Keynesian open economy DSGE model (Gertler et al., 2007).
- Two goods: Domestic (H) and Imported (F).
- Nominal Rigidities: domestic prices, imported prices, and wages.
- Imperfect asset substitution (Deviation from UIP).
- Financial accelerator (Bernanke et al., 1999).
- Liability dollarization (Gertler et al., 2007).
- Policy instruments: monetary policy rate and foreign exchange intervention (FXI).

- Balance Sheet:

$$N_t + B_{e,t} + \mathcal{E}_t B_{e,t}^* = Q_t K_{t+1} \quad (1)$$

- Degree of liability dollarization ϕ : $B_{e,t} = \phi \bar{B}_{e,t}$ and $\mathcal{E}_t B_{e,t}^* = (1 - \phi) \bar{B}_{e,t}$. $1 - \phi$ is the degree of *liability dollarization*
- The financial accelerator model can be summarized through an external finance premium:

$$sp_{t+1} = \Psi\left(\frac{Q_t K_{t+1}}{N_t}\right) \quad (2)$$

- Relationship between external premium and leverage; and between leverage and exchange rate movement when $\phi < 1$.

Central Bank Policies

- Monetary policy:

$$\frac{R_t}{\bar{R}} = \left(\frac{R_{t-1}}{\bar{R}} \right)^{\varphi_R} \left(\frac{1 + \pi_t}{1 + \bar{\pi}} \right)^{(1-\varphi_R)\varphi_\pi} \left(\frac{Y_t}{\bar{Y}} \right)^{(1-\varphi_R)\varphi_y} \left(\frac{R_t^*}{\bar{R}^*} \right)^{(1-\varphi_R)\varphi_{R^*}}$$

- Foreign exchange intervention rule that “leans against the wind” of capital inflows:

$$\frac{F_t^*}{\bar{F}^*} = \left(\frac{F_{t-1}^*}{\bar{F}^*} \right)^{\rho_{fx}} \left(\frac{R_t^*}{\bar{R}^*} \right)^{\theta_{R^*}}$$

- Importantly, changes in the stock of FX reserves satisfy the central bank's budget constraint:

$$\mathcal{E}_t F_t^* - B_t = \mathcal{E}_t F_{t-1}^* R_{t-1}^* - B_{t-1} R_{t-1} - T_t.$$

- Sterilized FXI are conducted by the issuance of domestic bonds B_t and the accumulation of foreign reserves F_t^*

Foreign borrowing and the foreign interest rate

- Foreign borrowing (in foreign currency) pays a premium Θ_t over the risk-free foreign rate, R_t^* .
- Individual agents do not internalize the effect of their decisions on this premium, Θ_t .
- Similar to Chang et al (2015), Θ_t determines the degree of asset substitution between domestic and foreign bonds and, therefore, the strength of the real effects of the FXI.
- We assume that in equilibrium the risk premium Θ_t depends on the stock of foreign and domestic bonds:

$$\Theta_t = \Theta(B_t^*, B_t / \mathcal{E}_t)$$

- Foreign interest rate shock:

$$R_t^* = \rho^* R_{t-1}^* + \varepsilon_t^*$$

Key Margins Influenced by Policies

- Global capital inflows induced by a reduction in the risk-free rate,
 $\downarrow R_t^*$
- External finance premium:

$$sp_{t+1} = \Psi\left(\frac{Q_t K_{t+1}}{N_t}\right)$$

$\downarrow R_t$, $\downarrow \mathcal{E}_t$, lower leverage, $\downarrow sp_{t+1}$, Rising or Lowering R_t ? Not obvious effects in aggregate demand

- Endogenous risk premium for foreign bonds:

$$\hat{R}_t^* = R_t^* \ominus \left(B_t^*, \frac{B_t}{\mathcal{E}_t} \right) \quad (3)$$

$\downarrow R_t^*$, $\downarrow RER_t$, Rising F_t^* , imperfect asset substitution b/w B_t^* and B_t
 $\Rightarrow \uparrow RER_t$ (offsetting effect in the real exchange rate)

Calibration (1)

- Model calibrated to a prototypical emerging economy.
- Standard values for parameters defining capital share in production, nominal rigidities, monetary policy rule, and so on.
- Degree of trade openness: M/GDP around 27 percent.
- Stock of FX reserves of 25 percent of GDP.
- Conventional values for parameters governing the financial accelerator mechanism.
- Liability dollarization (ϕ) of 50 percent (Levy-Yeyati, 2006).
- Elasticity of external debt risk premium Θ_t with respect to net foreign assets calibrated to ensure that 1 percent of GDP increase in FX reserves improves the current account by 0.4 percent of GDP (Bayoumi et al., 2015).

Calibration (2)

Table 1: Baseline Calibration

Parameter	Value	Description
β	0.995	Discount Factor
σ_C	1.00	Intertemporal substitution elasticity
σ_L	2.00	Inverse of the labor supply elasticity
γ_C	0.30	Share of imported goods in consumption
η_C	0.5	Substitution elasticity b/w H and F in consumption
γ_I	0.30	Share of imported goods in investment
η_I	0.5	Substitution elasticity b/w H and F in investment
μ_S	2.5	Parameter for adjustment cost in investment
$\bar{s}p^4$	1.035	Credit spread in annual terms in the SS
$4 \times F(\bar{\omega})$	0.03	Default premium in annual terms in the SS
$\bar{Q}\bar{K}/\bar{N}$	2.00	Capital-Net worth ratio of entrepreneurs in the SS
γ_e	0.975	Survival rate of entrepreneurs
$1 - \phi$	0, 0.50	Degree of financial dollarization

Calibration (3)

Table 1 (cont.): Baseline Calibration

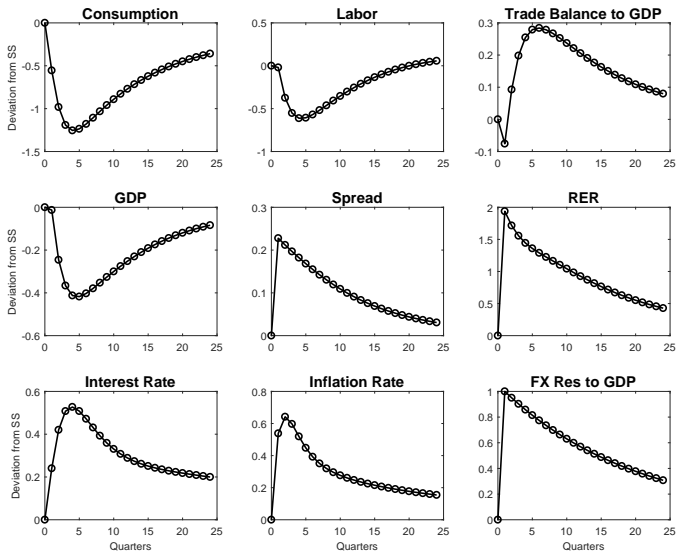
Parameter	Value	Description
ϕ_L	0.875	Calvo parameter in wages
ζ_L	0.5	Indexation to past inflation in wages
ϵ_L	6.0	Substitution elasticity across labor varieties
ϕ_H	0.75	Calvo parameter in the prices of H goods
ζ_H	0.5	Indexation to past inflation in prices of H goods
ϵ_H	11.0	Substitution elasticity across H varieties
ϕ_F	0.75	Calvo parameter in the prices of F goods
ζ_F	0.5	Indexation to past inflation in prices of F goods
ϵ_H	11.0	Substitution elasticity across F varieties

Calibration (4)

Table 1 (cont.): Baseline Calibration

Parameter	Value	Description
α	0.35	Capital share in domestic production
\bar{I}/\bar{Y}	0.20	Investment-output ratio in the SS
$(\bar{X} - \bar{M})/\bar{Y}$	0.0	Net export-output ratio in the SS
η^*	0.5	Price elasticity of exports
φ_R	0.70	Smoothing of the monetary policy rule
φ_π	1.50	Reaction to inflation in the monetary policy rule
φ_y	0.50/4	Reaction to output in the monetary policy rule
ρ_{R^*}	0.95	Persistence coefficient of foreign interest rate shocks
ϱ_1	0.001	External risk premium elasticity to B^*
ϱ_2	0.013	External risk premium elasticity to B_t/\mathcal{E}_t

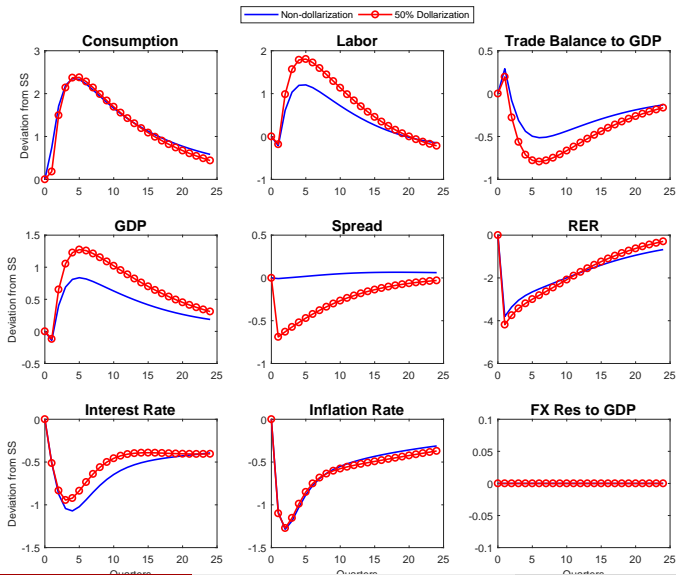
Transmission of exogenous FXI ($1 - \phi = 0.5$)



Macroeconomic Effects of Global Capital Flows

- Global capital inflows: 1 percentage reduction in R_t^* .
- Two scenarios: without liability dollarization ($1 - \phi = 0$) and with liability Dollarization ($1 - \phi = 0.5$).
- We assume central bank operates under a pure floating regime ($\varphi_{R^*} = 0$) and FX reserves are constant

Macroeconomic Effects of Global Capital Flows: Amplification under Dollarization



Optimal FXI in response to Global Capital Flows (1)

- Recall policy rules:

$$\frac{R_t}{\bar{R}} = \left(\frac{R_{t-1}}{\bar{R}} \right)^{\varphi_R} \left(\frac{1 + \pi_t}{1 + \bar{\pi}} \right)^{(1-\varphi_R)\varphi_\pi} \left(\frac{Y_t}{\bar{Y}} \right)^{(1-\varphi_R)\varphi_y} \left(\frac{R_t^*}{\bar{R}^*} \right)^{(1-\varphi_R)\varphi_{R^*}}$$

$$\frac{F_t^*}{\bar{F}^*} = \left(\frac{F_{t-1}^*}{\bar{F}^*} \right)^{\rho_{fx}} \left(\frac{R_t^*}{\bar{R}^*} \right)^{\theta_{R^*}}$$

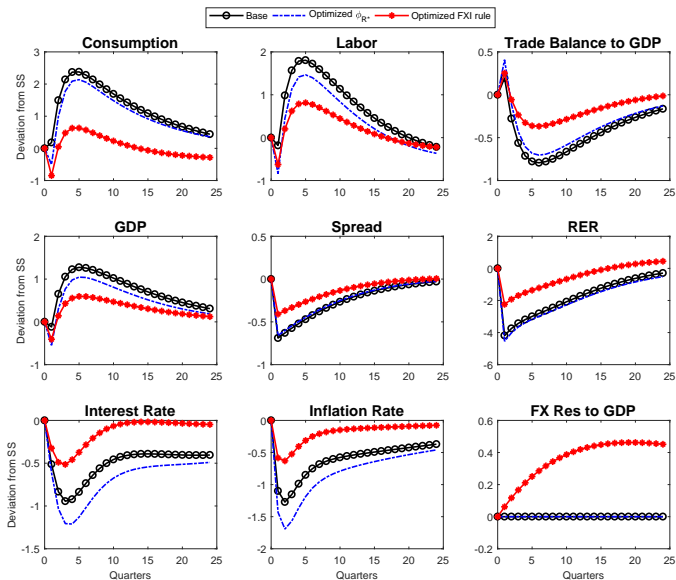
- Three alternative regimes: (i) Optimally use of the MP rate (optimize φ_{R^*}) and FX reserves are constant ($\rho_{fx} = \theta_{R^*} = 0$); (ii) Optimally use FXI (optimize ρ_{fx} and θ_{R^*}) and $\varphi_{R^*} = 0$; and (iii) Jointly optimize ρ_{fx} , θ_{R^*} and φ_{R^*} .
- Criteria for optimization: second-order approximation of households' welfare

Optimal FXI in response to Global Capital Flows (2)

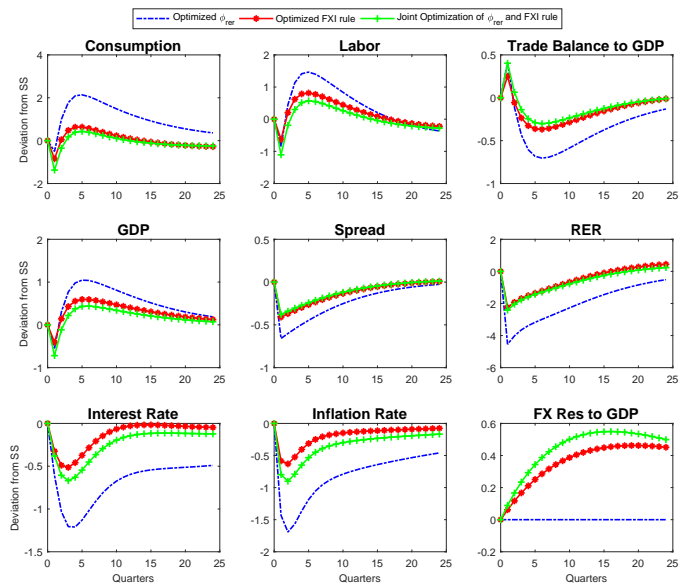
Table 2: Optimized parameters for alternative policy regimes

	Optimized φ_{R^*}	Optimized FXI rule	Joint optimization of φ_{R^*} and FXI
φ_{R^*}	-0.39	–	-0.29
θ_{R^*}	–	-0.99	-1.42
ρ_{fx}	–	0.95	0.93

Optimal FXI in response to Global Capital Flows (3)



Optimal FXI in response to Global Capital Flows (4)



Optimal FXI in response to Global Capital Flows (5)

Table 3: Welfare losses of fluctuations in global financial conditions

Baseline	0.29%
Optimized φ_{R^*}	0.26%
Optimized FXI rule	0.04%
Joint Optimization of φ_{R^*} and FXI rule	0.03%

Concluding Remarks

- VAR estimations show that a positive shock to global capital flows has an expansionary effect, and this is exacerbated in economies experiencing liability dollarization.
- Empirical estimations also find that FXI can insulate emerging economies from global capital flows.
- We develop a DSGE model for a small open economy with balance sheets effects and liability dollarization, which is able to replicate these empirical facts.
- Using the DSGE model we show that
 - Liability dollarization amplifies the effects of global capital flows shocks
 - Deploying FXI in response to capital flow shocks is a welfare-improving policy.
- Our empirical and theoretical results highlight the role of FXI for dealing with the global financial cycle, and rationalize this practice by many emerging economies.