Capital Controls in Chile: Effective? Efficient? †

Francisco Gallego*

Leonardo Hernández♣

Klaus Schmidt-Hebbel*

Abstract

New empirical evidence with regards to the effectiveness and efficiency of Chile's capital controls, based on more and better data on the range of controls, and a broad assessment of their costs and benefits, is provided here. The paper concludes that capital controls have been partially effective by raising the wedge between domestic and foreign interest rates, marginally reducing aggregate net capital inflows, and changing the debt composition toward longer maturities, without significantly altering the real exchange rate. Part of these effects is temporary as the effectiveness of controls is eroded over time for a given interest rates differential. Controls may have proven to be important at the time of the 1997-98 international financial turmoil by contributing to Chile's lower exposure to short-term foreign liabilities. However, achieving temporary macroeconomic benefits by relying on capital controls involves incurring in financial and growth effects that raise concerns about their efficiency.

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Authors' email: fgallego@condor.bcentral.cl; lhernandez3@imf.org; kschmidt@condor.bcentral.cl

* Research Department, Central Bank of Chile

♣ International Monetary Fund

1. Introduction

Controls on international capital flows have no place in a world without policy distortions and market failures. However, even in the presence of policy distortions and market failures, it is difficult to argue for imposing second-best measures such as capital controls. Here the conventional argument applies that a better alternative to capital controls is to address directly the distortions that render capital flows ‘excessive’. These distortions comprise inadequate regulation and supervision of the financial and corporate sectors, policy-induced moral hazard created, for instance, by the provision of foreign-exchange insurance. However, one may argue that international distortions affecting the supply of capital –ranging from the existence of contagion and bandwagon effects in private markets, to moral hazard problems derived from the existence of international rescuers of last resort– are not removable by recipient countries. Therefore, the argument follows, international distortions in the supply of capital should be offset by imposing domestic capital controls aimed at limiting excessive capital inflows in good times, hence reducing the likelihood of a solo or a twin crisis in bad times.

Chile’s long experience with capital controls—of both the administrative and the quantitative sort—has caught the interest of both policy makers and academics in a world of highly volatile capital flows, especially since Mexico’s crisis in 1994-95. An increasing number of recent studies has provided an empirical evaluation of the macroeconomic effects of Chile’s quantitative restriction on capital inflows—the unremunerated reserve requirement imposed by the Central Bank of Chile on selective (mostly short-term or financial) capital inflows during 1991-1998. This paper extends this literature in two directions: first, it provides an alternative measure of the financial cost of the reserve requirement, one that differs significantly in both magnitude and effects from conventional measures used in previous research; second, it broadens the study of capital controls to include other administrative controls on capital flows and their effects.

Section 2 provides a brief review of existing empirical studies on Chile. Subsequently, both quantitative and administrative controls on capital flows in Chile are described and measured.. Regression results for the macroeconomic and financial effects of all categories of capital controls are reported for monthly data covering the 1989-1998 decade in section 4. The paper concludes with a brief summary of benefits and costs of Chile's capital controls presented in section 5.

2. Previous Findings and Remaining Questions

The experience of Chile since controls to capital inflows were imposed in the early 1990s, in the form of an unremunerated reserve requirement –URR–, has been studied in a number of papers. This section sets the stage by summarizing this literature and its main findings, and listing some of the questions that have not been answered and, therefore, should be addressed. A more detailed review is provided in Gallego, Hernández, and Schmidt Hebbel (1999).

Starting with the study by Soto and Valdés (1996), the growing literature on the Chilean experience with capital controls during the 1990s has addressed three questions: (i) Has the URR increased the effectiveness of monetary policy, in an environment where the exchange rate is semi-fixed (i.e. where it fluctuates within a narrow band)?. (ii) Has the URR allowed for a more depreciated real exchange rate?. And (iii) Has the URR induced inflows of longer maturity?. These questions arise directly from the reasons argued by the authority to impose and maintain the URR in place from 1991 through September 1998[1].

Using quarterly data for 1987-96 and a single equation model (SEM), Soto and Valdés (1996) and Valdés and Soto (1998) conclude that the imposition of the URR did not alter the appreciating trend observed in the real exchange rate during the 1990s. However, these authors conclude that the URR changed the composition of inflows, reducing the share of taxed flows in total short-term credit. Using a similar approach but monthly data for 1991-96, Eyzaguirre and Schmidt-Hebbel (1997) reach a similar conclusion regarding the composition of inflows. Also, they find that the URR increases the effectiveness of monetary policy and depreciates the real exchange rate, albeit on a temporary basis. However, their findings show that the latter two effects are rather weak and not robust.

Conversely, using quarterly data for 1985-94 and a SEM, Laurens and Cardoso (1998) conclude that the URR had no effect on the composition of inflows, and that the

[1] The URR was not abolished, but its rate was dropped to zero in September 1998. Thus, the authority kept the option to use the instrument in the future.

URR did affect neither the real exchange rate nor the interest rate differential. However, the way this model is estimated and the sample used cast some doubts about these conclusions[2].

The main weaknesses of the preceding studies is that the estimations do not control for changes in other capital account regulations, i.e. the liberalization of capital outflows and inflows, and for changes in the URR other than the tax rate (coverage and presence of loopholes)[3]. The recent paper by De Gregorio et al. (1999) addresses the latter limitation by including a new variable aimed at measuring the presence of loopholes (the power of the URR). Using a SEM and quarterly data for 1987-96, they conclude that the URR gave the monetary authority additional room to maneuver and changed the composition of inflows toward long-term flows. However, like previous studies, they do not find any significant effect on the real exchange rate and on total inflows.

The latter result regarding the RER presents a puzzle, since the higher level of the domestic interest rates should lead to lower domestic spending and hence to a more depreciated real exchange rate. The reason that this effect has not been found in the empirical papers based on SEMs is most likely due to mispecification problems. This is corroborated by the results reported in studies that use VARs, Soto (1997) and De Gregorio, Edwards and Valdés (1999). Indeed, using monthly data for 1991-96 and 1991-98, respectively, these authors find that a shock on the URR causes a transitory real depreciation. Furthermore, Soto (1997) finds that increases in the URR leads to a reduction in the volatility of the RER. These papers also confirm the previous findings regarding the level of domestic interest rates and the composition of inflows.

In sum, there is robust evidence showing that the URR has led to higher domestic interest rates—with respect to the international interest rates—and a composition of inflows biased towards longer maturities. However, the effect of the URR on the real exchange rate—or its path—has proved to be more difficult to uncover, most likely due to the difficulties in finding the correct model that relates these two (and other) variables.

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[2] The capital control index used in this regression is positively correlated with the dependent variable (inflows) by construction, biasing its estimated coefficient upwards.

[3] For a critical review of the empirical literature see Nadal-De Simone and Sorsa (1999).

3. Capital Controls in Chile during the 1990s

Trends of Capital Controls worldwide and in Chile

Chile has a long history with controls on capital account transactions that started in the 1930s and continued through the mid-1970s. Controls were gradually liberalized in the late 1970s and early 1980s, but were tightened again in the aftermath of the debt crisis of the 1980s.

The resumption of voluntary capital flows to emerging markets coincided in time with new capital inflows starting coming to Chile in 1988. After a growing tide of inflows during 1988-1990, the CBCh imposed new quantitative restrictions in the form of an unremunerated reserve requirement on selective inflows in 1991 (that lasted through September 1998), and began liberalizing old administrative controls on outflows. At the same time, however, other quantitative and administrative controls on capital inflows were also lessened. In this section we summarize the specific restrictions based on the detailed analysis presented in Gallego, Hernández, and Schmidt-Hebbel (1999). We rely heavily on the methodology developed in that paper to quantify the different capital controls in Chile.

The unremunerated reserve requirement (URR) on selective capital inflows

The URR is a requirement to hold an unremunerated fixed-term (mostly 1-year) reserve at the Central Bank, equivalent to a fraction of capital inflows of selective categories. Hence the URR is equivalent to a tax per unit of time that declines with the permanence or maturity of the affected capital inflows. The quantitative nature of this restriction, i.e. its tax equivalence, is made explicit by its alternative form: foreign investors are alternatively entitled to pay an up-front fee determined by the product of the relevant foreign interest rate (i*) and the fraction of capital subject to the restriction.

Various features of the URR were altered during the June 1991–September 1998 period of its existence at non-zero rates. In particular, the CBCh introduced changes in the rate or fraction of deposit, the coverage of capital inflow categories, the foreign currency denomination for the reserve deposit and fee payment, the holding period, the restrictions to rollover maturing investments, and other administrative requirements related to the URR.

A simple equation that reflects the cost of the URR (urr) is the following:

(3.1) $$urr = \frac{t}{(1-t)} \quad \frac{h}{k} \quad i^*$$

where t is the fraction of deposit of the capital inflow at the CB; h is the required holding period; k is the average maturity of the foreign investment for which the urr is calculated (equal to 6 months in the empirical application); and i^* is the equivalent foreign interest cost for a k-month operation[4].

Similar measures to the urr defined above have been used in previous empirical studies. They can be termed "naive" in the sense that they do not reflect the option value of reinvesting or rolling over the capital after maturity (this option existed only up to 1996) as calculated by Herrera and Valdés (1998).

The resulting time series for urr (Fig. 3.1) reflects both changes introduced by the CBCh (affecting t, h/k, and the applicable i^*), and changing market conditions (affecting i^*). Starting with a tax rate of 20% in June 1991, t was raised to 30% in 1992 and maintained throughout June 1998, when it was reduced to 10%, followed by a further reduction to zero in September 1998. Other administrative changes introduced by the CBCh affected the maturity (h/k) and the relevant i^*[5], albeit the latter was also affected by changing market conditions. The resulting urr series that take into account all these factors are taken from Gallego, Hernández, and Schmidt Hebbel (1999) (Fig. 3.1). It shows a growing trend until late 1997, largely explained by the rising share of up-front fee payments[6]. From June 1991 through September 1998, the urr averaged 4.24% per year with a standard deviation of 2.14%. Its maximum was 7.7% in November 1997.

An indirect measure of how binding the URR was for capital inflows to Chile is provided by the total amount collected as deposits. The latter is comprised by the actual capital stock deposited as required reserve at the CB, and the capital stock equivalent to the up-front fee payments. At its peak in August 1997, the URR implied a total amount of US$ 2,237 million equivalent to reserve deposits, comprised by US$ 825 million of actual

[4] For details on the applicable i* see Gallego et al. (1999).
[5] The CBC changed from the Yen i* to the Dollar i* in November 1994. See annex 2 for details.
[6] The fee-option appears to be more expensive than making the deposit with the CB, because of the spread of 2.5% (and 4%) applied to it on top of the foreign interest rate i*. However, this result is in part due to having underestimated in the calculations the true (country and other) risk premia charged by foreign lenders, which we estimated as being nearly constant at around 1% throughout the period.

deposits and US$ 1,412 million of fee-equivalent deposits (Figure 3.2). This is a sizable amount, equal to 2.9% of 1997 GDP or 30.0 % of that year's net capital inflow. During the whole period, the total equivalent reserve deposit attained an average of 2.0% of GDP.

However, as in the case of any other tax, the URR provides an incentive for tax elusion and tax evasion.[7] Comparing actual and required total reserve deposits provides a measure of the URR tax effectiveness or power, *pow*. The latter is estimated by the ratio between the flows that were actually taxed with the URR –either by making a deposit or paying the equivalent up-front fee– and the total amount of new flows that were potentially subject to the URR. The estimation is made with monthly flows as shown in equation (3.2)

(3.2) pow_t = (actual flows paying the URR)$_t$ / (potential taxable flows)$_t$

where the potential taxable flows are derived after adjusting the recorded capital inflows for the re-labeling that occurred through the different loopholes.

The resulting time series (figure 3.4) suggests that the URR gained effectiveness through time, although this occurred because of the authorities constant effort to close loopholes in URR regulations—the latter was partly achieved by increasing its coverage. For instance, in January 1992, 6 months after its introduction, the URR power index was at 0.50, mainly because of the increasing re-labeling of several forms of capital inflows as dollar denominated deposits. Then, when dollar denominated deposits became subject to the URR in February 1992, the power index increased to 0.78 (though other loopholes were discovered and used by arbitrageurs). A more formal analysis to explain the behavior of the power of the URR is presented in section 4 below.

Combining the simple measure of the cost of the URR (urr), adjusted for changes in the coverage of the capital base of the URR (cov), and its effectiveness or power (pow), allows to obtain a measure of the effective cost of the reserve requirement (err):

(3.3) $err = urr * cov * pow$

Figure 3.4 depicts the time pattern of all three variables urr, pow, and err. All of them show a rising trend until late 1997, leading to an *err* with a sample average of 3.84% and a standard deviation of 2.30%.

[7] Le Fort and Sanhueza (1997) provide a good description of the elusion that occurred during the period.

Administrative controls on selective capital inflows and capital outflows

During the last decade the CBCh has liberalized to a large extent administrative restrictions on both capital inflows and outflows. This can be seen both as part of the country's overall trend of economic liberalization and a (temporary) substitution of quantitative restrictions on inflows (the URR) for administrative controls.

Regarding capital inflows, the two main quantitative restrictions are minimum solvency requirements on domestic issuers of foreign liabilities (bonds and ADRs) and size requirements on issues of foreign liabilities by corporations and banks. Both restrictions were partly liberalized during the last decade, as reflected in their liberalization index–*ix_issues*–depicted in Fig. 3.5 (taken from Gallego, Hernández, and Schmidt-Hebbel, 1999).

Minimum permanence requirements before repatriation of capital and profits may be interpreted as restrictions on both capital inflows and outflows. Technically they affect outflows of capital because they are imposed on capital that has flown in at some point in time–they restrict the repatriation of principal and cumulative profits accrued on past investments. However, in an *ex-ante* sense they will deter additional foreign investment, hence negatively affecting future capital inflows (Labán and Larraín, 1997).

Permanence requirements on foreign investment—both portfolio and FDI—were reduced from an average of 8 to 3 years in 1991, and further to 2.5 and 1.0 years in 1992 (*ix_remit* in Fig. 3.5). This liberalization was implemented in an *ex-post* way—i.e. old capital inflows could flow out after complying with the new shorter permanence period. For this reason one may expect a larger capital outflow in the short run—as intended by the CB—and this is the reason why we classify this is a capital outflow restriction. At the same time, however, this outflow liberalization provides an incentive for larger inflows, implying that the total effect on net capital flows is ambiguous.

Other regulations on capital outflows that were liberalized during the last decade include ceilings on foreign asset holdings by financial institutions, and surrender requirements imposed on export proceeds (abolished in July 1995). An aggregate index for the latter two and a host of other secondary administrative controls on outflows is depicted as *ix_other* in Fig. 3.5 (from Gallego, Hernández, and Schmidt Hebbel, 1999).

The specific indexes in Fig. 3.5 show significant and simultaneous progress in the liberalization of both capital inflows and outflows largely concentrated during 1991-1995—this is summarized by the (simple) average of the three indexes, *ix_comp*, in the figure. Towards late 1998 a significant number of restrictions had been either scrapped or significantly lessened. .

4. Empirical Results for Chile

This section reports estimation results for two sets of variables. First we specify and estimate equations to explain the measures of quantitative and administrative capital controls. Their specifications attempt to reflect the motivation of the Central Bank of Chile in setting the URR tax and the average level of administrative controls. Next, we specify the effect of capital controls on the relevant macroeconomic and financial variables, following the model spelled out in Gallego, Hernández, and Schmidt Hebbel (1999).

We start by analyzing empirically the behavior of Chile's capital controls and their power, to turn next to their effect on the relevant macro and financial variables.

Sample period, data, and estimation strategy. We fully exploit the 1989-1998:6 period during which Chile had relatively unhindered access to voluntary foreign capital inflows, and the 1998:7-1999:6 period when voluntary flows to emerging market economies became more scarce.. We use monthly data for all regressions, implying a maximum sample of 126 observations. Data definitions and sources are discussed in Annex.

Specification of equations encompasses the simple equations of the model mentioned above. Here we extend the specification by including variables that reflect non-instantaneous market clearing in goods and asset markets—a relevant feature of high-frequency data like ours. The estimation strategy addresses potential econometric problems derived from spurious correlation, endogeneity of right-hand side regressors, and inefficient estimation due to residual heteroscedasticity and autocorrelation, by conducting appropriate diagnostic tests and using appropriate estimation techniques.

Diagnostic Tests. The order of integration of individual variables varies between 0 to 1. A significant number of variables are I(1) justifying estimation in first differences. When appropriate, cointegration tests were conducted with generally acceptable results.

4.1 Capital controls

We start by studying the effectiveness of the URR. For this purpose we estimate an equation for *pow* against those variables that would induce arbitrageurs to by-pass the reserve requirement, plus the different policies implemented to reduce the evasion or elusion. The results are presented in Table 4.1

As expected, URR effectiveness rises with changes in its coverage and other regulations aimed at reducing its elusion and evasion. This is shown by the positive and significant coefficients reported for the different dummies in Table 4.1, which correspond to regulatory changes affecting dollar denominated deposits (D922), the currency denomination of the required deposit at the CB (D941), the issue of secondary ADRs (D957), and requirements to classify inflows as FDI (D9610). All these changes had permanent effects on the effectiveness of the URR.

More importantly, the results also show that the effectiveness of the URR decreased with the differential between domestic and foreign interest rates (adjusted by country risk), and with the level of the tax rate, τ (a *Laffer*-like effect for the reserve requirement, *tax*). These results have statistical significance and economic importance. For instance, for an interest rate differential of 4.5% –equal to the sample period average–, by the time τ was dropped to zero in September of 1998, the URR would have lost –ceteris paribus– about 72 percent of its initial power. This result shows that the URR cannot be used to sustain an interest rate differential on a permanent basis.

Based on our measures for the *urr* and the effective cost of the reserve requirement (*err*) reported in section 3, we now proceed to estimate equations for each of them. They are based on a specification that is common to both of them, illustrated here for the former:

$$urr_t = a_0 + a_1\, PDL\left(p_t - pt_t\right) + a_2\, PDL\left(\frac{e_t\, kf_t}{y_t}\right) + a_3\, PDL\left(\frac{kfl_t}{kf_t}\right)$$

+ + -

(4.1)

$$+ a_4\, PDL\left(\frac{e_t - \bar{e}_t}{\bar{e}_t}\right) + a_5\, PDL\left(pow_t\right) + a_6\,(r_t^{*} + r_t) + a_7\,(r_{t-1}^{*} + r_{t-1})$$

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$$+ a_8\, \frac{wfk_{t-1}}{wy_{t-1}}$$

+

where (π - πτ) is the difference between actual and target inflation, e is the real exchange rate, (w)kf is total net capital inflows to developing countries, kfl is long-term net capital inflows, y is real domestic output, *pow* is our measure of power of the reserve requirement, r* is the external interest rate, and ρ is the country risk premium.[8] Expected coefficient signs are positive for the inflation differential, the ratio of total net capital inflows to GDP, the contemporaneous external interest rate adjusted by country risk, and the total inflows to developing countries; and negative for the ratio of long-term net capital inflows to output,the real exchange rate depreciation, the lag of external interest rate adjusted by country risk and the power index—*pow* enters as a regressor only in the equation for the urr since by definition it is part of err.

The results in Tables 4.2 and 4.3 confirm the relevance of equation (4.1) to explain the CBCh's use of the URR. In both measures for the cost of the URR (*urr* and *err*), all variables have the expected signs and most of them are statistically significant at conventional levels. The CBCh raised the URR in response to larger capital inflows but lowered it in response to higher long-term inflows—the implication is that the Central Bank responded quite strongly and significantly to an increase in short-term inflows. In addition, the URR was altered in response to changing conditions in world capital markets—it was raised with the overall availability of funds and reduced with the (past) cost of funding $(r^*+\rho)_{-1}$ [9]. Also, the URR was raised in response to a higher rate of exchange rate

[8] The specification is restricted to include only simple lags or polynomial distributed lags (PDLs) of right-hand side variables, reflecting that only past variables are taken into account by the CB when setting the current (monthly) URR level.

[9] Note that $(r^*+\rho)_t$ is included in the regressions to control for the fact that it is part of urr_t.

appreciation, reflecting the CB concern with deterioration in foreign competitiveness. (In one of the equations in table 4.3, we also find—with a marginally significant coefficient—that the CB raised the URR in response to a larger actual-target inflation differential, reflecting its concern with price stability.) Additionally, it is also interesting to note that urr falls with its own power (Table 4.2). Thus, the CBCh raised the extent of the URR in response to a loss in power or efficiency due to evasion/elusion of the reserve requirement.

As it was mentioned in Section 2, in the 1990s the CBCh started lifting administrative controls on both capital inflows and outflows. To take account of this we use an aggregate index of administrative controls on the capital account (*ix_comp*). An increase in the index means a more restrictive regime—i.e., a less open capital account. Next, we explore the reasons that the authorities may have had to liberalize capital inflows and outflows. The estimated model is depicted in equation (4.2).

(4.2) $$ix\_comp_t = b_0 + b_1 \, \text{t} + b_2 \, \text{t}^2 + b_3 \, PDL\left(\frac{e_t \, kf_t}{y_t}\right) + b_4 \, PDL\left(\frac{e_t - e_{t-1}}{e_{t-1}}\right) + b_5 \, PDL\left(err_t\right)$$

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+

The expected coefficients are negative for total net capital inflows (as a ratio of GDP) and positive for the rate of depreciation of the real exchange rate. These expected signs imply that in the short run the authorities expected a greater liberalization would lead to lower net inflows, thus reducing the risks of overheating. For *err* the expected coefficient is positive (negative) if the administrative controls on capital flows and the URR were used as substitutes (complements) for the purpose of reducing overheating. The trend is expected to be negative as Chile lessened its capital account regulations.

The results in Table 4.4 confirm expected coefficient signs at conventional significance levels for all variables other than the depreciation of the real exchange rate. The results show that liberalization increased through time following a worldwide trend, though at a decreasing path. Also, as expected, capital account liberalization increased with the pace of net capital inflows and with the loss of effectiveness of the URR, validating the notion that both instruments (the URR and the administrative controls on capital flows) were aimed at the same goal.

5.2 Macroeconomic and Financial Variables

The model. In this part we describe briefly how the model spelled out in Gallego, Hernández, and Schmidt Hebbel (1999) works. The imperfect asset substitution between domestic government bonds and net foreign assets is reflected in a standard portfolio equation. The model can be rewritten as an international interest arbitrage condition corrected by the (expected equals actual) rate of depreciation of the real exchange rate. Net foreign asset accumulation is determined by the current account surplus, itself a function of the determinants of the excess supply of traded goods net of foreign factor receipts (i.e. the excess of saving over investment). Its determinants comprise standard variables such as the real interest rate, the real exchange rate, net foreign assets, the terms of trade, and government spending.

Non-traded goods equilibrium relates the equilibrium real exchange rate to non-traded supply and demand determinants, similar to those included in the preceding equation. To take account of the Balassa-Harrod-Samuelson effect of larger relative productivity growth in the traded-goods sector on the real exchange rate, the relative traded/non-traded sector productivity of labor is considered. In this context it is possible to solve for the non-traded goods equilibrium condition as an implicit function for the real interest rate. Substituting the real interest rate yields a system of two reduced-form difference equations for the real exchange rate and the stock of net foreign assets.

Domestic real interest rates. The specification for interest rates assumes imperfect international interest arbitrage, so that both external arbitrage and domestic market conditions affect interest rates in the short run. The general specification that nests an equation for the Central Bank policy rate and for the banking deposit rate is the following:

$$\begin{aligned} \mathrm{r_t} = \; & g_0 + g_1 r_t^* + g_2 \hat{e}_t^e + g_3 err_t + g_4 r_t + g_5 ix\_outflows_t + g_6 \frac{e_t l_{t-1}}{y_t} \\ & + g_7 \frac{cas_t}{y_t} + g_8 \left(\frac{y_t}{\bar{y}_t} \right) + g_9 tot_t + g_{10} \left(\frac{g_t}{y_t} \right) + g_{11} \left(\frac{m_{t-1}}{y_t} \right) + g_{12} \left(p_t - pt_t \right) \end{aligned} \tag{4.3}$$

The first four regressors represent cost-equivalent components of international arbitrage conditions: the real international interest rate (r*), the expected real exchange rate depreciation ($\hat{e}^e$), the URR policy (*err*), and a measure of the country risk premium (*r*). We also include the index of administrative controls on capital outflows (*ix_outflows*)[10] to check for a possible effect from the increasing financial integration. The ratio of the outstanding stock of net external liabilities (*l*) to output is also included, to reflect a combination of the positive country-risk effect and the negative effect on the domestic credit demand due to lower private financial wealth. An additional domestic private credit demand determinant is captured by the foreign terms of trade (*tot*). Policy variables include the ratios of aggregate government spending (g) and real M1 (m) to output. As three main arguments of the monetary policy reaction function we also include the difference between actual and target inflation, the ratio of actual to full-employment output, and the current account surplus. These were the main concern of the CB throughout the sample period.

Expected coefficient signs are positive for the first four components of the international arbitrage condition, government spending, the actual-target inflation difference, and the business-cycle effect. However, expected coefficients are negative for money, the current account surplus, and the index of administrative controls on capital outflows. The expected sign is ambiguous for the GDP ratio of net external liabilities and for the terms of trade—in the latter case depends on whether shocks are permanent or transitory.

Two variants of equation (4.3) are implemented: one for *cbr*, the Central Bank policy real rate of interest, and the other for *rdep*, the 91-365 day banking-sector real deposit rate. The central bank rate is expected to have a strong effect on the deposit rate (but not the reverse). Both rates are highly correlated but as it is expected the central bank's shows lower variation[11]. In the spirit of a monetary policy reaction function, we estimate the equation for *cbr* controlling for imperfect interest rate arbitrage, as a function of standard monetary policy objectives. The *cbr* is specified as depending only on lagged variables or

[10] This is a combined measure of *ix_remit* and *ix_other*.

[11] For monthly observations from 1989.1 through 1999.6 the following results are obtained. The contemporaneous correlation between both variables is 0.86, with a standard deviation of 0.089. The standard deviation of each variable separately is 0.0122 for *cbr* and 0.0178 for *rdep*.

polynomials as the Central Bank makes decisions based on information with a lag of 1 month or more. The second variant, for *rdep*, is in the spirit of an imperfect international arbitrage model a la Edwards-Khan (1985), where both foreign arbitrage and domestic credit demand variables determine this rate. We have added to the latter the Central Bank policy rate. Potential regressors include both contemporaneous and lagged variables.

The results in Table 4.5 for the CB policy rate show that all policy function determinants (π, *y* and *cas*) explain significantly the Bank's policy stance, implying that the CB raises its policy rate whenever the economy shows signs of overheating. Regarding the foreign interest arbitrage condition, none of its determinants appear to be significant (possibly due to the use of high frequency data). More interesting are the results regarding the URR policy. No significant effect is found for any of the measures of the financial cost of the URR (*urr*, *err*) or some combination of them and the determinants of the interest arbitrage condition. However, when analyzing the different elements comprising the URR policy it appears that its power matters for setting the policy rate; i.e., the role of the URR policy in permitting higher domestic interest rates was due primarily to its power rather than the rate (*tax*). On average during 1991-98, the URR efficiency (or power) –kept at about 0.8 by some combination of increasing coverage and cracking down on evasion/elusion– permitted a rise in the Bank's policy rate of about 9 basis points.

As argued above, for the banking deposit rate (*rdep*) we include the imperfect interest arbitrage components, the CB policy rate *cbr*, and potential credit demand determinants. The results in Table 4.6 show that all components of the foreign interest arbitrage variable, including URR, do not attain conventional significance levels. It is not surprising that their role in determining the deposit rate is completely dominated by the CB policy rate. Thus, the market has fully internalized the fact that the CB uses its policy rate to control aggregate demand and contain overheating pressures.

The fiscal policy stance, the domestic economic cycle, and the liberalization of capital outflows all exert a strong positive effect on the banking deposit rate. A higher stock of net foreign liabilities and improving terms of trade both reduce the deposit rate, suggesting that the wealth effect dominates the risk effect and transitory effects dominate permanent effects in the former and latter case, respectively.

Real exchange rate. The equation estimated for the real exchange rate differs from the simple specification of the model summarized above in several respects. In particular, we consider temporary effects of asset-market pressures –captured by the domestic-foreign interest rate differential– and nominal exchange rate pressures. The broader equation that we estimate is the following:

$$\begin{aligned}(4.4)\quad \Delta \log e_t = d_o + d_1 \Delta\, rlpt_t + d_2 \Delta\left(\frac{e_t l_{t-1}}{y_t}\right) + d_3 \Delta\left(\frac{g_t}{y_t}\right) + d_4 \Delta\, tot_t + d_5 \Delta\left(\frac{y_t}{\bar{y}_t}\right) + d_6 \Delta\, r_t \\ + d_7 \Delta\, r_t^* + d_8 \Delta \hat{e}^e_{t,t+1} + d_9 \Delta\, err_t + d_{10} \Delta\, r_{t-1} + d_{11} \Delta\, E_{t-1}\end{aligned}$$

The first 6 regressors reflect the short and long-term influence on the real exchange rate of changes in non-traded goods market conditions, However, they also include the GDP ratio of net foreign liabilities (*l*) and the domestic interest rate (*r*) since both have a role on long-term investment-saving decisions and on temporary portfolio shifts that influence net capital inflows. The four following regressors reflect the temporary influence of asset market pressures arising from the components of foreign interest rate arbitrage. The final variable reflects the temporary influence of a nominal devaluation –E is the nominal exchange rate level consistent with the definition of *e*– while Δ stands for the difference operator.

Expected coefficient signs are positive for the GDP ratio of net foreign liabilities, the components of the foreign interest arbitrage expression, and the lagged nominal exchange rate depreciation, while expected coefficients are negative for the relative traded/non-traded sector labor productivity, government spending, the business cycle, the terms of trade, and the domestic interest rate[12].

We estimate an error correction model in two steps (Engel and Granger, 1987). The co-integration vector for the log of the real exchange rate is comprised of the GDP ratio of government spending, the GDP ratio of net foreign liabilities, the relative traded/non-traded labor productivity, and the terms of trade, and displays significant expected signs for all but the last variable (bottom of Table 4.7). In the error correction equation we include the lagged residual from the co-integration relationship and it considers as regressors many

[12] We assume that the negative effect through portfolio shifts (i.e., the interest rate arbitrage condition)

other short-term determinants of the exchange rate devaluation (top of Table 4.7)[13]. Among the determinants of the non-traded goods market equilibrium are selective lags of the business cycle and the traded/non-traded sector labor productivity. However, neither the domestic interest rate nor the components of the foreign interest arbitrage condition –except for the country risk premium (r)– affect the real exchange rate. Thus, as previous research has shown, neither measure of the cost of the URR –*urr*, nor *err*–exerted a statistically significant influence on the real exchange rate.

Total net capital inflows. As in the case of the preceding equation, the specification for net capital inflows reflects both the permanent influence of the determinants of the goods-markets equilibrium (i.e., the current account), and the temporary influence of asset-market pressures (captured by the domestic-foreign interest rate arbitrage condition). The estimated equation is the following:

$$\frac{e_t\, kf_t}{y_t} = l_o + l_1\left(\frac{e_t l_{t-1}}{y_t}\right) + l_2\, tot_t + l_3\,\frac{g_t}{y_t} + l_4\left(\frac{y_t}{\bar{y}_t}\right) + l_5\, e_t + l_6\, r_t + l_7\, r_t^* + l_8\, \hat{e}^e_{t,t+1}$$
$$+\, l_9\, err_t + l_{10}\, r_t + l_{11}\,\frac{ks_{t-1}}{k_{t-1}} + l_{12} ix\_remit_t + l_{13} ix\_issues_t + l_{14}\,\frac{wfk_t}{wy_t} \quad (4.5)$$

The first 6 regressors reflect the influence of the determinants of the current account deficit on capital inflows. They are identical to the long-term fundamentals of the real exchange rate in equation (4.5), except for the exclusion of the traded/non-traded labor productivity (*rlpt*) and the inclusion of the real exchange rate (e). The latter variable is expected to reduce the current account deficit, hence, net capital inflows.

The domestic interest rate (r) has a double role: it influences long-term investment-saving decisions and affects temporary portfolio shifts that influence net capital inflows. We assume that the latter effect dominates. The five following regressors reflect the influence of the foreign interest rate parity. Among them is the ratio of short-term to total outstanding

dominates the positive effect through investment- saving decisions (i.e., the expenditure channel).

[13] We have also included a term for the rate of depreciation between periods 5 and 6 as expected at period t-1, to make the actual 1-month devaluation horizon consistent with the six-month maturity of all relevant interest rates included in the regression.

net foreign liabilities (*ks/k*) that should increase the country risk premium. Furthermore, we include both the indexes of administrative controls on remittances of past investment and profits, and of new international issues (with expected coefficients of different sign), and a measure of the relative world supply of capital flows to developing countries, *wfk*/*wy*, to capture international push factors.

Expected coefficient signs are positive for the GDP ratio of government spending, the business cycle variable, the index of administrative controls on remittances, the domestic interest rate, and the relative supply of foreign capital to developing countries. Expected coefficients are negative for the terms of trade, the ratio of short-term to total net foreign liabilities, the level of the real exchange rate, the index of administrative controls on international issues, the components of the foreign interest rate parity condition including the country risk (r) and the URR, and the GDP ratio of net foreign liabilities.

The overall results in table 4.8 are mixed. The two measures of the cost of the URR, *urr* and *err*, have the correct sign, but only the latter is statistically significant. This implies that the URR is effective in reducing the flow of foreign capital but only to the extent that its power is not eroded. Thus, increasing the *err* in 100 basis points per year –through some combination of increasing its coverage and cracking down evasion/elusion– reduces total inflows by about 1 percent of GDP, and affected inflows by about 2 percent of GDP, implying a substitution of not-affected for affected flows. However, the results regarding other regressors are less satisfactory. Only the determinants of country risk –net foreign liabilities over GDP and the share of short-term debt in the total– and the index of administrative controls on new international issues show the correct sign and attain statistical significance at conventional levels. On the contrary, all the determinants of the current account and the interest rate differential show the wrong sign (and some of these coefficients are statistically significant). This leads us to believe that a more serious bias problem may be present in the results reported in table 4.8.

To check the robustness of these results we run the same regressions but using the current account deficit as a regressior instead of its determinants. The results, reported in Table 4.9, show that all the coefficients have the correct sign, and except for the index of administrative controls on new international issues, all attain statistical significance at standard levels. Most important, again the effective cost of the URR (*err*) appears to play a marginally significant –albeit small– negative role in total net capital inflows. Thus, the result that increasing the *err* in 100 basis points reduces net capital inflows by about one percentage point of GDP in the short-term still holds. This is again a temporary effect as the power of the URR (and hence *err* itself) declines over time for a given interest rates differential. However, the result regarding the substitution between non-affected and affected flows does not appear so clearly as before. We address this issue using a different approach next.

Composition of total net foreign liabilities. As a substitute for the preceding result about the composition of net capital inflows, we test for the effect of capital controls on the composition of outstanding total net foreign liability stocks, controlling for other return and risk variables that may affect portfolio composition. We specify the following equation for the ratio of short-term to overall net foreign liabilities:

(4.6) $$\frac{ls_t}{l_t} = m_o + m_1\, r_t + m_2\, r_t^* + m_3\, \hat{e}_t^e + m_4\, err_t + m_5\, ix\_remit_t + m_6 \left(\frac{e_t\, l_{t-1}}{y_t} \right)$$

The portfolio share of short-term debt in total net foreign liabilities is expected to rise with the domestic to foreign interest rate differential (because the latter attracts short-term flows). Similarly, a more restrictive environment for the remittance of past investments and accrued profits should lead (in the short run) to a decrease in the share of short-term debt (*ls*) in total liabilities (*l*). Country risk –or its determinants– will affect negatively both short-term and long-term foreign inward investment. Hence, expected coefficient signs are positive for the domestic interest rate, ambiguous for total net foreign indebtedness, and negative for the index of administrative controls on remittances**,** the foreign interest rate, the expected rate of depreciation, the effective cost of the URR, and the marginal product of capital. Only lagged values or PDLs enter the specification.

Results in table 4.10 are relatively disappointing, however, as a few variables do not exhibit expected signs or acceptable significance levels. This result notwithstanding, both measures of the cost of the URR unambiguously reduce the share of short-term debt in net foreign liabilities. Also, as expected, lessening the conditions for the remittance of foreign capital led to a larger share of short-term foreign liabilities in the total.

Conclusions. We have gone a long way in testing for the macroeconomic and financial effects of Chile's capital controls. We derive various conclusions from our empirical estimations. First, capital controls themselves have been highly responsive to the domestic and international macro-financial environment. The Central Bank of Chile put the URR into place for a combination of reasons: to retain monetary control, to stem overall capital inflows and, in particular, short-term and financial inflows, and to maintain international competitiveness. Our results confirm these motives. Both the simple measure (urr) and the effective measure (err) of the cost of the Chilean URR increased with total capital inflows, the level of short-term flows, and the level of exchange rate appreciation (and *err* also responded to the difference between actual and target inflation levels). In addition the CB responded to the decline in tax power due to evasion and elusion by raising the cost and coverage of the URR through various changes in its administration. Separately we have also obtained results for the intensity of administrative controls on capital outflows: they tend to respond to similar variables as the URR and, in addition, seem to have been used as a complement to the latter.

Second, in the context of a monetary policy reaction function, complemented by imperfect foreign interest arbitrage, we found that after controlling for the significant influence of policy objectives, the power of the URR has had a significant positive effect on the CBCh's policy rate –but we did not find any direct effect of the cost measures *urr* and *err*. Subsequently we focused on the real bank deposit rate, finding the CBCh's rate to be a main determinant. No separate direct effects were found for either err or urr. Hence err has exerted only an indirect, albeit significant, influence on the bank deposit rate. This stands in contrast to controls on outflows: lowering the latter throughout the 1990s has helped in raising the bank deposit rate.

Third, an error-correction model for the real exchange rate, that reflects temporary and permanent influences of other equilibrium forces, did not yield significant effects of Chile's capital controls on this variable. This may be due to the offsetting short- and medium-term effects of larger capital controls on the real exchange rate, as suggested by the model sketched in Gallego, Hernández, and Schmidt Hebbel (1999).

Fourth, a similar model –reflecting the influence of variables affecting investment-saving decisions and temporary effects due to domestic-foreign interest rate differentials– was specified and run for net capital inflows. Total net inflows were reduced significantly by the *err* (but not by the alternative *urr*). Moreover, there is some evidence (albeit weak) that the *err* reduced proportionately more some type of flows, implying some kind of substitution between tax-exempt flows and short-term and URR-affected flows. An alternative portfolio composition equation for the share of short-term in total net foreign liability stocks shows a significant negative effect of both *urr* or *err*. Hence the Chilean URR has unambiguously changed the composition of total net foreign liability flows and stocks away from short-term (or affected) and toward medium and long-term (or not affected).

5. Pros and Cons of the URR, conclusions and overall assessment.

In this paper we have analyzed the Chilean experience with capital controls during the 1990s, extending the existing literature on the subject in three dimensions. First, we broadened the concept of the URR to take into account changes in its effectiveness through time; and second, we constructed indicators for other administrative measures aimed at liberalizing the capital account; and finally, we extended the sample period to include the last year when the URR rate was reduced to zero.

From our analysis of the Chilean experience we briefly summarize and conclude next on the pros and cons of capital controls. Since our findings are based on a single country experience, our final remarks will refer to the potential risks associated with using the same type of capital controls in other countries.

Potential benefits of the URR

(i) Monetary independence. The URR can be beneficial for a country like Chile because it permits a greater degree of monetary autonomy. Since it introduces a wedge between domestic and foreign interest rates, the URR provides more space for the use of monetary policy to accommodate different shocks. Our results show that this benefit was achieved in

the case of Chile. However, we also found that the interest rate differential supported by the URR –more precisely by its power– was, on average, relatively small (9 basis points).

(ii) Real Exchange Rate. The URR should lead –in the short run– to a less appreciated real exchange rate and, therefore, a more competitive export sector. However, our results do not support this view. The Chilean experience shows that the introduction of the URR did not affect the real exchange rate.

(iii) External indebtedness. The URR is expected to lead to smaller capital inflows, therefore reducing the country's overall indebtedness. Our results validate this view for the case of Chile. We find that the URR led to a fall in capital inflows, although this effect is of a transitory nature due to the URR loss of power.

(iv) Composition of inflows. The URR is expected to change the composition of capital inflows toward longer maturities, making the recipient country more resilient to shocks. Our results indirectly show that this result was attained in the case of Chile. The introduction of the URR led to a distribution of external liabilities that was skewed towards long-term stocks.

Overall, through channels (iii) and (iv) above the URR allowed the Chilean economy to attain better economic fundamentals than otherwise. This very likely reduced the risk of suffering a sudden reversal of flows—and eventually a recession and financial crisis—when external conditions changed in 1997-98, even if the reversal of flows could have been caused by pure contagion or bandwagon effects. This benefit should not be overlooked despite the difficulties associated with measuring it (something that we do not attempt in this paper). However, when trying to draw the relevant policy lessons it should be kept in mind that these benefits are of a temporary nature, and can be realized only if the central bank is very active in maintaining the effectiveness of the URR. The speed at which the URR loses its effectiveness indicates that economic fundamentals will start deteriorating shortly after the URR has been introduced if the central bank fails in doing its job.

It is possible to think of the URR as having an effect on the volatility of the relevant variables. We do not try this here, but Edwards (1999) shows that the URR was unable to isolate Chile from the very large financial shocks of 1997-99 (it helped only to reduce stock market instability). Volatility and contagion in Chile was similar to that of other countries.

Potential costs of the URR

(i) Quasi-fiscal losses. The URR can lead to large quasi-fiscal losses, mainly because it loses its effectiveness through time and, for a given interest rate differential sought by the authorities, may induce a rapid accumulation of reserves. The Chilean experience shows that the net cost associated with funding the excess of reserves is not negligible, reaching about 0.5 percent of GDP per year (Gallego et al. 1999).

(ii) Misallocation of resources. Since the URR tends to increase short-term interest rates proportionately more, or because banks are more tightly monitored, it will lead to an inefficient allocation of resources. In particular, the URR will discriminate against short-term projects and those sectors that are more dependent on bank financing. In addition, there are costs associated to the search for loopholes and their closure. Although this cost could not be measured in the case of Chile, it is likely that its burden has fallen proportionately more on the small and medium size enterprises (Edwards, 1999).

(iii) Investment and growth. The higher level of domestic interest rate caused by the URR reduces investment and long-term growth. This cost is dependent on the interest elasticity of investment. In the case of Chile this cost is non-negligible. The results presented in Gallego, Hernández, and Schmidt Hebbel (1999) show that without the URR –and the policy stance that accompanied it– the Chilean economy could have grown by about half of a percentage point more than it did during the 1990s.

Some final remarks

Before closing it is important to keep in mind that the effectiveness of the URR in the case of Chile is due, to a large extent, to the high enforcement capacity of the CB, the long tradition of compliance with the law, and a relatively low degree of corruption. Thus, in countries operating with a weaker institutional and legal environment, a reserve requirement of the sort used by Chile could be less effective and, in the extreme, lead to more corruption.

Similarly, the URR used in Chile has to be understood as a complementary policy aimed at improving the trade-off between monetary and exchange rate policies. However, it is not aimed at substituting for a sound fiscal stance or an appropriate regulatory and prudential framework for the financial system. It is possible that in many instances the URR could be wrongly used as an excuse to delay the implementation of important reforms in the financial system or the fiscal front. This has not been the case in Chile as the country has a solid, highly capitalized and well-regulated financial sector, and has maintained a largely sound fiscal stance since the mid-1980s.

Despite of the difficulties in assessing its net benefits or costs, the URR should be understood as part of a policy mix where the exchange rate was allowed to move within pre-specified bounds. However, in the long run adequate regulation of banks and corporations and avoidance of government guarantees that lead to excessive foreign indebtedness could replace capital controls, in particular within a context of a floating exchange rate system.

References

De Gregorio, J., S. Edwards and R. Valdés (1999), "Capital Controls in Chile: An Assessment". Manuscript, Central Bank of Chile, March.

Edwards, S. (1999), "How Effective are Capital Controls", *Journal of Economic Perspectives* 13 (4), Fall.

Edwards, S. and M. Khan (1985) "Interest Rate Determination in Developing Countries: A Conceptual Framework", IMF Staff Papers, pp 377-403, September.

Engel, R. And C. Granger, (1987), "Cointegration and Error Correction: Representation, Estimation, and Testing", *Econometrica* 55.

Eyzaguirre, N. and K. Schmidt-Hebbel (1997), "Encaje a la Entrada de Capitales y Ajuste Macroeconómico". Manuscript, Central Bank of Chile, May.

Gallego, F., L. Hernández, and K. Schmidt-Hebbel (1999), "Capital Controls in Chile: Effective? Efficient?. *Working Paper* 59, Central Bank of Chile, December. (http://www.bcentral.cl/Estudios/DTBC/59/dtbc59.pdf)

Herrera, L.O. and R. Valdés (1997) "The Effects of Capital Controls on Interest Rate Differentials". Manuscript, Central Bank of Chile.

Labán, R. and F. Larraín (1997) "Can a Liberalization of Capital Outflows Increase Net Capital Inflows?, Journal of International Money and Finance 16 (3), pp 415-31, June.

Laurens, B. and J. Cardoso (1998), "Managing Capital Flows: Lessons from the Experience of Chile". IMF Working Paper 168, December.

Le Fort, G. and G. Sanhueza (1997), "Flujo de Capitales y Encaje en la Experiencia Chilena de los 90". Manuscript, Central Bank of Chile, May.

Milesi-Ferretti, G.M. (1998) "External Sustainability: A Study of Chile", Manuscript, Central Bank of Chile, January.

Nadal De-Simone, F. and P. Sorsa (1999), "Capital Account Restrictions in Chile in the 1990s". Mimeo, IMF, January.

Soto, C. (1997) "Controles a los Movimientos de Capital: Evaluación Empírica del Caso Chileno", Manuscript, Central Bank of Chile.

Soto, M. and S. Valdés-Prieto (1996), "¿Es el Control Selectivo de Capitales Efectivo en Chile? Su Efecto Sobre el Tipo de Cambio Real". *Cuadernos de Economía*, 33 (98) 77-104, April.

Valdés, R. and V. Délano (1999) "Productividad y Tipo de Cambio Real de Largo Plazo" Revista de Análisis Económico 14 (1), June.

Valdés-Prieto, S. y M. Soto (1998), "The Effectiveness of Capital Controls: Theory and Evidence from Chile". *Empirica*, 25 (2).

Annex. Data Sources and Frequency

VARIABLE	SOURCE	DESCRIPTION
Effective and Unremunerated Reserve Requirement	Author's Elaboration.	See below for details on each component of this variable
Actual and target inflation	Central Bank of Chile.	The Central Bank of Chile's target inflation is set for December of each year. So, we construct the monthly target using the lineal combination of each couple of two consecutive targets.
Real exchange rate	Central Bank of Chile.	
Policy Interest Rate	Central Bank of Chile.	This variable is the PRBC rate up to 1995, and the overnight rate since.
Deposit Interest Rate	Central Bank of Chile	This rate is the one paid on 91-365 days deposits
Capital Flows to Chile	Balance of Payment Department, Central Bank of Chile.	
Capital Flows to the Emerging Markets	Author's elaboration based on the IMF International Finance Statistics.	We construct this variable using the quarterly capital account deficits for the OECD countries over the GDP of OECD countries, next we interpolate the quarterly data to monthly frequency using standard RATS routines.
Power Index	Author's elaboration.	See annex 5 for more details.
Capital Account Indexes	Author's elaboration.	See annex 5 for more details.
International Interest Rate	Central Bank of Chile.	This rate corresponds to the LIBOR-180 days.
Expected Exchange Rate Depreciation	Author's elaboration.	This variable is constructed as the projection from rolling regressions for the 6 months exchange rate depreciation. This methodology is the same than the one used by De Gregorio et al. (1999)
Country Risk	Author's elaboration, Central Bank of Chile and EMBI.	This variable is the premium charged on international bond issued by Chilean corporations.
GDP	Author's elaboration and Central Bank of Chile	This variable was constructed using the IMACEC (monthly aggregate production index) to transform the quarterly GDP into a monthly basis.
Terms of Trade	Central Bank of Chile	We interpolate the quarterly data to monthly frequency using standard RATS routines.
Government Expenditure	Ministry of Finance and author's elaboration	
M1	Central Bank of Chile	
Rlpt	Author's elaboration in base of data obtained form Central Bank of Chile and National Institute of Statistics	This variable is constructed with the same methodology used by Valdés and Délano (1999)
Nominal Exchange rate	Central Bank of Chile	
Output gap	Author's elaboration	We estimated the potential GDP using a HP Filter.
Net Foreign Liabilities	Authors's elabotation	This variable was constructed adding the monthly flows to the figures estimated by Milessi-Ferretti (1998) for December of 1988

Figure 3.1
URR Tax Rate and URR Cost (%)

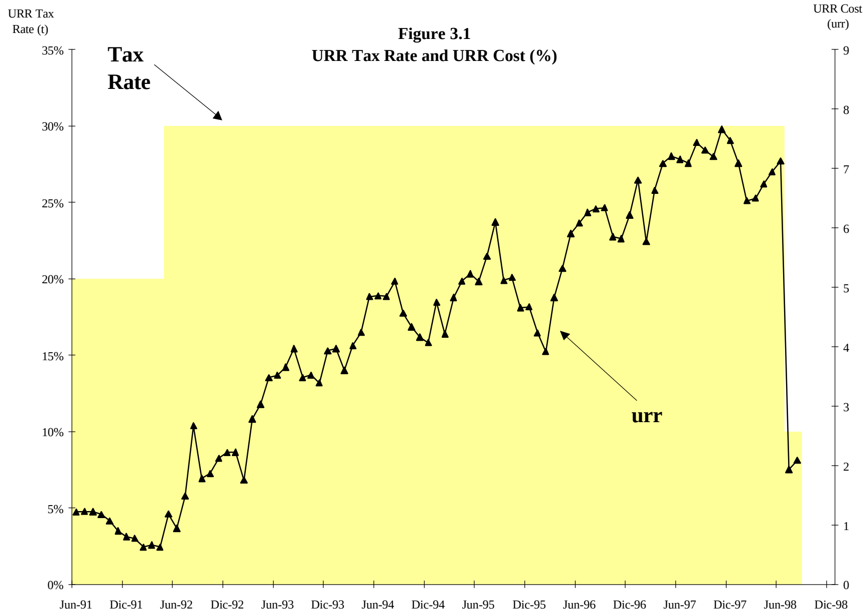

Figure 3.2
URR Deposits at the Central Bank (mmUS$)

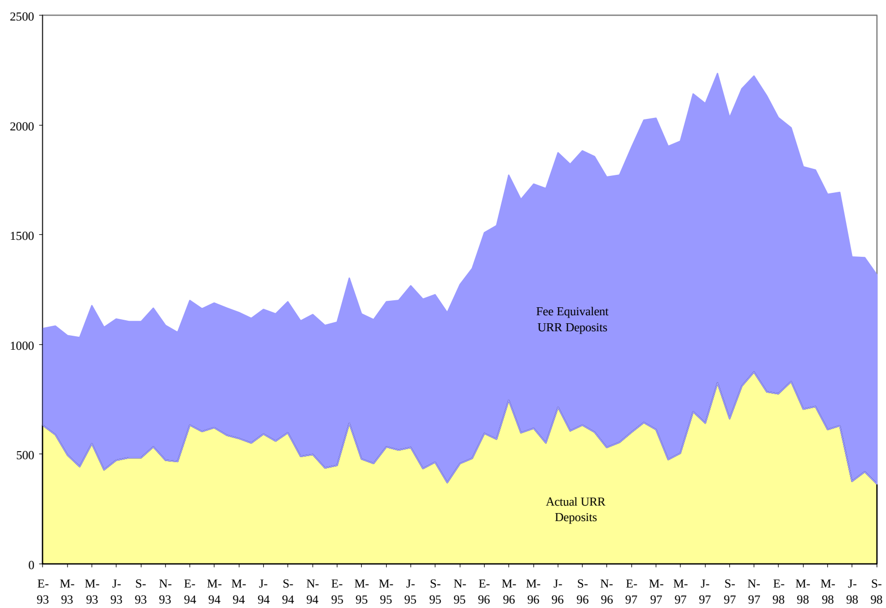

Figure 3.4
URR Cost, URR Power, and URR Effective Cost (%)

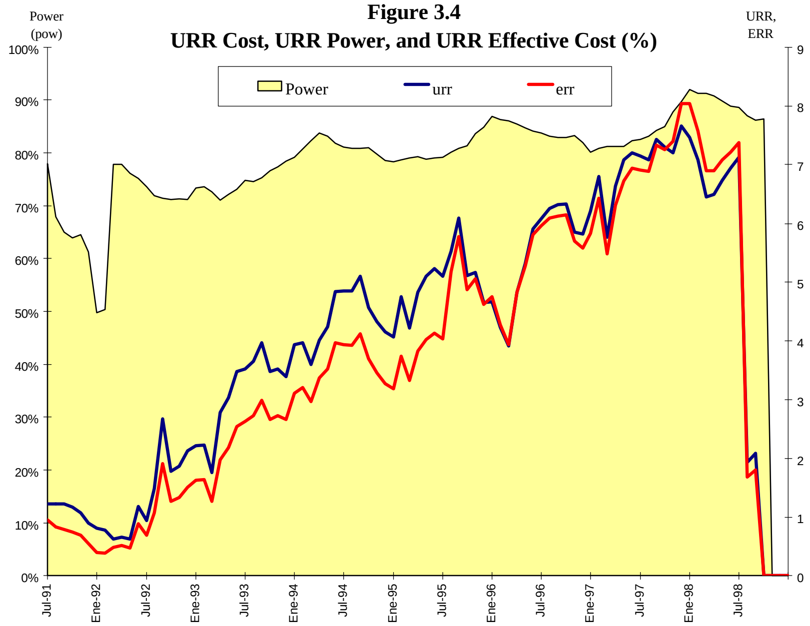

Figure 3.5
Administrative Controls in Capital Inflows and Capital Outflows

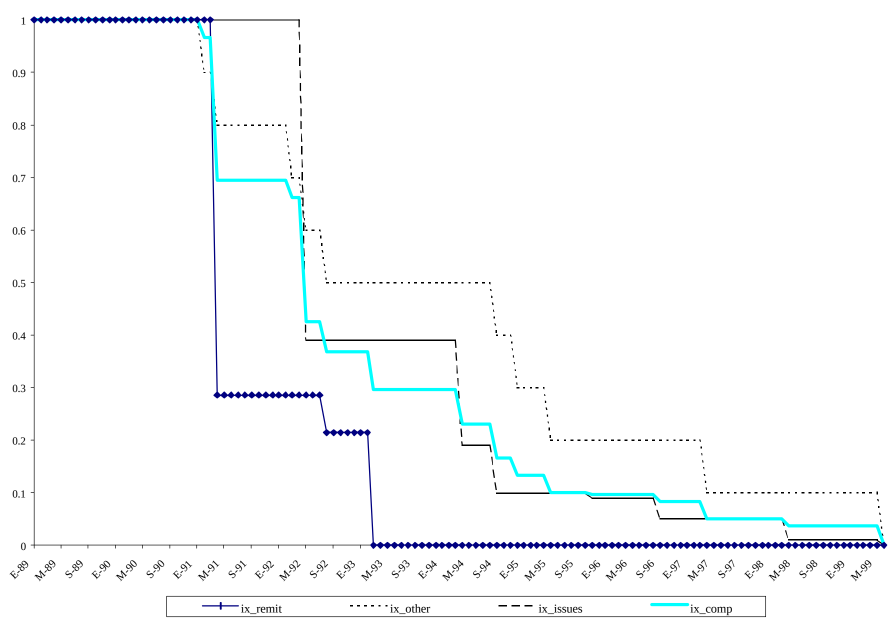

Table 4.1
Power of the URR

Sample	Dependent Variable: D(power) 1991:07-1998:08
C	0.004
	(1.54)
D(tax)	-0.11
	(5.78)
$r - r^* - \hat{e}^e - \rho$	-0.0011
	(1.73)
D922	0.27
	(102.44)
D941	0.02
	(2.83)
DYEN	0.01
	(1.33)
D957	0.02
	(3.99)
D(T957)	-0.001
	(0.24)
D9610	0.01
	(3.20)
D(T9610)	-0.00
	(0.05)
D($power_{-1}$)	0.23
	(2.09)
Adjusted R^2	0.78
Durbin's h	0.26
Estimation Technique	LS

Newey-West consistent t-statistics in parenthesis.

Table 4.2
Cost of the URR

Sample	Dependent Variable: D(urr) 1991:06-1998:09	Dependent Variable: D(urr) 1991:06-1998:09
D(r) + D(ρ)	0.73	0.77
	(5.61)	(5.92)
$D(r^{*}_{-1})$	-0.03	-
	(0.16)	
$D(\rho_{-1})$	-1.15	-
	(1.56)	
$D(r^{*}_{-1}) + D(\rho_{-1})$	-	-0.17
		(1.69)
$D(\frac{wfk_{-1}}{wy_{-1}})$	30.00	39.10
	(1.82)	(1.95)
$PDL(\frac{e_t lfl_t}{y_t};-3;-14;1)$	-7.98	-7.33
	(6.11)	(5.88)
$PDL(\frac{e_t lf_t}{y_t};-6;-9;2)$	2.84	2.87
	(3.78)	(3.55)
$PDL(D(\frac{e_t - e_{t-1}}{e_{t-1}});-2,-8,2)$	-42.26	-53.60
	(3.48)	(5.28)
PDL(D(power(-1)),9,3))	-3.13	-4.29
	(2.51)	(2.78)
π–πτ	0.03	0.04
	(0.50)	(0.77)
D(urr(-1))	0.44	0.46
	(2.08)	(2.04)
Adjusted R^2	0.51	0.46
Durbin's h	0.1	0.2
Estimation Technique	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.
PDL (X;,A,B,C) stands for a polynomial distributed lag for the X variable, where A and B are the first and last lag, respectively, while C is the order of the polynomial.

Table 4.3
Effective Cost of the URR

Sample	Dependent Variable: D(err) 1991:06-1998:09	
$D(r^{*}) + D(\rho)$	0.63	0.70
	(5.26)	(5.82)
$D(r^{*}_{-1})$	-0.02	-
	(0.07)	
$D(\rho_{-1})$	-1.17	-
	(2.46)	
$D(r^{*}_{-1})+ D(\rho_{-1})$	-	-0.23
		(1.06)
$D(\frac{wfk_{-1}}{wy_{-1}})$	36.31	33.32
	(1.72)	(1.46)
PDL($\frac{e_t lfl_t}{y_t}$;-3;-14;1)	-4.14	-4.57
	(1.98)	(1.99)
PDL($\frac{e_t lf_t}{y_t}$;-6;-9;2)	2.05	2.50
	(1.77)	(1.89)
PDL(D($\frac{e_t - e_{t-1}}{e_{t-1}}$);-2,-8,2)	-33.39	-45.43
	(2.04)	(2.04)
$\pi-\pi\tau$	0.15	0.07
	(1.59)	(1.04)
D(err(-1))	0.51	0.43
	(2.01)	(2.46)
Adjusted R^2	0.39	0.33
Durbin's h	0.48	0.37
Esmation Technique	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.
PDL (X;,A,B,C) stands for a polynomial distributed lag for the X variable, where A and B are the first and last lag, respectively, while C is the order of the polynomial.

Table 4.4
Administrative Controls on Capital Account

	Dependent Variable: ix_comp
Sample	1989:01-1999:06
Trend	-0.01
	(2.22)
Trend*Trend	4.36e-0.5
	(2.28)
ix_comp(-1)	0.73
	(5.65)
PDL($\frac{e_t lf_t}{y_t}$;-3;-11;2)	-0.19
	(1.72)
PDL($\frac{e_t - e_{t-1}}{e_{t-1}}$;-1;-8;1)	-0.18
	(0.20)
PDL((D(err));-3,-15,2)	0.06
	(2.33)
Adjusted R^2	0.99
Durbin's h	0.02
Esmation Technique	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.
PDL (X;,A,B,C) stands for a polynomial distributed lag for the X variable, where A and B are the first and last lag, respectively, while C is the order of the polynomial.

Table 4.5
Central Bank Policy Real Rate of Interest

Sample	Dependent Variable: D(rcb) 1989:01-1998:08							
$D(r^*)$	-0.04 (1.16)	-0.04 (1.18)	-	-	-	-	-0.04 (1.18)	-0.04 (1.17)
$D(\hat{e}^e)$	0.01 (0.77)	0.01 (0.77)	-	-	-	-	0.01 (0.81)	0.01 (0.78)
D(ρ)	0.02 (1.12)	0.02 (1.15)	0.02 (0.87)	0.02 (0.86)	0.02 (0.89)	0.02 (0.90)	0.02 (1.18)	0.02 (1.17)
D(err)	-0.01 (0.24)	-	-0.02 (0.47)	-	-	-	-	-
D(urr)	-	0.00 (0.09)	-	-0.03 (0.57)	-	-	-	-
D(ext)	-	-	0.01 (0.61)	0.01 (0.62)	-	-	-	-
D(err)+D(ext)	-	-	-	-	0.00 (0.51)	-	-	-
D(urr)+D(ext)	-	-	-	-	-	0.00 (0.47)	-	-
D(tax)	-	-	-	-	-	-	0.08 (1.46)	-
$D(power_{-1})$	-	-	-	-	-	-	-	0.11 (1.97)
$D((\pi-\pi\tau)_{-4})$	0.07 (2.99)	0.07 (2.93)	0.08 (2.97)	0.08 (2.98)	0.08 (2.98)	0.08 (2.99)	0.07 (3.00)	0.08 (3.00)
$D(\frac{cas}{y}_{-1})$	-0.55 (1.66)	-0.56 (1.72)	-0.54 (1.65)	-0.53 (1.68)	-0.56 (1.62)	-0.56 (1.67)	-0.60 (1.67)	-0.61 (1.70)
$PDL(\frac{y_t}{\bar{y}_t};-1;-2;1)$	2.02 (2.19)	2.00 (2.17)	2.11 (2.18)	2.12 (2.18)	2.10 (2.20)	1.99 (2.18)	1.99 (2.18)	1.99 (2.19)
$D(rcb_{-1})$	0.16 (3.37)	0.16 (3.32)	0.17 (3.47)	0.17 (3.49)	0.17 (3.45)	0.16 (3.35)	0.16 (3.35)	0.16 (3.38)
Adjusted R^2	0.13	0.13	0.14	0.14	0.14	0.14	0.14	0.14
Durbin's h	0.02	0.01	0.16	0.14	0.15	-0.01	-0.01	-0.03
Esmation Technique	LS	LS	LS	LS	LS	LS	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.

$D(ext) = D(r^*) + D(\hat{e}_t^e)$

PDL (X;,A,B,C) stands for a polynomial distributed lag for the X variable, where A and B are the first and last lag, respectively, while C is the order of the polynomial.

Table 4.6
Deposit Real Rate of Interest

Sample	Dependent Variable: D(rdep) 1989:01-1998:06							
$D(r^*)$	0.01	0.07	-	-	-	-	-0.10	-0.04
	(0.04)	(0.37)					(0.39)	(0.41)
$D(\hat{e}^e)$	-0.01	-0.01	-	-	-	-	-0.01	-0.01
	(0.96)	(1.05)					(0.97)	(0.98)
D(ρ)	0.24	0.18	0.23	0.17	0.16	0.17	0.11	0.11
	(0.66)	(0.53)	(0.66)	(0.50)	(0.45)	(0.48)	(0.31)	(0.30)
D(err)	-0.11	-	-0.09	-	-	-	-	-
	(0.55)		(1.02)					
D(urr)	-	-0.25	-	-0.17	-	-	-	-
		(1.03)		(1.82)				
D(ext)	-	-	-0.01	-0.01	-	-	-	-
			(0.77)	(0.61)				
D(err)+D(ext)	-	-	-	-	-0.01	-	-	-
					(1.26)			
D(urr)+D(ext)	-	-	-	-	-	-0.01	-	-
						(0.98)		
Durr	-	-	-	-	-	-	0.08	-
							(0.48)	
D(power)	-	-	-	-	-	-	-	0.11
								(0.53)
D(rcb)	0.62	0.63	0.62	0.63	0.63	0.63	0.62	0.62
	(3.04)	(2.97)	(3.07)	(3.08)	(3.12)	(2.80)	(2.97)	(2.88)
$D(\frac{el_{-1}}{y})$	-6.24	-6.84	-6.05	-5.96	-5.85	-5.87	-5.79	-5.84
	(1.67)	(1.88)	(1.94)	(1.99)	(1.84)	(1.74)	(1.73)	(1.73)
D(tot(-3))	-4.27	-4.40	-4.26	-4.33	-4.15	-4.42	-4.36	-4.36
	(2.53)	(2.63)	(2.59)	(2.63)	(2.61)	(2.61)	(2.35)	(2.40)
$D(\frac{g}{y})$	4.71	5.70	4.53	4.74	4.43	4.42	3.97	3.95
	(1.61)	(1.93)	(1.20)	(1.27)	(1.17)	(1.05)	(1.23)	(1.22)
$D(\frac{m_{-1}}{y})$	-11.33	-12.33	-11.53	-13.10	-10.44	-10.31	-11.14	-11.19
	(0.87)	(0.97)	(0.88)	(1.02)	(0.84)	(0.88)	(0.86)	(0.87)
$d(\frac{y_t}{\bar{y}_t})$	2.33	2.51	2.34	2.52	2.25	2.24	2.26	2.27
	(2.12)	(2.21)	(2.06)	(2.18)	(2.08)	(2.07)	(2.12)	(2.13)
0.5*[D(ix_remit) +D(ix_other)]	-1.16	-1.39	-1.15	-1.27	-1.08	-1.08	-1.16	-1.17
	(2.02)	(2.14)	(2.29)	(2.43)	(2.38)	(2.89)	(2.08)	(2.13)
$D(rdep_{-1})$	0.16	0.16	0.16	0.16	0.17	0.17	0.16	0.16
	(1.97)	(2.01)	(1.98)	(1.97)	(2.04)	(0.93)	(1.76)	(1.73)
Adjusted R^2	0.35	0.36	0.35	0.36	0.36	0.36	0.35	0.35
Durbin's h	0.34	0.54	0.33	0.49	0.14	0.13	0.16	0.18
Esmation Technique	LS	LS	LS	LS	LS	LS	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.

$D(ext) = D(r^*) + D(\hat{e}_t^e)$

Table 4.7
Real Exchange Rate

A. Error Correction Model

Sample	Dependent Variable: D(rer) 1989:01-1998:12			
U_{coint}(-1)	-0.02	-0.02	-0.02	-0.02
	(2.05)	(1.96)	(2.17)	(2.18)
D(rlpt(-9))	-0.08	-0.08	-0.07	-0.07
	(2.41)	(2.42)	(2.49)	(2.50)
$D(\frac{y_{t-3}}{\bar{y}_{t-3}})$	-0.10	-0.10	-0.11	-0.11
	(2.29)	(2.30)	(2.53)	(2.53)
$D(\frac{y_{t-4}}{\bar{y}_{t-4}})$	-0.11	-0.12	-0.13	-0.13
	(2.18)	(2.20)	(2.73)	(2.73)
$D(E_{t-1})$	0.29	0.29	0.28	0.28
	(2.18)	(3.83)	(3.44)	(3.43)
D(rcb)	0.00	0.00	-	-
	(0.24)	(0.32)		
$D(r^*)$	0.00	0.01	-	-
	(1.06)	(1.29)		
$D(\hat{e}^e{}_{+6})$	0.00	0.00	-	-
	(1.17)	(1.18)		
D(ρ)	0.03	0.03	-	-
	(3.21)	(3.33)		
D(err)	-0.01	-	-	-
	(1.00)			
D(urr)	-	-0.01	-	-
		(1.34)		
D(gapext)-D(err)	-	-	-0.00	-
			(1.28)	
D(gapext)-D(urr)	-	-	-	-0.00
				(1.20)
Adjusted R^2	0.22	0.23	0.21	0.21
DW	2.00	2.01	2.00	2.00
Estimation Technique	LS	LS	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported. D (gapext)=D (rcb) - D (r*) - $D(\hat{e}^e_{t+6})$

B. Cointegration Vector

Variable	Dependent Variable (Rer) Coefficients	
$\frac{g_t}{y_t}$	-5.12	-6.46
	(1.57)	(1.82)
$\frac{e_t l_t}{y_t}$	0.63	0.64
	(0.28)	(0.32)
Rlpt	-1.40	-1.48
	(0.43)	(0.43)
Tot	0.14	-
	(0.20)	
Log likelihood	1619.5	1310.8
Estimation Technique	Johansen	Johansen

Standard errors in parenthesis, constant not reported.

Table 4.8
Capital Inflows

Sample	Dependent Variable 1989:01-1999:06					
	D(Total Flows/GDP)		D(Short Term Flows/GDP)		D(Affected Flows/GDP)	
D (rcb) - D (r*) - D($\hat{e}^{e}_{t+6}$)-D(ρ)	-0.00 (1.03)	-0.00 (1.08)	-0.00 (1.03)	-0.00 (1.67)	0.00 (0.69)	0.00 (0.45)
D(err)	-0.014 (1.78)	-	-0.014 (1.78)	-	-0.024 (2.57)	-
D(urr)	-	-0.013 (0.66)	-	-0.019 (0.82)	-	-0.028 (1.47)
D($\frac{e_t l_{t-1}}{y_t}$)	-4.04 (3.10)	-4.00 (3.05)	-4.07 (2.92)	-4.01 (2.89)	-1.86 (1.99)	-1.55 (1.78)
D($\frac{ls_{t-1}}{l_{t-1}}$)	-3.91 (3.22)	-3.96 (3.22)	-5.61 (3.66)	-5.72 (3.62)	-1.97 (2.38)	-1.92 (2.31)
D($\frac{wfk}{wy}$)	1.30 (1.23)	1.31 (1.25)	1.85 (1.56)	1.86 (1.58)	0.64 (0.62)	0.60 (0.61)
D(ix_remit)	0.52 (7.31)	0.52 (7.32)	-	-	0.33 (2.19)	0.30 (1.87)
D(ix_issues)	0.02 (0.28)	0.02 (0.25)	-	-	-0.01 (0.11)	-0.02 (0.21)
D(ix_comp)	-	-	0.57 (1.47)	0.57 (1.49)	-	-
D(rer)	1.44 (1.63)	1.45 (1.61)	1.71 (1.80)	1.73 (1.76)	0.24 (0.26)	0.19 (0.21)
D(tot)	0.26 (0.69)	0.27 (0.72)	0.56 (1.65)	0.58 (1.68)	0.38 (1.58)	0.39 (1.59)
D($\frac{g}{y}$)	-1.37 (1.19)	-1.37 (1.19)	-0.79 (0.80)	-0.79 (0.81)	-1.10 (1.24)	-1.04 (1.18)
D($\frac{y}{\bar{y}}$)	-0.50 (2.52)	-0.51 (2.42)	-0.40 (1.92)	-0.41 (1.92)	-0.51 (2.06)	-0.52 (1.95)
Adjusted R^2	0.55	0.54	0.53	0.52	0.49	0.47
DW	1.98	1.98	1.97	1.97	2.11	2.08
Estimation Technique	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS

Newey-West consistent t-statistics in parenthesis, constants not reported.
The instrumented variables are real exchange rate, the ratio of actual output to potential output. The instruments are lags of each variable.

Table 4.9
Capital Inflows

Sample	Dependent Variable 1989:01-1999:06					
	D(Total Flows /GDP)		D(Short Term Flows /GDP)		D(Affected Flows /GDP)	
D (rcb) - D (r*) - D($\hat{e}^e_{t+6}$)-D(ρ)	0.002 (2.00)	0.002 (1.47)	0.001 (1.06)	0.00 (0.75)	0.002 (1.79)	0.002 (1.48)
D(err)	-0.0178 (2.07)	-	-0.0183 (2.10)	-	-0.0136 (2.31)	-
D(urr)	-	-0.023 (1.32)	-	-0.025 (1.42)	-	-0.019 (1.48)
D($\frac{e_t l_{t-1}}{y_t}$)	-1.23 (2.12)	-1.34 (2.25)	-1.17 (1.84)	-1.13 (2.78)	-0.21 (0.73)	-0.12 (0.43)
D($\frac{ls_{t-1}}{l_{t-1}}$)	-1.73 (3.85)	-1.87 (3.87)	-3.19 (5.17)	-3.41 (5.30)	-0.06 (0.22)	-0.17 (0.57)
D($\frac{wfk}{wy}$)	1.65 (2.17)	1.48 (2.02)	1.62 (1.62)	1.49 (1.56)	1.08 (1.40)	1.06 (1.41)
D(ix_remit)	0.06 (0.65)	0.05 (0.44)	-	-	0.04 (0.96)	0.03 (0.64)
D(ix_issues)	-0.11 (1.92)	-0.11 (2.12)	-	-	-0.10 (1.70)	-0.10 (1.67)
D(ix_comp)	-	-	-0.13 (0.63)	-0.12 (0.61)	-	-
D($\frac{cas}{\bar{y}}$)	-1.09 (5.51)	-1.06 (5.39)	-0.99 (5.06)	-0.98 (5.07)	-0.98 (12.03)	-0.99 (11.16)
Adjusted R^2	0.70	0.69	0.66	0.66	0.59	0.57
DW	1.91	1.90	1.97	1.97	1.71	1.66
Estimation Technique	TSLS	TSLS	TSLS	TSLS	TSLS	TSLS

Newey-West consistent t-statistics in parenthesis, constants not reported.
The current account surplus is instrumented using: lags of itself, the terms of trade, the ratio of government expenditure to GDP, and lags of exchange rate and the ratio of actual output to potential output.

Table 4.10
Portfolio Share of Short-Term Net Foreign Liabilities in Total Net Foreign Liabilities

Sample	Dependent Variable 1989.01-1999:06	
PDL(D(rcb));-1,-5,2)	0.00 (0.46)	0.01 (0.69)
PDL(D(r^*));-1,-5,2)	-0.00 (0.01)	0.00 (0.29)
PDL(D(D(D($\hat{e}^e$)));-1,-5,2)	0.00 (0.64)	0.00 (0.71)
PDL(D(err));-1,-5,2)	-0.01 (2.81)	-
PDL(D(urr));-1,-5,2)	-	-0.01 (1.91)
PDL(D($\frac{e_t l_{t-1}}{y_t}$);-5,-10,3)	-0.31 (1.66)	-0.28 (1.48)
PDL(D(ix_remit);-1,-12,3)	-0.10 (2.79)	-0.11 (3.24)
Adjusted R^2	0.17	0.16
DW	1.81	1.78
Estimation Technique	LS	LS

Newey-West consistent t-statistics in parenthesis, constants not reported.
PDL (X;,A,B,C) stands for a polynomial distributed lag for the X variable, where A and B are the first and last lag, respectively, while C is the order of the polynomial.