



Capital controls on inflows, exchange rate volatility and external vulnerability

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ABSTRACT

We use high frequency data and a new econometric approach to evaluate the effectiveness of controls on capital inflows. We focus on Chile's experience during the 1990s, and investigate whether controls on capital inflows reduced Chile's vulnerability to external shocks. We recognize that changes in the controls will affect the way in which different macro variables relate to each other. In particular, we consider the case where controls co-exist with an exchange rate band aimed at managing the nominal exchange rate. We develop a methodology to deal explicitly with the interaction between these two policies. The main findings may be summarized as follows: (a) a tightening of capital controls on inflows depreciates the exchange rate and (b), we find that a tightening of capital controls increases the unconditional volatility of the exchange rate, but makes it less sensitive to external shocks.

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1. Introduction

During the last few years the economics profession has made important progress in understanding the determinants of currency crises. This research has helped reshape the way in which monetary and fiscal policies are conducted in emerging and transition nations. Scholars and policy makers, however, continue to disagree on some important aspects of macroeconomic policy. One of the key topics of debate refers to the role of capital controls and the adequate degree of financial integration of emerging markets to the rest of the world.¹ According to some authors, limiting the extent of financial integration reduces speculation, and helps countries withstand external shocks and avoid extreme exchange rate fluctuations (Bhagwati, 1998; Krugman, 1999; Stiglitz, 2000, 2002; Rodrik, 2006).² Authors that support restricting capital mobility have mentioned Chile's experience with market-based controls on capital inflows between 1991 and 1998 as an example worthwhile emulating.³ In late 2006 Thailand's economic authorities justified the imposition of controls on short term capital inflows, by

referring to Chile's experience during the 1990s.⁴ In 2007, Colombia imposed short term capital inflows in an effort to reduce the extent of (nominal) exchange rate appreciation; in rationalizing this policy the authorities also referred to Chile's experience with controls on inflows.⁵

Authors such as Stiglitz (2002), Eichengreen (2000), Eichengreen and Hausmann (1999), Stallings (2007) and Williamson (2003) have argued that Chile-style controls on inflows have three important effects: (a) they reduce the degree of vulnerability to external shocks; (b) they result in lower exchange rate volatility; and (c) they help avoid the extent of currency appreciation during episodes of capital inflows. According to these authors, controlling short term inflows were one of the keys to Chile's economic success during the 1990s.

Calvo and Mendoza (1999), however, have argued that Chile's success during the 1990s was mostly the result of favorable external conditions, including very positive terms of trade. In their view, macroeconomic policies – including the controls on inflows – had little to do with “the notable accomplishments of the Chilean economy.”⁶ The empirical literature on Chile's controls has tended to support Calvo and Mendoza (1999); most works on the subject have found that Chile's controls had limited macroeconomic effects. De Gregorio et al. (2000), for example,

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¹ See, for example, the papers collected in Edwards (2007).

² The IMF seems to support a very gradual lifting of restrictions to capital mobility in emerging economies. See, for example Prasad et al. (2003).

³ For a detailed discussion of Chile's experience with capital controls on inflows see Cowan and De Gregorio (2007).

⁴ On Thailand's 2006 imposition of controls on inflows, see <http://www.imf.org/external/np/sec/pn/2007/pn0739.htm>.

⁵ On Colombia's 2007 controls on inflows, see, <http://www.rgemonitor.com/blog/economonitor/196421>.

⁶ In a different paper Calvo and Mendoza (2000) point out that capital controls on inflows may be justified if the costs of contagion are high. See also Edwards (2007).

found that during the 1990s controls on inflows altered the composition of capital flows, with short term flows declining and longer term flows increasing. Controls, however, failed to stop currency appreciation or to increase the Central Bank's ability to control monetary aggregates over the medium or long run. Similar results were found by Edwards (1999) and Valdes-Prieto and Soto (1998). Forbes (2003, 2005) uses firm-level data to investigate whether Chile's controls had microeconomics effects. Her results indicate that by restricting access to external funding, the controls increased the cost of capital to small and mid size firms (see, also, Ulan, 2000).

Although the results reported by these early papers are useful, they are subject to some limitations and potential econometric problems. In particular, these works have ignored the fact that controls on capital inflows were only one component of Chile's external macroeconomic policy, and of the authorities' efforts to avoid "excessive" nominal exchange rate fluctuations and, in particular, currency appreciation. A second key element of this policy was a band of varying width that constrained the movement of the nominal exchange rate. Ignoring this exchange rate band can introduce an important bias in the estimation of equations that attempt to assess the effects of the controls on key macroeconomic data, such as the exchange rate (nominal or real). The reason for this is that the controls themselves affected the width and realignment of the band, and the existence of the band affected the behavior of macroeconomic variables such as interest rates and the exchange rate.

The purpose of this paper is to develop a new methodology that allows us to evaluate the effects of capital controls on inflows in countries that intervene in the foreign exchange market. In particular, this new approach allows us to investigate whether restricting capital inflows will reduce nominal exchange rate changes and volatility. We do this by using a two-step estimation technique that incorporates the concept of shadow or equilibrium exchange rate developed by Bertola and Caballero (1992). In the first step, we use data on exchange rate fundamentals and on the nature of the foreign exchange rate intervention policy (or, if appropriate, the exchange rate band) to estimate the shadow exchange rate.⁷ In the second step, we use an augmented GARCH approach to evaluate whether changes in the restrictiveness of capital controls affected the level and volatility of the nominal exchange rate. In the empirical section we use high frequency daily data for Chile for 1991–1998; in some of the estimates, and in order to investigate the robustness of our estimates, we use monthly data.

The methodology and results presented in this paper go beyond the historical interpretation of Chile's economic performance, and are useful to evaluate future initiatives aimed at restricting capital mobility in countries that pursue an active exchange rate management policy. This exchange rate intervention policy may take place through an explicit band, as in Chile, or through implicit feedback rules that rely on more implicit intervention thresholds. As pointed out above, both Thailand and Colombia recently imposed controls on inflows as a way to avoid nominal exchange rate appreciation.

Our analysis differs from previous work on the subject in, at least, four respects: First, we use high frequency (daily) data to analyze the effects of controls on capital inflows on the nominal exchange rate. Previous work, in contrast, has used relatively low frequency data (monthly or quarterly) to analyze real exchange rate behavior. Second, we explicitly take into account the fact that an active exchange rate policy affects the evaluation of capital controls. All previous papers on the subject that we are aware of ignored this important fact. Indeed, one of the key objectives of introducing capital controls is to allow the monetary authority to exercise some control over exchange rates. As we explain in detail in Section 3, we do this by estimating a shadow exchange rate, which captures the response of the exchange rate to changes in fundamentals in the absence of the exchange rate band.

⁷ See Kearns and Rigobon (2005) for a discussion on identification and estimation of central bank exchange rate intervention rules.

Third, we focus on the effects of the controls on the level and volatility of the nominal exchange rate. In contrast, most previous research deals with the impact of controls on the level of the exchange rate only. And fourth, we use a two-step augmented ARCH and GARCH, while most previous analyses have relied on VARs and/or standard regressions.

It is also important to clarify at the outset what our paper doesn't do: we don't provide a complete cost–benefit analysis of Chilean style capital controls. In particular, we don't deal with the potential efficiency (and other) costs of restricting capital mobility. Also, this paper doesn't deal with the effects of capital controls on the probability of a currency crisis, or their effects on interest rates and foreign debt maturities. These are important issues, but they are beyond the scope of the present paper.⁸

The main findings from our analysis may be summarized as follows. First, a tightening of capital controls results in a depreciation of the domestic currency. This level effect on the nominal exchange rate should have been expected, given that tighter capital controls reduce capital inflows, and cause a deterioration in the balance of payments.⁹ To return to equilibrium, then, an improvement in the current account is required, and hence a real exchange rate depreciation should take place; this real exchange rate change takes mostly place through changes in the nominal exchange rate. Surprisingly, most of the papers that have studied the Chilean experience have not found significant effects of the controls on the real exchange rate.¹⁰ We believe that this is because early studies on the subject ignored the endogenous response of the exchange rate to monetary policy. Second, we find that the "vulnerability" of the nominal exchange rate to external factors decreases with a tightening of the capital controls. More specifically, we find that Chile's controls on capital inflows were effective in (partially) isolating the nominal exchange rate from external shocks to import and export prices and international interest rates. Third, we find that a tightening of capital controls increases the unconditional volatility of the exchange rate. This effect can be explained by the fact that tighter controls are likely to have segmented the Chilean foreign exchange market further. On the other hand, isolating the foreign exchange market contemporaneously means that, in the end, exchange rate volatility is larger in the following periods. Capital controls introduce a tradeoff stabilizing contemporaneous exchange rates (in terms of external shocks), but destabilizing future nominal rates.

The rest of the paper is organized as follows: In Section 2 we discuss the functioning of Chile's controls on inflows, and we review the empirical literature on the subject. Section 3 is the core of the paper: we present our model, and we discuss a two-stage strategy for estimating the effects of controls on inflows on the level and volatility of the exchange rate. In this Section we compare the results obtained using a shadow exchange rate and the observed exchange rate. Additionally, we present some robustness tests and we discuss issues for future research. Finally, Section 4 is the conclusions.

2. Controls on capital inflows: Chile's experience during the 1990s

2.1. The mechanisms for controlling capital inflows into Chile

Chile introduced market-based controls on capital inflows in June 1991.¹¹ Originally all portfolio inflows were subject to a 20% reserve

⁸ For an analysis of (some of) the costs of Chile's experience with controls on inflows, see Forbes (2003, 2005). Edwards (2007) addresses the effects of controls on the probability of a crisis; De Gregorio et al. (2000) analyze the effects on interest rates and debt maturity.

⁹ Most emerging markets that have undertaken modernizing reforms have been subject to massive capital inflows that have generated forces toward currency appreciation. See, for example, Calvo et al. (1993).

¹⁰ See, for example, De Gregorio et al. (2000).

¹¹ For a detailed discussion on the administrative details of Chile's controls on inflows, see Ulan (2000), and Cowan and De Gregorio (2007). Chile also implemented controls on inflows during the 1980s. That earlier episode is discussed in Edwards (1998).

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