

Comments

Oscar Landerretche: Tapia and Tokman analyze an interesting scheme for monetary policymakers in the volatile environment of emerging economies. They argue empirically that Chile has been successful in implementing a system of announced exchange rate intervention periods and that the announcements have helped to diminish the volatility of the exchange rate more than the actual interventions. Although they do not theorize profoundly on why this is true, they implicitly find evidence of the preponderance of the information channel for sterilized interventions in the exchange market. A priori this scheme is interesting because it can provide a way for central banks in emerging market to clean up their floating regimes.

Two noteworthy characteristics of the Chilean intervention regimes are perhaps insufficiently emphasized by the authors. First, the intervention periods are transitory and exceptional in the midst of a clean floating exchange rate regime. The context of these events—what makes them so exceptional—is a Central Bank that is increasingly interested in encouraging agents to get used to covering themselves against exchange rate volatility in the market. These exceptional periods will help confirm, rather than refute, the credibility of the flexible exchange rate regime as long as they are only declared when there is a clear sensation that a run against the currency is possible, if not imminent. Second, the intervention periods are announced together with a maximum reserve commitment. This is designed to keep reserves well over the benchmark for a rational run against the Central Bank, hence avoiding the possibility of contributing to the run. This also helps signal that the bank is not involved in a de facto fixation of the exchange rate within a de jure float.

Tapia and Tokman seem to show that this scheme has been effective and cheap. In fact, the actual expenditure of reserves seems to have no effect on the exchange rate. I support the notion that it is an effective scheme, but it is not as cheap as it seems, nor widely applicable among emerging economies.

In practice, the main rationale for the system is what the authors refer to as the information channel. One of the most important characteristics of this channel is that it is assumed that the exchange rate can deviate significantly from its fundamental level. This is exactly the belief that prompted the Central Bank to declare these exceptional intervention periods: namely, the Asian crisis, the Argentine turmoil, and the Brazilian scare were events that could deviate the price of the peso from fundamentals. In my view, this is an assumption of the mechanism.

In this sense, Argentine and Brazilian sneezing toward Chile is completely different from the Asian crisis. The Asian crisis involved the appearance of news that actually revealed to everybody that the fundamentals had changed. For example, it could make a lot of sense to run away from Chile when international demand for commodities is about to collapse. The Argentine and Brazilian problems were different because most people who had no money at stake were already convinced that Chile was decoupled from its larger neighbors. At the same time, investors were somewhat uncertain about the possibility of a run against the peso. The information necessary for everybody to be convinced that a significant piece of the market was not going to run against the peso seems to have been absent. What the Central Bank of Chile did was to provide a contingent asset to holders of peso-denominated instruments. The Central Bank would stop the run with its reserves and provide the market all the reserves it required if it ever seemed as if the market were ready to run. This would give the investor time to adjust optimally when a fundamental depreciation was on the way (1998) or would stop the currency from misaligning itself in the face of a possible run (2001–03). This may explain the finding of an important effect of the announcement of the intervention regime, rather than the intervention itself.

This rationalization implies several conditions for the mechanism to be effective. First, the market has to agree with the Central Bank on the possibility of the run and the justification of declaring a special intervention period. Second, the Central Bank must have the reserves or the credit lines to actually be able to intervene when it has to. Third, the Central Bank must have some source of credibility that it will use reserves to intervene as the market expects, once it has announced an intervention regime.

With regard to the first condition, quick devaluations can generate sharp deteriorations in the balance sheets of companies that intermediate credit from abroad. Moreover, such companies with direct access to international

markets are usually of significant size or strategic importance in the economy (for example, utilities). Since speculative attacks that lead to devaluations are both inflationary and recessive, central bankers prefer to prevent them if they can. However, central bankers in emerging economies often have overappreciating tendencies. Overappreciating a currency has historically been a good way of achieving quick reductions in inflation together with a credit or real estate boom. The bust and devaluation that come with the end of reserves tend to be heavily discounted. The fear, if any, is that central bankers will try to overappreciate the currency. This is why the special periods scheme is actually good for floating. It allows the Central Bank to intervene when everyone wants it to, without allowing for the overappreciating mischief that is possible in a dirty float. A crucial aspect of the scheme as implemented in Chile is that it sets a limit to the expenditure of reserves. The risk involved is that the central bank will gamble its credibility every time it declares one of these special periods, since it will basically be interpreting the fears of the market. This will probably be easier in a country where the central bank has a reputation for not messing around with the exchange rate too much.

The second condition is reserve adequacy. In many ways the Central Bank of Chile is an unusually solvent bank for an emerging economy. De Beaufort Wijnholds and Kapteyn show that Chile had a relatively high reserve adequacy in 1999 when measured against short-term debt rather than GDP or months of imports.¹ Chile currently has more international reserves than Argentina, though its economy is about 60 percent the size (in dollars) of Argentina's, and it has 30 percent the reserves of Brazil, with an economy that is 15 percent the size. Moreover, given its long history of fiscal responsibility, Chile has an excellent relationship with the International Monetary Fund (IMF), the Inter-American Development Bank (IDB), and the World Bank. This essentially means that the Central Bank has even more contingent reserves from which to draw if it ever wants to walk the walk.

Finally, there is a strange trade-off in this mechanism between precaution and credibility. If we believe in Tapia and Tokman's results, the Central Bank could potentially announce special periods every time it seemed necessary, never spend a cent of reserves, and stem all speculative attacks. Eventually, however, the market will need some proof that these inten-

1. De Beaufort Wijnholds and Kapteyn (2002).

tions are actually backed by money. The Central Bank must therefore be careful to declare special periods only when the intervention is necessary and when it is likely that it will have to intervene a bit. The fading effects of the 2002–03 episode seem to show that announcing the willingness to intervene when it is unlikely to actually happen carries a credibility cost. Hence, the mechanism may not be applicable to any other emerging economy. The same factors that make Chile a relatively attractive emerging market allow the Central Bank to keep the exchange rate from deviating violently from fundamentals by declaring that it will use its solvency and credibility if it sees that this is necessary. Insolvent central banks that have a history of exchange rate tampering or that lack independence are unlikely to be able to implement this sort of scheme successfully.

In a small, open economy like Chile, shocks will come and go. The best policy in the medium term is to develop the institutions that best insulate the country against contagion, rather than to rely on reserves and interventions. The need to defend the currency will appear time and again. These special intervention periods seem to represent a pragmatic floating of the currency that is much more clearly defined than the traditional dirty interventions.

Tapia and Tokman's evidence is encouraging, but it is very early for an evaluation. It is necessary to see how a scheme of this sort works in another country or in a different moment before coming to any conclusions. The 1998–99 episode is not clearly comparable with the other two, and the 2002–03 episode may not have been necessary. Moreover, the Central Bank of Chile was very creative and innovative in the 1990s with regard to exchange rate mechanisms and rules. Hence, it is not entirely clear that the market had internalized the rules in the first and second intervention episodes. The market may have been expecting the exchange rate bands to come back at some moment and may have interpreted these announcements as a movement in that direction. It will be interesting to see the application and performance of this scheme the next time that the ghouls of contagion come screaming over the Andes.

Roberto Rigobón: The problem of estimating how effective a central bank is in affecting the exchange rate is perhaps one of the most debated questions in international economics—and for very good reasons. Markets believe that central banks have the power to affect the exchange rate; this is easily reflected in the tremendous attention that markets devote to

central bank announcements regarding the nominal or the real exchange rate. Central banks intervene frequently and sometimes make announcements regarding what they believe should be the exchange rate—and unless they are in the business of just adding noise to the market, this behavior reflects the fact that they also believe that they can affect the exchange rate. This supposedly strong power of the central bank is hard to find, however, based on either the data or what theory predicts.

Indeed, OLS estimates of the impact of interventions on exchange rates are usually biased owing to the problem of simultaneous equations. The central hypothesis is that intervention affects the exchange rate, but the decision to intervene is not independent of the movements in the exchange rate. Moreover, even once a central bank has decided to intervene, the quantity of currency it buys or sells and its timing will typically depend on the response of the exchange rate to its trades. The literature generally deals with the simultaneous equations problem by assuming that the contemporaneous decision of the central bank is independent of the current innovations to the exchange rate. This is a strong assumption at daily frequencies. For example, it implies that the central bank does not change its selling or buying behavior by assessing the impact its actions have had on the exchange rate.

Matías and Andrea's paper contributes to this discussion by estimating the impact of the Central Bank's intention to intervene. Although they estimate the contemporaneous impact of interventions on the exchange rate, their most important contribution is that the Central Bank's announcements signaling its willingness to intervene in a certain direction were very effective in moving the exchange rate in the Chilean experience. In this discussion, I concentrate on the tremendous endogeneity problem that exists in the data, even when the coefficients are estimated using ten-minute data. This should indicate how important their contribution is.

The Endogeneity Problem and the OLS Bounds

I propose the following simple model of central bank intervention:

$$(1) \quad \begin{aligned} e_t &= \alpha i_t + \varepsilon_t \text{ and} \\ i_t &= \beta e_t + \eta_t, \end{aligned}$$

where e_t is the nominal exchange rate change and i_t is the intervention by the central bank. The first equation indicates how intervention affects the nominal exchange rate, and the second equation summarizes the central bank's intervention decision. Under the interpretation that the central bank leans against the wind, I would expect the first coefficient (α) to be negative and the second one (β) to be positive.

This model abstracts from other important issues in the intervention problem, such as the nonlinearities of the intervention (Central Banks do not intervene most of the time, but rather only when deviations are perceived to be large enough) and common shocks (clearly, factors that are not related to either exchange rate innovations or intervention decisions move both exchange rates and interventions). The purpose of this discussion, however, is to concentrate on the endogeneity problem, and this setup illustrates the problem.¹

The severity of the endogeneity problem can be assessed by what is called reversed regressions, or the OLS bounds. In this simple setup, this method determines the bounds where the true coefficient lies. It was proposed by Leontief and recovered by Leamer and Edwards.²

The general problem of simultaneous equations can be summarized by the simple relationship

$$e_t = a i_t + v_t,$$

where the right-hand-side variable, i_t , is correlated with the residual v_t . This is exactly the first equation in the system of equations, but here I would like to discuss when this correlation arises from multiple sources, not just from reverse causality.

The variable a cannot be estimated consistently in the presence of these misspecifications. Indeed, there are two forms of estimating a :

$$(2a) \quad e_t = a i_t + v_t \text{ and}$$

$$(2b) \quad \begin{aligned} i_t &= \frac{1}{a} e_t + \bar{v}_t \\ &= b e_t + \bar{v}_t. \end{aligned}$$

1. For a detailed discussion of the estimation problem, see Kearns and Rigobon (2003).

2. Leontief (1929); Leamer (1981); Edwards (1992).

Both regressions are equally wrong! Leontief studied this problem and realized that depending on the sources of the misspecification, the OLS estimates in these regressions provide bounds for the true coefficient. In particular, assume that the true model is given by equation 1. The OLS estimate in equation 2a is then

$$\hat{a}_{2a} = (i_t' i_t)^{-1} i_t' e_t = \alpha + \beta(1 - \alpha\beta) \frac{\sigma_\varepsilon^2}{\sigma_\eta^2 + \beta^2 \sigma_\varepsilon^2},$$

while the estimate of $1/a$ in equation 2b is

$$\begin{aligned} \hat{b}_{2b} &= (e_t' e_t)^{-1} e_t' i_t = \beta + \alpha(1 - \alpha\beta) \frac{\sigma_\eta^2}{\alpha^2 \sigma_\eta^2 + \sigma_\varepsilon^2} \\ &= \frac{1}{\alpha} - \frac{1}{\alpha} (1 - \alpha\beta) \frac{\sigma_\varepsilon^2}{\alpha^2 \sigma_\eta^2 + \sigma_\varepsilon^2}. \end{aligned}$$

If one is interested in a , one can solve \hat{b}_{2b} for $1/\alpha$ instead of b . In fact, both estimates, \hat{a}_{2a} and \hat{b}_{2b} , can be used to compute the range in which the true coefficient a must lie if the model is correct. To illustrate the range, consider the case in which a and b have different signs.³ If a and b have different signs, the bias in equation 2a makes the OLS coefficient smaller (in absolute value) than the true one. In other words,

$$|\hat{a}_{2a}| < |\alpha|.$$

Similarly, the bias is also toward zero in equation 2b. I can thus write

$$|\hat{b}_{2b}| < \left| \frac{1}{\alpha} \right|.$$

Therefore,

$$|\hat{a}_{2a}| < |\alpha| < \left| \frac{1}{\hat{b}_{2b}} \right|.$$

In other words, if the two schedules have different signs, then the true coefficient lies between the two estimates; this is exactly why this method

3. See Lee, Ricci, and Rigobon (2003) for a general discussion of the bounds for all the cases.

determines the bounds. If the problem of simultaneous equations is small, the two bounds should be close.

DAILY DATA. The next step, therefore, is to compute the bounds for the daily and intraday data.⁴ Using daily data the bounds are as follows (after some normalization): for equation 2a, the point estimate of a is 0.11, with a standard deviation of 0.05; for equation 2b, the inverse of the point estimate is 34.74, with a standard deviation (using the Delta method) of 16.85. A test of whether the point estimates are statistically different yields a result of 2.05, rejecting the hypothesis that the estimates are statistically different. Although this is important, it is not the crucial dimension I would like to highlight.

Based on these derivations, I concluded that the true coefficient lies between these two estimates—which is a very large confidence interval. The assumption that the estimate in the first column is correct raises an inference problem: while it would be tempting to say that the estimate is 0.11 and that it is between 0.01 and 0.21, this process is incorrect. This is not the estimate of the intervention's effectiveness, but the estimate of the lower bound of the estimate—and even though the lower bound is precisely estimated, the true coefficient is between 0.11 and 34.74. What is even worse is the fact that the estimates are positive instead of negative! This suggests that when the central bank intervenes, the exchange rate moves in the wrong direction.

INTRADAY DATA. Several papers in the literature concentrate on extremely high frequency data as a means of solving the endogeneity problem. The argument is that looking at the data every ten minutes should dramatically reduce the simultaneous equations issue.

Table 7 presents estimates of the bounds for each of the fourteen days in the sample. Most of the estimates are negative, suggesting that the endogeneity problem is not as severe as it is in the daily data. The bounds are still extremely large in relative terms, however: the upper bounds are consistently a hundred times the lower bounds. While there are fewer rejections in this case—the upper and lower bounds are statistically different in only four of the fourteen days—the distance between the lower and upper bounds indicates that the endogeneity problem is still important, even when the data are collected every ten to twenty minutes. This exercise

4. I thank Andrea and Matías for providing me with the regression results. The data are confidential, and hence I appreciate their efforts.

TABLE 7. Estimates of the Bound Based on Intraday Data

| Day | Equation 2a | | Equation 2b | | t statistic |
|-----|----------------|--------------------|----------------|--------------------|-------------|
| | Point estimate | Standard deviation | Point estimate | Standard deviation | |
| 1 | -1.50 | 0.49 | -284.94 | 251.81 | 1.13 |
| 2 | -2.41 | 0.70 | -30.73 | 13.11 | 2.16 |
| 3 | -1.98 | 0.85 | -12.70 | 8.83 | 1.21 |
| 4 | -0.64 | 0.52 | -55.61 | 50.33 | 1.09 |
| 5 | -1.72 | 0.57 | -17.29 | 4.74 | 3.26 |
| 6 | -5.02 | 0.68 | -13.63 | 7.57 | 1.13 |
| 7 | -0.81 | 0.27 | -12.06 | 5.29 | 2.12 |
| 8 | -0.50 | 0.40 | -13.06 | 11.22 | 1.12 |
| 9 | -0.24 | 0.10 | -8.97 | 3.50 | 2.49 |
| 10 | -0.22 | 0.14 | -3.65 | 3.13 | 1.09 |
| 11 | -0.26 | 0.00 | -4.77 | 4.62 | 0.98 |
| 12 | -0.48 | 0.10 | -8.79 | 6.35 | 1.31 |
| 13 | 0.28 | 0.00 | 42.11 | 43.66 | 0.96 |
| 14 | -0.04 | 0.07 | -24.47 | 44.90 | 0.54 |

shows that the problem of estimating the effectiveness of central bank interventions cannot be solved by concentrating on extremely high frequency data alone; the solution is somewhere else.

The problem of estimating whether interventions are effective is one of the most challenging problems in empirical open economy macroeconomics. In my paper with Jonathan Kearns, we devise a procedure that is able to solve the problem, but its applicability is quite limited and, in particular, it cannot be used in the Chilean case.⁵

Since the estimation issue cannot be solved by looking at extremely high frequencies, what can be done? Andrea and Matías offer a different perspective. Instead of concentrating on the problem of directly estimating the impact of interventions on the exchange rates, they looked at a possibly less endogenous variable—namely, the Central Bank's decision and announcement of its intention to intervene. Future research should continue to study this issue, and creative avenues such as the one proposed by Andrea and Matías are likely to be prolific.

5. Kearns and Rigobon (2003).

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