Measuring the effects of FX intervention using intraday data: Evidence from Peru

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BIS CCA Research Network Project
Cartagena, Colombia

November 29-30, 2012
Structure

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3. Main features
4. FX market and the Central Bank
5. Data analysis
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Question

Do FX interventions have any effect on the level of the exchange rate?

Preliminary answer

Yes . . . and they have asymmetric effects on the level of the exchange rate.
**Figure:** Response of log of exchange rates to intervention (net purchases) using intraday data
Figure: Accumulated responses of five-minute changes in exchange rates
Figure: Response of log of exchange rates (daily data)
Motivation

- Central Bank of Peru is perceived to have low quantitative constraints to perform FX spot operations in either direction.
  - Net International reserves currently stand at 33% of GDP (USD 63.2 billions).
  - Net International position is around 23% of GDP (USD 44.8 billions).
  - Daily interbank FX turnover approx. USD 0.5 billions.

Then, what are the effects of interventions?

- Do interventions affect the level of the exchange rate?
- Volatility?
- Are these effects symmetric?
Main features of the paper

- Main question: Does FX intervention have any effect on the **level of the exchange rate**?

- Effectiveness of FX interventions (to reduce volatility)?

- Intraday data (first time for Peru).

- Identification of exogenous changes in intervention using a SVAR model:
  1. Intervention shocks are identified using long-run restrictions.
  2. The approach allows us to deal with the endogeneity problem that arises when fx interventions are discretionary.
FX market in Peru

- A local market primarily based on spot transactions (very small market of forwards and options).
- Spot transactions are traded primarily in a private electronic trading platform operated by the company DATATEC.
- Blind system: the bidders are known only to those involved in the transaction and after the transaction is closed.
- FX market operates between 9:00 am and 1:30 pm, Monday - Friday.
FX market in Peru

- The settlement of transactions is done on the same day through a real time gross settlement (RTGS) system in a payment vs payment platform (payments are made on each bank’s account held at the central bank).

- Participants are commercial banks and the Central Bank. Five banks are the major players (in terms of average amount traded).

- Currently, the average amount traded in the interbank spot FX market is around US700 million.

- The largest amount traded in one day was approximately US 1,700, almost 1 percent of GDP.
Central Bank interventions

- Objective: to reduce excessive interday volatility in the exchange rate.
  1. To avoid an negative balance-sheet effect that can be generated by drastic changes in the exchange rate.
  2. 43% of financial assets are dollarized.
  3. No exchange rate target: exchange rate is determined by fundamentals (cannot be altered permanently).

- Part of open market operations to regulate daily liquidity.
- FX operations (and open market operations) are decided everyday by a committee that meets roughly between 11:30 am and 1 pm.
Central Bank interventions

- The main FX intervention is through direct operations with commercial banks in the spot market at the prevailing exchange rate (swap transactions have been used very rarely).

- Interventions are sterilized to achieve the prevailing interest rate target (using Central Bank Securities (CDs-Central Bank Certificate of Deposits), and Treasury’s deposits at the Central Bank).

- FX operations are discretionary (do not respond to any pre-announced rule). They can be done any day and at any time while the fx market is in operation.
Central Bank interventions

- Blind system: the other participants do not know the Central Bank’s positions, and only after an operation has been closed they can identify it as the counterpart.

- However, the Central Bank announces when it starts to intervene, so that all participants become aware of it even if they do not perform transactions with the Central Bank.

- The amount of intervention is published when the market closes.
Data analysis

Sample includes: purchases and sales, intervention and non-intervention days, international crisis and recovery period.

Figure: Exchange rates and FX interventions: 2009-2010
Data analysis

**Table:** Size of Intervention Data. Sample period goes from January 5, 2009 to April 27, 2011

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011&lt;sup&gt;a/&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>Number of observations (5-min. intervals)</td>
<td>13209</td>
<td>13311</td>
<td>9894</td>
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<tr>
<td>Number of transactions</td>
<td>1933</td>
<td>5050</td>
<td>487</td>
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<tr>
<td>Number of transactions (5-min. intervals)</td>
<td>181</td>
<td>505</td>
<td>38</td>
</tr>
<tr>
<td>Number of purchases</td>
<td>89</td>
<td>504</td>
<td>23</td>
</tr>
<tr>
<td>Number of sales</td>
<td>91</td>
<td>0</td>
<td>14</td>
</tr>
</tbody>
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<sup>a/</sup> Intervention data up to 27 April
FX intervention is discretionary and is done around the closing time of the FX market:

**Figure**: Timing of interventions: intraday frequency distribution
Methodology: Structural VAR approach

\[
\begin{bmatrix}
  e_t \\
  P_t \\
  S_t
\end{bmatrix} = \sum_{i=0}^{\infty} \begin{bmatrix}
  \phi_{11}(i) & \phi_{12}(i) & \phi_{13}(i) \\
  \phi_{21}(i) & \phi_{22}(i) & \phi_{23}(i) \\
  \phi_{31}(i) & \phi_{32}(i) & \phi_{33}(i)
\end{bmatrix} \begin{bmatrix}
  \varepsilon_{F,t-i} \\
  \varepsilon_{P,t-i} \\
  \varepsilon_{S,t-i}
\end{bmatrix}
\]

(1)

where:

- \( E \) is the log interbank exchange rate, \( e_t \equiv E_t - E_{t-1} \) rate of growth of the exchange rate.

- \( P_t \) is the amount of dollars purchased by the Central Bank in the foreign exchange market.

- \( S_t \) the amount of dollars sold by the central bank.
Methodology: Structural VAR approach

- $\varepsilon^F_t$ exogenous changes in fundamentals.
- $\varepsilon^P_t$ and $\varepsilon^S_t$ exogenous decisions to purchase and sell dollars, respectively.
- $e_t$, $P_t$, and $S_t$ are stationary: disturbances have no permanent or long-run effects.
- Disturbances might have long-run effects on $E_t$ (unit root process).
- Controls: macroeconomic shocks (surprises) for both Peru and USA (interest rate shocks, GDP shocks, CPI shocks).
- Dummy variables: first observation of each day, each week, and each hour.
**Methodology: Identification strategy**

- Blanchard and Quah (1989): long-run restrictions (at least three).

1. \(\varepsilon_t^P\) and \(\varepsilon_t^S\) have no long-run effect on the log exchange rate:
   \[
   \sum_{i=0}^{\infty} \phi_{12}(i) = 0 \text{ and } \sum_{i=0}^{\infty} \phi_{13}(i) = 0.
   \]

2. A sale innovation \(\varepsilon_{t-i}^S\) will have no long-run effect over dollar purchases:
   \[
   \sum_{i=0}^{\infty} \phi_{23}(i) = 0.
   \]

3. By symmetry, a purchase innovation \(\varepsilon_{t-i}^P\) will have no long-run effect on dollar sales:
   \[
   \sum_{i=0}^{\infty} \phi_{32}(i) = 0.
   \]
Results: intraday data

Table: Long-run effects and overidentifying restrictions.

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<tbody>
<tr>
<td>$\sum_{i=1}^{\infty} \phi_{11}(i)$</td>
<td>0.05</td>
<td>-0.35</td>
<td>0.87</td>
<td>3.86</td>
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<td>$\sum_{i=1}^{\infty} \phi_{21}(i)$</td>
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<tr>
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<td>0.00</td>
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<tr>
<td>$\sum_{i=1}^{\infty} \phi_{31}(i)$</td>
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</tr>
<tr>
<td>$\sum_{i=1}^{\infty} \phi_{33}(i)$</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
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LR test for over-identification

| Chi-square(1) | 1.63 |
| Probability   | 0.20 |
Results: intraday data

Figure: Response of log of exchange rates to intervention (net purchases) using intraday data
Results: intraday data

Figure: Accumulated responses of five-minute changes in exchange rates
Results: daily data

Figure: Response of log of exchange rates (daily data)
FX interventions have an asymmetric effect on the level of the exchange rate.

Central Bank intervention has more impact reducing the interbank exchange rate as opposed to raising it.
Thank you very much

Grazie mille

Muchas gracias

Muito obrigado

Vielen Dank

Merci beaucoup