

Public Savings and the effectiveness of Sterilized Foreign Exchange Intervention

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3. Preliminary data exploration
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6. Conclusions

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Foreign exchange intervention (FXI)

- Under inflation targeting framework, FXI are sterilized so the monetary base remains unchanged and the inflation target is not jeopardized
- Are sterilized FXI effective in influencing the nominal exchange rate (NER)?

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Portfolio balance channel & public savings

- Kumhof & Niewerburgh (2007) and Kumhof (2010) have made a theoretical framework through which public savings might be deduced as the key variable for the portfolio balance channel to be active
- Using a DSGE model they introduce a fiscal exogenous shock: an unexpected income cut

Portfolio balance channel & public savings

- Effects:
 - ✓ Nominal exchange rate's movements that revalue the government's nominal liabilities: Fiscally induced exchange rate volatility
- Medium term solution:
 - ✓ Tax reform
- Short term solution:
 - ✓ Debt issuance

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Portfolio balance channel & public savings

- Uncovered interest parity is broken: perfect substitutability between different currency assets no longer holds due to the currency risk portion of the risk premia:
 - ✓ The government passes the fiscal shock to the households who hold domestic currency debt due to the depreciation of the exchange rate: Households will demand higher nominal return to increase their holding of this type of assets
 - ✓ By Jensen's inequality higher exchange rate volatility makes expected real return increase (real value of nominal assets is convex in the exchange rate)

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Portfolio balance channel & public savings

- Uncovered interest rate parity is replaced by a monotonically increasing and concave relationship between the stock of domestic currency government debt and domestic interest rate:
- ✓ The higher the stock of nominal debt hold by households the smaller the exchange volatility needed to revalue the government budget (the higher the stock the higher the base for inflationary tax)
- ✓ The lower the exchange rate volatility the lower the expected real return

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Portfolio balance channel & public savings

- Sterilized intervention becomes a second independent monetary instrument beside the repo rate that affects the exchange rate
- Under these circumstances it should depreciate the exchange rate and reduce its volatility
- Sterilized intervention should be more effective in countries with small domestic currency government debt or larger public savings

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It is imperative to end up with an equation which explains the NER depreciation in terms of nominal and real variables

$$E_t[e_{t+1} - e_t] = i_t - i_t^* - rp_t \quad (1)$$

$$e_t = p_t - p_t^* \quad (2)$$

$$m_t - p_t = \alpha y_t - \beta i_t \quad (3)$$

$$y_t = C_t + I_t - S_t^P + NX_t + T_t \quad (4)$$

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It is imperative to end up with an equation which explains the NER depreciation in terms of nominal and real variables

$$e_t = \sum_{j=0}^{\infty} \frac{\gamma^j}{1 + \beta} E_t[(m_{t+j} - m_{t+j}^*) - \alpha (\ln(C_{t+j} + I_{t+j} - S_{t+j}^P + NX_{t+j} + T_t) - y_{t+j}^*) + \beta rp_{t+j}] \quad (5)$$

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It is imperative to end up with an equation which explains the NER depreciation in terms of nominal and real variables

- Equation (5) is derived with respect to S_{t+j}^P :

$$\frac{\partial e_t}{\partial S_{t+j}^P} = \sum_{j=0}^{\infty} \frac{\gamma^j}{1+\beta} E_t \left[(-\alpha) \left(\ln \frac{1}{(C_{t+j} + I_{t+j} - S_{t+j}^P + NX_{t+j} + T_t - y_{t+j}^*)} \right) * (-1) \right] > 0 \quad (6)$$

- The more public savings there is, the more depreciated the NER would be

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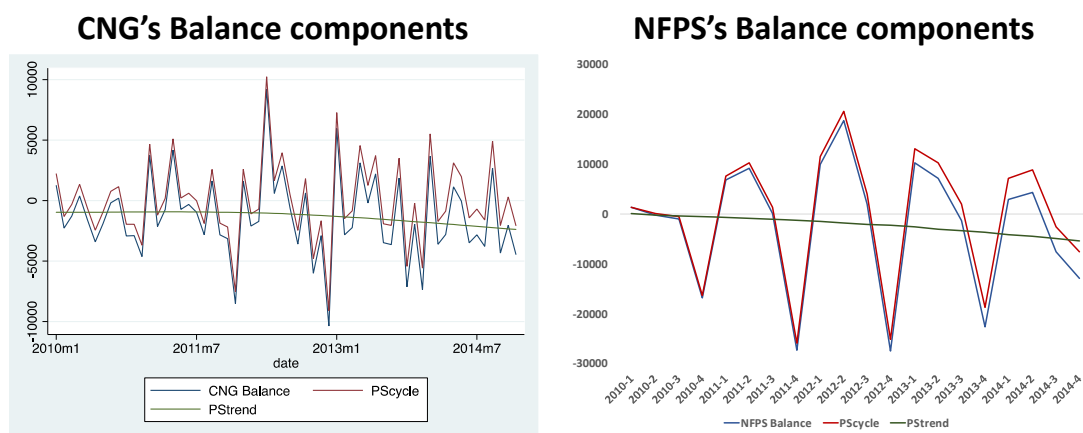
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What does the data say for Colombia? Are there public savings? How is a public saving period understood?

- Variable chosen : cycle of the Central National Government's (CNG) fiscal balance:
- Critics:
 - ✓ This variable does not capture the public savings of the government but its liquidity position
 - ✓ Debt issuance decisions are taken in lower frequency periods
- Counter-argument:
 - ✓ Debt issuance decision is taken by adding the month by month excess or lack of government's liquidity

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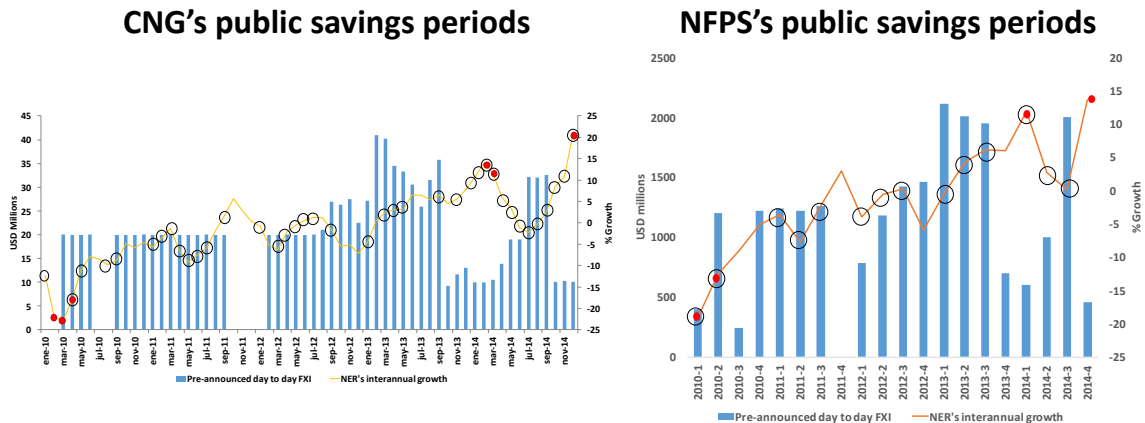
CNG/NFPS's Balance components: Trend & Cycle (HP filter)



Source: Author's Calculations based on MHCP.

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Public Saving periods, the NER's inter-annual growth and the Pre-announced day to day FX purchases: (2010-2014)



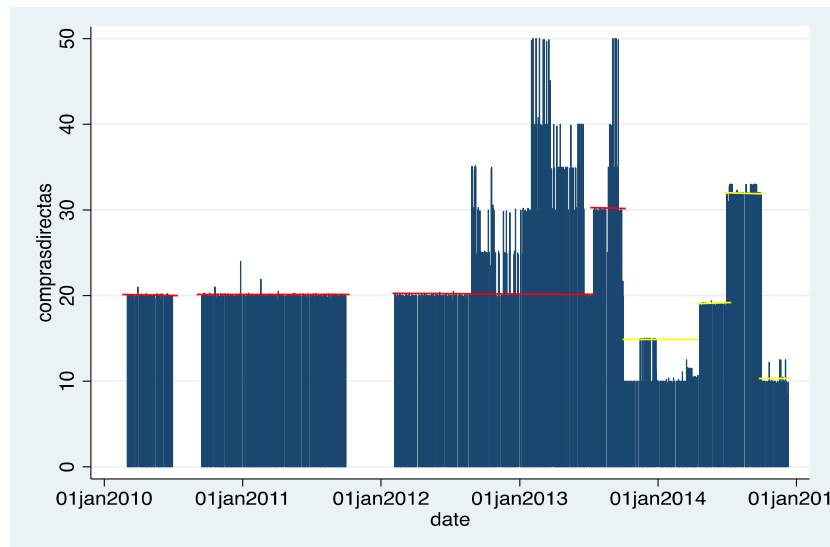
Source: Author's calculations based on Banco de la República and MHCP.

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Pre-announced day to day FXI



Source: Authors calculations based on Banco de la República

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Central Bank's reaction function for intervening in the FX market

$$\Delta I_t^{FX} = t_t + \beta_0 + \beta_1 \Delta I_t^{FX} + \beta_2 \Delta e_{t-30} + \beta_3 (e - \bar{e})_{t-30} + \beta_4 \pi_t +$$

$$\beta_5 \Delta R^{Int}_{t-30} + \beta_6 S_{t-30}^P + \beta_7 S_{t-30}^{2P} + \mu_t \quad (10)$$

- Where:

- ✓ ΔI_t^{FX} : the difference between the actual FX purchase and the limit
- ✓ t_t : year effects
- ✓ β_0 : constant
- ✓ ΔI_t^{FX} : the lagged difference between the actual FX purchase and the limit
- ✓ Δe_{t-30} : the NER inter-annual appreciation/depreciation
- ✓ $(e - \bar{e})_{t-30}$: the RER misalignments (Hodrick Prescott estimated cycle)
- ✓ π_t : the difference between inflation and the year's target
- ✓ S_{t-30}^P : central government fiscal balance's cycle (Hodrick Prescott estimated cycle)
- ✓ S_{t-30}^{2P} : squared public savings

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Results

- In general terms the Central Bank behaved as expected, it purchased FX when:
 - The NER was appreciating
 - The RER was appreciating in relation to its trend
 - When inflation was low
 - When IR were low
 - Public savings do not have an effect on the FX purchases' quantities

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NER's Econometric model: Mean equation

$$\Delta e^r_t = \beta_0 + \beta_1 \Delta e^r_{t-1} + \beta_2 \Delta m_t + \beta_3 \Delta m^*_t + \beta_4 S^P_t + \beta_5 [I_t - E([I_t | X_t])] + \beta_6 S^P_t [I_t - E([I_t | X_t])] + \beta_7 \Delta embi + u_t \quad (11)$$

- Where:
- ✓ Δe^r_t : NER return
- ✓ β_0 : long term return of the NER
- ✓ Δe^r_{t-1} : lagged NER return
- ✓ Δm_t : Colombian M1's growth
- ✓ Δm^*_t : US M1's growth
- ✓ S^P_t : central government fiscal balance's inter-annual difference expressed as GDP points
- ✓ $[I_t - E([I_t | X_t])]$: policy shock of preannounced day to day FXI
- ✓ $S^P_t [I_t - E([I_t | X_t])]$ interaction between public savings and the policy shock
- ✓ $\Delta embi$: Colombian embi's growth
- ✓ u_t : unexpected short term NER return

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NER's Econometric model: Variance equation

$$h_t = \alpha_0 + \alpha_1 u^2_{t-1} + \alpha_2 h_{t-1} + \alpha_3 \Delta m_t + \alpha_4 \Delta m^*_t + \alpha_5 S^P_t + \alpha_6 [I_t - E([I_t | X_t])] + \alpha_7 S^P_t [I_t - E([I_t | X_t])] + \alpha_8 \Delta embi \quad (12)$$

- Where:
- ✓ h_t : conditional variance of the NER return
- ✓ α_0 : long term conditional variance
- ✓ u^2_{t-1} is the unexpected squared return
- ✓ h_{t-1} is the lagged conditional variance of the NER return
- ✓ The rest of variables are defined as in (11)
- GARCH methodology
- Alternative specifications: i) different maturities of the NER return are estimated (day to day, week to week, month to month, trimester to trimester, semester to semester, year to year); ii) (11) and (12) are estimated with the different definitions of policy shock; iii) instead of using the central government fiscal balance, the total debt inter-annual difference as GDP points is used (a more financial definition of the public savings variable)

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Results

- There is evidence of:
 - ✓ Preannounced day to day FXI depreciating the NER the day, month, trimester, semester after: For every 10 million USD purchased by the Central Bank the NER's depreciates between 0.11% and 0.17%
 - ✓ An enhancement on the effectiveness of preannounced day to day FXI in reducing the NER volatility caused by public savings: For every 10 million USD purchased by the Central Bank and an increase of 0.5 GDP points in the CNG's balance the NER's variance is reduced between 0.02 and 0.1

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Conclusions

- The Central Bank purchases FX when: the NER appreciates, when the RER appreciates in relation to a long-term trend, when inflation is low, and when international reserves are low
- FXI depreciates the NER after a day, a month, a trimester and a semester from intervention
- FXI enhances its effectiveness on reducing the NER volatility because of public savings after a week, a month, a trimester and a semester

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Policy Recommendations

- It is imperative to get to the top level of coordination between the monetary and fiscal authorities of the country for enhancing the effectiveness of FXI
- This is relatively easy because of the organization of the Board of Directors of the Central Bank conceived by the Political Constitution
- The Government must continue in the fulfillment of the budgetary targets established by the fiscal rule
- This may help the alignment of the fiscal and monetary authorities incentives

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- ✓ Kumhof, M. & Nieuwerburgh, S. (2007). Monetary Policy in an Equilibrium Portfolio Balance Model. IMF Working Paper 07/72. International Monetary Fund.