Capital Controls in Chile: Effective? Efficient? [†]

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Abstract

New empirical evidence with regards to the effectiveness and efficiency of Chile's capital controls is provided here, based on more and better data on the range of controls and a broad assessment of their costs and benefits. The paper concludes that capital controls have been partially effective by raising the wedge between domestic and foreign interest rates, 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 been crucial by contributing to Chile's lower exposure to short-term foreign liabilities at the time of the 1997-98 international financial turmoil. However, achieving temporary macroeconomic benefits by relying on capital controls involves incurring in financial and growth effects that raise concerns about their efficiency. The costs that resulted from the policy mix that comprised the capital controls, in terms of quasi-fiscal losses and lower investment and growth, were probably not negligible.

Resumen

Este trabajo presenta nueva evidencia empírica sobre la efectividad y eficiencia de los controles de capital en Chile. La evidencia se basa en más y mejores datos sobre estos controles y en una estimación aproximada de algunos de sus costos y beneficios potenciales. En el trabajo se concluye que los controles de capital han sido parcialmente efectivos en aumentar la diferencia entre las tasas de interés internas y externas, reducir los flujos netos de capitales, y cambiar la madurez de los pasivos externos, aunque sin afectar significativamente al tipo de cambio real. El efecto sobre la madurez de los pasivos externos (hacia plazos más largos) pudo haber jugado un rol trascendente durante la crisis financiera internacional de 1997-98. Sin embargo, parte de estos efectos son transitorios debido a que la efectividad de los controles se erosiona a través del tiempo por la existencia de diferenciales positivos de tasas de interés. Los controles de capitales, no obstante generar beneficios macroeconómicos transitorios, también producen efectos financieros y sobre el crecimiento, los que deben ser tomados en cuenta para evaluar su eficiencia. Existen costos importantes, en términos de déficits cuasi-fiscales y menores tasas de inversión y crecimiento, resultantes de la combinación de políticas de las cuales el encaje es parte integrante.

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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, etc. 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 three directions: first, it provides an alternative measure of the financial cost of the reserve requirement, 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; and third, it evaluates various potential "social" costs of capital controls (more precisely, of the policy mix that accompanied the controls).

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. Section 4 presents a simple dynamic model to analyze the effects of capital controls on macroeconomic and financial aggregates. 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 5. A discussion of the quasi-fiscal, financial, and growth costs of capital controls takes place in section 6. The paper concludes with a brief summary of benefits and costs of Chile's capital controls presented in section 7.

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 in future research. A more detailed review of the literature is provided in Annex 1.

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 related questions, namely:

1. 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 set by the authority)?
2. Has the URR allowed for a lower real exchange rate—a more depreciated currency—than it would have been the case otherwise?
3. Has the URR contributed to a sounder—less risky—inflow composition, in the sense of inducing inflows of longer maturity?

These questions arise directly from the reasons argued by the authority to impose and maintain the URR in place from June 1991 through September 1998[1].

The existing research on this subject has addressed these questions using two complementary approaches, namely:

A. Single equation models (SEMs) in which the domestic interest rate (i_d), the real exchange rate (RER), and the composition of flows are regressed against the URR and other explanatory variables, and
B. Vector auto-regressive (VAR) models.

The SEMs are aimed at identifying and measuring the direct effect of the URR—controlling for other determinants—on any of the three dependent variables (i_d, RER, and the composition of flows). One disadvantage of this approach is that it requires strong assumptions regarding the functional form of the equations to be estimated (i.e., the relationship among the different variables) and exogeneity of the right hand side variables. Furthermore, there is a risk of an estimation bias because of missing variables. The VAR approach, on the other hand, addresses these problems since it identifies the dynamic relationship existing among the variables, imposing only minimum identification restrictions. However, it does not provide a direct measure of the effect of the URR on the variables of interest, nor does it identify the channel through which the URR works.

Using quarterly data for 1987-96 and the SEM approach, 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. This effect was stronger (albeit marginally significant) during 1995-96, when the URR was higher, and when a non-linear single equation model is used in the estimations. Also using a SEM approach but monthly data for 1991-96, Eyzaguirre and Schmidt-Hebbel (1997) reach a similar conclusion regarding the composition of inflows; in particular, they find that the URR reduces the share of short-term flows and increases that of long-term flows. Also, the latter find that the URR increases the effectiveness of monetary policy—the URR permits a higher interest rate differential with foreign rates—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 to different specifications for the estimated equations.

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 assert that the URR did

[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.

affect neither the real exchange rate nor the interest rate differential. However, the way this model is estimated and the sample period 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, namely, the liberalization of capital outflows and inflows, and for changes in the URR other than the tax rate (i.e., coverage and presence of loopholes)[3]. The recent paper by De Gregorio, Edwards and Valdés (1999) addresses the latter limitation by including a new variable aimed at measuring the presence of loopholes (an index measuring 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—permitted a higher domestic interest rate—and changed the composition of inflows toward long-term flows. However, like previous studies, they are still unable to find any significant effect on the real exchange rate (RER) and on total inflows.

The latter result regarding the RER presents a puzzle, since the higher level of the domestic interest rates—supported by the URR—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 the SEM approach is most likely due to mispecification problems. This is corroborated by the results reported in the two studies that use the VAR approach, 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 exchange rate 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—or a larger differential with 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. This issue requires additional research.

Additional methodological aspects remain to be addressed in future empirical research. Among these are the need to properly control for the liberalization of capital inflows and outflows—something we attempt to do here—, and permitting other functional forms for the relationship between the URR and the variables of interest[4]. Also, there is the need to consider the social costs and welfare implications of the URR, something we also attempt to do—albeit indirectly—in this paper (see section 6).

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[2] The capital control —or URR— index used in this regression is positively correlated with the dependent variable (inflows) by construction, biasing its estimated coefficient upwards. In particular, the capital control index is measured as the URR tax-rate times the tax base. The latter, in turn, is constructed as the cumulative capital inflows since 1985. This puts the contemporaneous inflow variable on both sides of the estimated equation. In addition, the sample period comprises years when capital inflows were not entirely voluntary—voluntary flows to Chile resumed only in 1989.

[3] For a critical review of the literature—without rigorous empirical analysis—see Nadal-De Simone and Sorsa (1999).

[4] It is plausible that the URR affects the inflow of capital—through the interest rates differential—in a non-linear way, especially since it puts a wedge separating the decision to borrow from abroad from that of investing abroad (the URR separates the two conditions of arbitrage). It is worth noting that none of the empirical papers exploring this relationship allows for a non-linear specification in this regard.

3. Capital Controls in Chile during the 1990s

Trends of Capital Controls worldwide and in Chile

While controls on inflows and outflows can be equivalent under steady-state conditions (as argued by Laban and Larraín, 1997), they are very different under non-stationary conditions and, in particular, in a crisis situation. Indeed, controls on inflows (like Chile's 1991-98 reserve requirement) are imposed ex-ante in a preventive way, while controls on outflows are typically imposed as ex-post measures to stem capital outflows (like Chile's 1982 and Malaysia' 1997 controls). As a change in the rules of the game that amounts at least to a temporary expropriation, controls on outflows are much more costly to foreign investors and to the countries that impose them. In addition, the international evidence suggests that controls on outflows are easier to evade than those on inflows. Finally, controls on inflows are pro-cyclical (they are imposed when the world supply of capital increases), while controls on outflows are anti-cyclical.

Chile is no exception to this world experience, with a long history of controls on capital account flows and 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 Latin American 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. We review the specific restrictions and their changes observed during the last decade next (see Table 3.1 and annexes 2, 3 and 4).

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. As summarized in Annex 2, 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:

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

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[5].

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, as calculated by Herrera and Valdés (1998). However, in 1996 the CBCh restricted the possibility of rolling over maturing investments, reducing the relevance of this option value.

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^*[6], albeit the latter was also affected by changing market conditions. (See Annex 5 for a detailed description of how urr and its components are measured in this paper.) The resulting urr series (Fig. 3.1) shows a growing trend until late 1997, largely explained by the rising share of up-front fee payments[7]. 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 made in lieu of the reserve deposit. 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 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 June 1991-September 1998 period, the total equivalent reserve deposit attained an average of 2.0% average GDP, or 40% of the average capital-account surplus.

However, as in the case of any other tax, the URR provides an incentive for tax elusion and tax evasion.[8] 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 (see annex 5 for a detailed

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5 For details on the applicable i* see annex 5.

6 The CBC changed from the Yen i* to the Dollar i* in November 1994. See annex 2 for details.

7 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* (see annex 2). However, this result is in part due to having underestimated in our 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.

8 Le Fort and Sanhueza (1997) provide a good description of the elusion that occurred during the period when the URR was in effect.

discussion of this and related measures). 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[9].

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). This pattern is shown in the figures 3.3 and 3.4. In the former figure it is possible to observe that the share of effectively affected inflows in the total increased in time up to 1995, next there is a transitory decline in this share in 1996, and a further increase in 1997. A more formal analysis to explain the behavior of the power of the URR is presented in section 5 below.

Combining the simple measure of the cost of the URR (urr), adjusted for changes in the coverage of the capital base on which the URR is required (cov), and the effectiveness or power of the tax (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%.

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. The solvency requirements impose minimum rating levels provided by risk-rating agencies to corporations that issue equity and bonds internationally. Size requirements refer to floors regarding absolute amounts on any issue of stocks and bonds. Both restrictions were partly liberalized during the last decade, as reflected by their combined measure –*ix_issues*– depicted in Fig. 3.5.

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

[9] See annex 5 for more details on the construction of the relabeled flows.

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 overall 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—banks, insurance companies, and pension funds—relative to their capital. Further restrictions on outflows that were lifted are requirements imposed on exporters to surrender their export proceeds to the CB (these were fully abolished in July 1995). An aggregate index for the two latter regulations and a host of other secondary administrative controls on outflows as described in annex 4 is depicted as *ix_other* in Fig. 3.5.

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. Collinearity among the three quantitative restrictions is very high during the whole sample period as liberalization was implemented across all categories of restrictions[10].

4. A Simple Model of the Macro-Financial Dynamics of Capital Controls

Do capital controls affect macroeconomic aggregates and financial variables –and if they do, are they temporary or permanent effects? How does a tax on capital account transactions affect domestic interest rates, the real exchange rate, and capital inflows? In which direction do impact and long-term effects go? We address these questions next with the help of a simple, reduced-form, and qualitative open-economy model. The setup is in the tradition of the Australian two-sector small open economy equilibrium complemented by a conventional portfolio equation that reflects imperfect substitution between foreign and domestic assets. Goods and asset markets clear instantaneously and forwarding-looking behavior is characterized by perfect foresight.

The government establishes an ad-valorem tax on the stock of net foreign assets (liabilities) held (issued) by domestic residents. The tax is symmetric in the sense that it affects both capital outflows and inflows; thus, no distinction is made here between taxes on outflows and inflows. The tax is independent of both the type of capital inflow transaction and its maturity. The tax is collected by the government –consolidated with the central bank– from domestic (foreign) holders

[10] Pairwise correlation coefficients between the aggregate indexes for capital inflow restrictions (*ix_issues*), permanence requirements (*ix_remit*), and other capital outflows restrictions (*ix_other*) are 0.85, 0.96, and 0.88 for the first and second, first and third, and second and third. The standard deviation for all three correlation coefficients is 0.089.

of foreign (domestic) assets, and returned to the domestic private sector in lump-sum fashion. The exchange rate is fully flexible and the consolidated public sector does not hold any foreign assets.

Imperfect asset substitution between domestic government bonds and net foreign assets is reflected in a standard portfolio equation. A particular functional form of the latter, consistent with standard Brainard-Tobin portfolio equilibrium features, can be rewritten as an international interest arbitrage condition for the (expected equal actual) rate of depreciation of the real exchange rate:

$$\frac{e_{t+1} - e_t}{e_t} = r_t - r_t^* - tax_t - r\left(\frac{b_{t-1} + e_t k_{t-1}}{e_t k_{t-1}}\right) \tag{4.1}$$
$$(+)$$

where e is the real exchange rate (up is down and down is up, in the confusing LDC tradition[11]), r is the domestic real interest rate, r^* is the foreign real interest rate, tax is the tax on foreign capital holdings, b is outstanding domestic government debt in real domestic-currency units, k is outstanding net foreign assets in real domestic-currency units, and r is a risk-premium function that depends positively on domestic debt relative to foreign assets. Stocks are dated at end of period, sub-index t denotes the time period, and a sign under a variable denotes the sign of the corresponding partial derivative.

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 (tot), and government spending (g):

$$k_t - k_{t-1} = cas\,(r_t,\ e_t,\ k_{t-1},\ tot_t,\ g_t) \tag{4.2}$$
$$(+)\ (+)\ (-)\ (+)\ (-)$$

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 (rlpt) is included. Solving the non-traded goods equilibrium condition as an implicit function for the real interest rate yields:

$$r_t = r\,(e_t,\ k_{t-1},\ tot_t,\ g_t,\ rlpt_t) \tag{4.3}$$
$$(+)\ (+)\quad (+)\ (+)\ (+)$$

Substituting the real interest rate from eq. (4.3) into equations (4.1) and (4.2) yields a system of two reduced-form difference equations for the real exchange rate and the stock of net foreign assets:

[11] In other words, an increase is a depreciation.

$$\frac{e_{t+1} - e_t}{e_t} = r\left(e_t,\ k_{t-1},\ tot_t,\ g_t,\ rlpt_t\right) - r_t^* - tax_t - r\left(\frac{b_{t-1} + e_t k_{t-1}}{e_t k_{t-1}}\right) \tag{4.4}$$
$$(+)\ (+)\ (+)\ (+)\ (+) \qquad (+)$$

$$k_t - k_{t-1} = cas\left(e_t, k_{t-1}, tot_t, g_t, rlpt_t\right) \tag{4.5}$$
$$(+)(+)\ (+)\ (+)\ (+)$$

where sign dependencies in equation (4.5) assume that coefficient signs in the non-traded equilibrium condition (4.3) dominate those in the net foreign asset accumulation equation (4.2).

Imposing stationary equilibrium conditions on equations (4.4) and (4.5) yields long-term equilibrium values for the state variable *k* and the jumping variable *e*, and (by substituting the two latter into equation 4.1 or 4.3) for *r*. Dynamic equilibrium exhibits saddle-path stability as depicted in Fig. 4.1.

Now consider a rise in the tax on foreign asset holdings (Fig. 4.2). The tax imposes a long-term wedge between domestic and foreign arbitrage interest rates, encouraging a portfolio shift from domestic to foreign assets (i.e., lower foreign indebtedness). Net foreign assets are higher and the equilibrium real exchange rate (as a result of larger net private wealth) is more appreciated in the long-term, as reflected by the new steady-state equilibrium at point C (Fig. 4.2, higher panel)[12]. On impact the real exchange rate depreciates (point B), starting a subsequent process of real exchange rate appreciation and net foreign asset accumulation toward point C.

The long-term interest rate will be higher than the initial rate (at point C, lower panel) if the tax wedge effect on the domestic rate dominates the decline in country risk premium that arises from the larger net foreign assets. This is likely if domestic and foreign assets are relatively close substitutes—i.e., when the risk premium r is not excessively sensitive to changes in the relative holdings of domestic and net foreign assets. On impact the real interest rate will increase by the sum of the tax increase (positive) and the real exchange rate depreciation (which is negative). If the positive tax effect dominates, the interest rate could rise on impact (to points B or B', lower panel). In the (unlikely) opposite case, the interest rate could fall (point B'') on impact.

This simple framework suggests that a tax on foreign asset holdings can have very different impact and long-term effects. While it contributes to a short-term real exchange rate depreciation, in the long-term the tax may appreciate the real exchange rate as a result of lower net foreign indebtedness. The current account (capital account) exhibits a temporary surplus (deficit). Real interest rates are raised in the short-term by the direct effect of the tax, but lowered by the temporary real exchange rate expected appreciation. The long-term domestic interest rate is likely to be higher after the tax under conditions of empirically reasonable (high) asset substitutability.

[12] Note that this simple framework abstracts from further wealth effects that could arise from an endogenous response of domestic real capital to a permanently higher interest rate by implicitly assuming an endowment economy. In addition the possible inconsistency between permanent changes in the difference between the domestic interest rate and the subjective discount rate is not addressed here. Taking account of the latter would require developing a micro-founded small open economy model, which is beyond the scope of this paper.

5. 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 in section 4.

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:II sample 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. During this decade, Chile liberalized gradually its administrative restrictions on both capital inflows and outflows and, from June 1991 through September 1998, imposed the URR discussed in section 3. We use monthly data for all regressions, implying a maximum sample of 126 observations. Data definitions and sources are discussed in Annex 6.

Specification of equations encompasses the simple equations of the model discussed 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. Estimation is by individual equations. 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[13].

5.1 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 5.1

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 5.1, 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

[13] Unit root and co-integration test results are available upon request.

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.

According to the discussion in section 3, the *urr* was imposed in 1991 in order to retain control of monetary policy (for achieving the inflation target), to reduce external vulnerability (by stemming the growing tide of capital inflows, particularly of the short-term or financial types), and to maintain external competitiveness (by reducing the deviation of the real exchange rate from its long-term equilibrium level). Further changes in urr and its coverage were imposed by the Central Bank to stem the loss of power due to evasion and elusion by private market participants.

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:

$$
\begin{aligned}
urr_t = {} & a_0 + a_1\, PDL(p_t - pt_t) + a_2\, PDL\left(\frac{e_t\, kf_t}{y_t}\right) + a_3\, PDL\left(\frac{kfl_t}{kf_t}\right) \\
& \qquad\qquad + \qquad\qquad + \qquad\qquad - \\
& + a_4\, PDL\left(\frac{e_t - \bar{e}_t}{\bar{e}_t}\right) + a_5\, PDL(pow_t) + a_6(r_t^* + r_t) + a_7(r_{t-1}^* + r_{t-1}) \\
& \qquad\qquad - \qquad\qquad - \qquad\qquad + \qquad\qquad - \\
& + a_8 \frac{wfk_{t-1}}{wy_{t-1}} \\
& \qquad +
\end{aligned}
\tag{5.1}
$$

where (π - $\pi\tau$) is the difference between actual and target inflation, e is the real exchange rate, (w)kf is total net capital inflows (to all 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. 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. 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 5.2 and 5.3 confirm the relevance of equation (5.1) 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 $(r^*+\rho)_{-1}$ [14]. Also, the URR was raised in response to a higher rate of exchange rate appreciation, reflecting the CB concern with deterioration in foreign competitiveness. (In one of the equations in table 5.3, 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.)

It is also interesting to note that urr falls with its own power (Table 5.2). 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.

In the 1990s, the Central Bank started lifting administrative controls on both capital inflows and outflows. Because of the strong observed correlation of controls on inflows and outflows noted in section 3, we construct 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 (5.2).

$$(5.2) \qquad ix\_comp_t = b_0 + b_1\, t + b_2\, t^2 + b_3\, PDL\left(\frac{e_t\, kf_t}{y_t}\right) + b_4\, PDL\left(\frac{e_t - e_{t-1}}{e_{t-1}}\right) + b_5\, PDL\left(err_t\right)$$

$$\qquad\qquad\qquad\qquad\qquad\qquad\quad - \qquad ? \qquad\qquad - \qquad\qquad\qquad + \qquad\qquad\qquad +$$

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 5.4 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

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:

[14] Note that the positive coefficients for the contemporaneous cost of funding $(r^*+\rho)_t$ in tables 5.2 and 5.3 do not have a meaningful interpretation; i.e., $(r^*+\rho)_t$ is included in the regressions to control for the fact that it is part of urr_t.

$$
\begin{aligned}
r_t = {} & g_0 + g_1 r_t^* + g_2 \hat{e}_t^e + g_3 err_t + g_4 r_t + g_5 ix\_outflows_t + g_6 \frac{e_t l_{t-1}}{y_t} \\
& + g_7 \frac{cas_t}{y_t} + g_8 \left(\frac{y_t}{\overline{y}_t} \right) + g_9 tot_t + g_{10} \left(\frac{g_t}{y_t} \right) + g_{11} \left(\frac{m_{t-1}}{y_t} \right) + g_{12} (p_t - pt_t)
\end{aligned}
\tag{5.3}
$$

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*)[15] 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 (5.3) are implemented: one for *cbr*, the Central Bank policy real rate of interest[16] 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 the central bank shows lower variation[17]. 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 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 5.5 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

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

[16] On 90-day maturity instruments until 1995; overnight rate afterwards.

[17] 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*.

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 5.6 show that all components of the foreign interest arbitrage variable, including the different elements of the 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 presented above in several respects. In particular, we solve equation 4.4 for the contemporaneous level of the real exchange rate –implying that most coefficients change sign– and include other variables that influence the equilibrium in non-traded goods (like the phase of the cycle). In addition, 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:

$$\begin{aligned}(5.4)\quad \Delta \log e_t = {} & d_o + d_1 \Delta\, rlpt_t + d_2 \Delta\left(\frac{e_t l_{t-1}}{y_t}\right) + d_3 \Delta\left(\frac{g_t}{y_t}\right) + d_4 \Delta\, tot_t + d_5 \Delta\left(\frac{y_t}{\bar{y}_t}\right) + d_6 \Delta\, r_t \\ & + d_7 \Delta\, r_t^* + d_8 \Delta \hat{e}^e_{t,t+1} + d_9 \Delta\, err_t + d_{10} \Delta\, r_{t-1} + d_{11} \Delta\, E_{t-1}\end{aligned}$$

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[18].

We proceed in two steps. First, a co-integration relationship was found among a small number of I(1) variables that are potentially linked by a long-term relationship (bottom of Table 5.7). 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. Next, we include the lagged residual from the cointegration relationship in a standard error-correction model that considers as regressors many other short-term determinants of the exchange rate devaluation (top of Table 5.7)[19]. 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:

$$\frac{e_t\, kf_t}{y_t} = l_o + l_1\left(\frac{e_t l_{t-1}}{y_t}\right) + l_2\, tot_t + l_3\,\frac{g_t}{y_t} + l_4\left(\frac{y_t}{\bar{y}_t}\right) + l_5\, e_t + l_6\, r_t + l_7\, r_t^* + l_8\, \hat{e}^e_{t,t+1} + l_9\, err_t + l_{10}\, r_t + l_{11}\frac{ks_{t-1}}{k_{t-1}} + l_{12} ix\_remit_t + l_{13} ix\_issues_t + l_{14}\,\frac{wfk_t}{wy_t} \tag{5.5}$$

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 (5.5), 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 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.

---

[18] We assume that the negative effect through portfolio shifts (i.e., the interest rate arbitrage condition) dominates the positive effect through investment- saving decisions (i.e., the expenditure channel).

[19] 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.

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 5.8 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 5.8.

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 5.9, 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:

$$(5.6) \qquad \frac{ls_t}{l_t} = m_o + m_1\, r_t + m_2\, r_t^* + m_3\, \hat{e}_t^e + m_4\, err_t + m_5\, ix\_remit_t + m_6 \left(\frac{e_t\, l_{t-1}}{y_t} \right)$$

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 5.10 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.

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.

A monetary policy function, complemented by imperfect foreign interest arbitrage, was estimated for the CBCh's policy rate. 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.

An error-correction model for the real exchange rate that reflects temporary and permanent influences of both short and long-run non-traded goods market equilibrium determinants and temporary asset-market equilibrium forces did not yield significant effects of Chile's capital controls. 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 section 4.

A similar model –reflecting the influence of short and long-term effects 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).

6. Potential costs of the URR

The existing research has focused on the macroeconomic aspects of the URR and its effects, neglecting all microeconomic considerations. However, there are strong reasons to address microeconomic and welfare implications of the URR. Indeed, the finding reported above concerning the URR's positive (direct and indirect) effect on the level of domestic interest rates, suggests that some costs may have been paid in Chile since 1991, due to the reallocation of resources induced by the higher prevailing interest. Among these are the use of resources in the search for loopholes and, associated to it, the cost of uncovering and closing these loopholes (incurred by private investors and the authorities, respectively). In this section we discuss the most important costs derived from the URR and the policy mix that accompanied it, and to the extent allowed by the data, attempt to quantify them.

6.1 Non-measurable costs

Market segmentation. The most obvious cost arises from the fact that the URR discriminates among investors with different access to capital markets, and between investment projects with different expected productive lives. Since information asymmetries play a crucial role in financial markets, and there are fix costs—i.e., economies of scale—of overcoming them, usually small borrowers have limited access to capital markets and, like short-term investors, must rely largely on bank lending to fund their operations. To the extent that it is more difficult for the banking system to elude the URR, either because it is closely monitored by the authorities or due to the nature of its business, small investors (and projects with a shorter life) will bear a proportionately larger cost of the URR. Thus, it is expected that the URR will represent a larger tax for small and medium size enterprises, deterring their growth and giving a competitive advantage to larger enterprises with direct access to international capital markets.

Also, the existence of the URR, especially if it is in place for a long period, may exacerbate the process of financial desintermediation. This will occur since companies with access to long-term funding through the issue of primary ADRs (and long-term bonds) will have an additional incentive not to finance their investments through the banking system. This will also occur in the medium-term, as the search for loopholes in URR regulations will lead to the development of new (and less efficient) forms of financing (i.e., through direct credit from foreign suppliers). In sum, the URR will, at the margin, exacerbate the asymmetries existing in financial markets between small and large businesses, while artificially discriminating against short-term projects (those that are more heavily taxed) and promoting the development of less efficient ways of financing.

Search for loopholes. To the extent that the URR creates profitable arbitrage opportunities, a result that depends on the monetary policy stance followed after imposing the URR, businessmen will allocate resources to the search of loopholes in URR regulations. The resources spent in these search activities, as well as those spent by the authorities in detecting and closing loopholes, are a clear deadweight for the society as a whole. These search losses are dependent on the URR leading to higher domestic interest rates, something that has been convincingly proved in this and previous research as occurring in Chile. Moreover, the microeconomic distortions referred above will be more acute if because of the URR, short-term interest rates increase proportionately more than long-term rates, a likely result considering the nature of the Chilean URR.

Indirect evidence. It is important to note that the extent of these distortions and their associated costs are proportional to the interest rate differential with abroad, itself a result of the monetary policy applied after imposing the URR. In the case of Chile the CB increased short-term interest rates to dampen aggregate demand and avoid overheating several times before and after imposing the URR—in fact the URR was introduced in an attempt to increase the effectiveness of a tight monetary policy. An indirect manner to assess the extent of the distortion introduced with the URR is by looking at changes in the slope of the term-structure.

Figure 6.1 shows the differential between long- and short-term CB interest rates through the late 1980s and 1990s, and highlights (gray areas) the periods when the CBCh tightened monetary policy in order to dampen aggregate demand. During the periods when the CB's policy rate was relatively high, the short-term rate was higher than the long-term rate—i.e., the term-structure was negatively sloped. A similar conclusion follows when looking at the term-structure of interest rates constructed from the yields observed in the secondary market; i.e., the term-structure was negatively sloped several times during the 1980s and 1990s (figure 6.2)[20].

It is important to note that the term structure had a negative slope—indicative of the degree of microeconomic distortion—at times when the monetary policy was tightened, but not necessarily when the URR was raised. This is clearly seen in figure 6.1 that shows a normal (positively sloped) term-structure during 1992, the year when the URR rate was increased from 20 to 30 percent. This finding is confirmed by regressing the difference between long- and short-term interest rates against the URR and the CB's policy rate. Table 6.1 shows that the CB's monetary policy rate reduced the slope of the term structure, whereas the URR had no significant effect on it.

Thus, the URR affected the level of domestic interest rates—especially short-term rates—and lead to resource misallocation only indirectly through the tight monetary policy applied by the authority. This is consistent with the findings in section 5—and in previous research[21]—regarding the different coefficients found for the URR and the CB's rate in the regression that explains market deposit rates (see table 5.6).

6.2 Measurable costs

Given the result above, it can be argued more generally that the potential costs are not due to the URR *per se*, but to the macroeconomic policy stance that accompanied and was supported by it, namely, a tighter monetary policy, a more expansionary fiscal policy, and a less flexible exchange rate policy than otherwise. This policy-mix proved to be costly to the extent that it led to higher domestic interest rates and the CB holding a larger stock of international reserves. In what follows we attempt to measure the costs associated with these outcomes.

A simple look at the data shows that during the 1990's relatively high interest rates prevailed. For instance, Loayza and Gallego (1999) compare the US T-bill 3-month rate with the

[20] The rates used in figures 6.1 and 6.2 are not comparable because the former are risk-free rates from CB securities (at the time of issue), while the latter are an average of the yields in corporate bonds, mortgages and CB securities takem from the secondary market.

[21] De Gregorio, Edwards and Valdés (1999) report that the URR is more important than foreign rates (i*) in explaining the level of domestic interest (i^d) rates, though in their model the two variables enter the estimated equation linearly and could be added. They explain this finding by arguing that the URR acts indirectly by permitting the authority to raise domestic rates.

rate in the CBCh 3-month notes during 1991:6 and 1997:12. They conclude that the average interest rate differential was about 4.62 percent per year. Of this, about 0.68 percent can be explained by the sum of country risk, foreign exchange risk, and exchange rate depreciation[22], while about 3.94 percent can be explained by the authorities' attempt to dampen aggregate demand by maintaining a tight monetary policy.[23]

Lower investment and growth. In addition to the misallocation of resources discussed above, the economy as a whole paid a cost derived from the lower investment and growth that resulted from the higher interest rates prevailing during the period. To assess this effect we proceed as follows: first we construct an estimate for the interest rate that would have prevailed without the URR. Next, relying on previous research on the determinants of aggregate investment and the stock of capital in Chile, we estimate the rate of investment and growth that would have existed without the URR. Though the exercise is done for each year during 1991-97, the discussion that follows refers to the average for the entire period.

Using actual data on foreign interest rates, foreign inflation, and the country risk premium[24], and assuming that the real exchange rate was expected to appreciate by 2 percent per year[25], we estimated a proxy for the real interest rate that would have prevailed in Chile during 1991-97. The resulting series, however, underestimated the rate that would have prevailed because of the foreign exchange (and possibly other) risk premium. We solved this by taking the difference between the resulting series and the actual deposit rates that prevailed in Chile during the 8 months immediately preceding the introduction of the URR. As this difference largely exceeds any plausible estimate of the exchange rate risk premium—mainly because the period prior to introducing the URR was one of monetary tightness—we interpret it as a measure of the '*unexplained interest differential*' (UID) that comprises the effect of both, the tight monetary policy applied and the FX risk premium. Based on these estimates we took four possible measures[26] for the UID, and proceeded to estimate the interest rate differentials for subsequent years that were caused and/or supported by the URR[27]. The results are reported in table 6.2 at the end. The estimates show that the increase in interest due or induced by the URR is in the range of 2 to 3

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22 Note that during this period the real exchange rate steadily appreciated.

23 Of this amount about 3.0 percent can be attributed directly to the URR, while 0.94 percent to other capital inflow taxes (Herrera and Valdés, 1997). Regarding the latter figure, there is a stamp-tax of 0.1 percent per month, with a ceiling of 1.2 percent (or twelve months), on all domestic credits. This was extended to foreign credits in mid 1990 (see annex 2).

24 For the foreign interest rate we used the dollar 180-days LIBOR, for foreign inflation we took the 6-month (forward) change in the US WPI, and for country risk premium we used the average of the actual spreads charged in bond issues by Chilean firms each year.

25 This rate corresponds to the (long-term) slope of the nominal exchange rate band announced by the authorities—the middle-point of this band moved by the difference between domestic and foreign inflation, minus an adjustment of 2 percent equal to the relative gain in productivity in the Chilean tradable sector. It is important to note that the assumption regarding the level of this rate is irrelevant for our purposes, since any measurement error in it carries on into the estimate for the UID.

26 This difference fluctuated widely between October 1990 and May 1991, because in the months prior to the introduction of the URR the Central Bank tightened (and then relaxed) monetary policy. In all calculations the domestic rate is the deposit real rate for similar maturities.

27 Since the base period—last quarter of 1990 through first half of 1991—was one of tight monetary policy (see figure 6.1), most likely the effect on interest rates attributed to the monetary policy stance will be overestimated for subsequent years. Hence, the effect on interest rates attributed to the URR and accompanying policies will tend to be biased downwards.

percent per year. These figures are fully consistent with those given in previous research based on a different approach[28].

Next, we use these interest differentials to estimate the effect on aggregate investment and economic growth. Based on the findings of Bustos et al. (1998), we estimate the capital-output ratio that would have existed in the absence of the URR[29]. Similarly, we also used the results reported by Lehmann (1991) to compute the new levels of aggregate investment that would have taken place if the interest rates had been lower[30]. Using these results and an *Incremental Capital Output Ratio* of 4.0—equal to the actual mean ICOR observed in Chile during 1991-97—we computed the cost in terms of lower growth[31]. The results are presented in table 6.3 at the end.

Overall, in the absence of the URR and the accompanying policy mix the Chilean economy would have grown by about half of a percentage point per year more than it actually did. The compound lost in output growth during the whole 1991-97 period fluctuates between 3.2 and 5.8 percent, depending on which results are used for the calculations[32]. Finally, the model estimated by Lehmann (1991) permits the computation of a social cost *á la* Harberger—that is, the deadweight measured as the area under the demand for investment. Measured in terms of the average GDP during 1991-97, this cost was about 1.56 percent per year (a cumulative cost of about 11 percent of GDP for the entire period).

Quasi fiscal losses. The tight monetary policy applied to dampen aggregate demand, jointly with the attempt to avoid a sharp appreciation of the real (and nominal) exchange rate, led to a large and rapid accumulation of international reserves at the CB through the 1990s. Thus, the stock of international reserves increased from US$ 2.5 billion (six months of imports) in 1988, to US$ 17.8 billion (11 months of imports) in 1997. Figure 6.3 shows the monthly percentage changes in the stock of international reserves and domestic credit from March 1989, through June 1998. It is clear that the monetary authority attempted through the decade to sterilize the increases in the monetary base caused by the surge in inflows (itself partly induced by the high interest rates).

Holding this stock of reserves—and financing it by the issue of domestic debt—imposed an important burden on the Central Bank's budget. However, the cost that could be attributed to the policy-mix chosen by the authority refers only to the stock of reserves held in excess by the Central Bank. This potential cost is equal to the reserves held in excess—in turn, the difference between the actual and the *optimum* level of reserves—times the difference in returns on domestic debt and that on foreign assets. To assess this cost we constructed two measures of the optimum level of reserves, each based on a different assumption. The first measure assumes that there is an optimum ratio between reserves and monthly imports, while the second assumes an optimum ratio between international reserves and domestic credit, the other component of the monetary base. We estimated these two equilibrium ratios using the average figures of monthly imports, international reserves,

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[28] The estimates given in the literature are based on the URR formula presented in equation 3.1 for different investment maturities.

[29] Using data for 1980-95, Bustos et al. (1998) estimate a model for the long-term capital-output ratio for the Chilean economy. Among the determinants in their model is the real interest rate.

[30] Using Chilean data for 1981-89, Lehmann (1991) estimates a model for the level of total productive investment.

[31] In the case of the model by Bustos et al. we also assumed that the investment rate changes in the same proportion than the capital-output ratio. This seems a reasonable assumption given that their model is valid for the long-term.

[32] These results are consistent with lower investment rates—as a share of GDP—of about 1.23 and 3.2 percent per year, respectively.

and domestic credit for 1985-88. Figure 6.4 shows the actual level of reserves, and the reserves held in excess during 1990-98 (measured as a share of the actual stock).

It is clear from figure 6.4 that the stock of reserves held by the CB through the 1990s was significantly higher than the optimum—on average, using the optimum average of 6.9 months of imports, about 37 percent of the stock held was excessive (52 percent if using the estimate based on the optimum composition of monetary base). The financial cost of holding the excess reserves was computed by taking the difference between the real interest paid on CB instruments, and LIBOR plus the change in the nominal exchange rate and minus domestic inflation. This difference was about 6.7 percent per year on average during 1990-98. Figure 6.5 shows the cost of holding excess reserves measured as a share of each year GDP. The estimated cost is not negligible; using the lowest estimate it averaged about 0.6 percent per year, and amounted to about 5.2 per cent of GDP on a cumulative basis (the corresponding figures for the highest estimate are about 0.8 and 7.2 percent, respectively). To calculate the overall financial cost for the CB, however, we need to subtract from this figure the proceeds received for the inflows that did not make a deposit with the CB, but preferred to take the fee option described earlier in the paper. The latter was on average about 0.11 percent of GDP per year during the period. Thus, the net cost for the CB represented a flow of about 0.5 percent of GDP per year on average, still a non-negligible amount.

It is important to note that the monetary cost of holding excess reserves do not necessarily mean a net social cost. If the agents bringing capital in are residents, then the CB losses represent just a transfer among nationals, but if the agents doing the arbitrage are non-residents, then the CB losses become a social cost. It is impossible to know the nationality of the counterparts of the CB losses. Thus, the figures calculated above need to be used with caution if they are interpreted as a social cost. Nevertheless, to the extent that these losses put in jeopardy the autonomy of the Central Bank—which will occur in the long-term if losses are sustained because of the erosion in CB's equity—there is a social cost associated to them (though the latter is not easily measured).

7. 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; second, we constructed indicators for other administrative measures aimed at liberalizing the capital account; third, we attempted to estimate the economic costs associated to the URR in terms of growth and quasi-fiscal losses; 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). It should be emphasized that the negative effects on short, medium and long-term growth of an episode of capital flight and a disruption in the access to international capital markets, may be quite substantial. The latter was shown by the experience of Latin America after the debt crisis of the early 1980s.

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.

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.

(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.

(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. Our results 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.

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Annex 1 Empirical Studies: summary of results and methodologies used

Study by	**S. Valdés & M. Soto (1998)**	*Comments*	**Laurens & Cardoso (1998)**	*Comments*	**C. Soto (1997)**	*Comments*
Frequency, period	Quarterly 1987-96	Comprises part of the period when inflows were not voluntary (1987-88)	Quarterly, 1989-1994 and 1985-94	Comprises part of the period when inflows were not voluntary (1985-88)	Monthly, 1991-96	
Theoretical model	Yes; partial equilibrium, single equation	Use back of the envelope (simple) formula; URR enters in a non-linear way in the estimation	NO; partial equilibrium, single equation	URR enters in a non-linear way in the estimation	Structural VAR	Use back of the envelope (simple) formula
Empirical model						
Controls for					Variables included are:	
- sterilization	YES	Change in CB's NFA as share of GDP	NO		- Domestic interest rate	
- scale flow variable	C.A balance for LAC countries	As a share of Chile's GDP	NO		- Capital control index	
- capital outflow liberalization	NO		NO		- RER	
- trade volume (credit)	YES		NO		- RER volatility	
- country risk rating	Use S&P rating	Take values 1 when invest. grade and 0 otherwise	NO		- Capital flows, level and composition	
- domestic interest rate set by the CB	YES	This is endogenous and its rationale also combine with change in NFA	use interest rate differential from abroad			
Dependent variable	Short-term credit flows from BoP net of URR plus EE&OO	EE&OO captures exempt flows	total flows, short-and long-term flows separately		All of the above	
Hypothesis tested	URR on ST flows		Whether flows			

	(and on the RER in previous paper)		respond to the URR		
Main Pitfalls	Endogeneity issue	Use instrumental variables		URR index induces misleading conclusions	
Main argument	Substitution between different flow types				
Conclusion	Ineffective (except marginally for high URR rates; i.e., in 1995-96, in previous versions) Previous studies find no systematic effect on RER	- Does not control for re-labeling - Does not control for loopholes closing (intensity and effectiveness of the URR)	No long-term effect on total capital inflows, the exchange rate, or interest rates (though no formal test is provided for the claim on the latter two variables); short-term negative impact on total flows; results are mixed regarding the composition of flows since a drop in short-term flows reverses after a few quarters (but a chart shows a decrease in the share of short-term flows in the total)	The way the model is set casts serious doubts on the validity of the authors' results. The capital control index—right hand side variable—has the dependent variable on it: it is calculated as flows times the tax rate. - Same pitfalls as in Valdés&Soto regarding loopholes and re-labeling	URR affects, though in a small amount and on a transitory basis: - the domestic interest rate (higher) - the nominal (and real) exchange rate (depreciates) - and real exchange rate volatility (lower) In the long-term the URR affects flows composition (skewed toward longer term)

Study by	**De Gregorio, Edwards and Valdés (1999)**	*Comments*	**Eyzaguirre & Schmidt-Hebbel (1997)**	*Comments*
Frequency, period	Quarterly 1987-96 and Monthly 1991-98		Monthly, 1991-1996	
Theoretical model	Yes, for the derivation of the URR formula	In the empirical part use a simple back of the envelope calculation; also a power index aimed at capturing the lack (or presence) of loopholes is used;	YES; portfolio equilibrium (macro) model	
Empirical model	one equation models in all cases plus VARs, linear effect	URR enters linearly in all the equations	one equation model in all cases; URR enters the equations linearly	Treats URR as an endogenous variable (estimates an equation for this purpose)
Controls for				
- sterilization	NO		Does it indirectly by putting the CB set rate as an explanatory variable in the interest rate equation	
- scale flow variable	yes, but resulted being non-significant		NO	
- capital outflow liberalization	NO		NO	
- trade volume (credit)				
- country risk rating	YES (relative to other countries)		NO	
- domestic interest rate set by the CB	(used as a dependent variable in the interest rate equation)	Control for the determinants of the CB policy (domestic inflation) instead	YES (see above)	
Dependent variable	Interest rates; total and short term-flows; real exchange rate		Short-term interest rate; flow composition; RER and URR (also ΔNFA)	
Hypothesis tested	URR on interest rates, flows (composition), and the RER			
Main Pitfalls	Endogeneity issue	Use Ivs		
Main argument	The URR gives the authority some room to meneuver; substitution between capital flows occurs			

Conclusion	The URR—using i* in dollars—does permit higher domestic interest rates and skew capital inflows toward long-term flows on a permanent basis; however, the RER is not affected by the imposition of URR	In the VAR estimations they find that the RER depreciates, on a transitory basis, with the increase in the URR; bottom line: there is no conclusive evidence on the effect on the RER	The URR has increased interest rates (though the results are not very robust), and through this channel it has reduced the CAD (though these results are rather weak). Similarly, the URR would have a small and transitory effect on the RER (though the results are not very robust) The URR has a strong effect on the composition of inflows	The URR responded (Δ^{+}) to movements in the RER (appreciation)

Annex 2 URR: changes in coverage, rates, and methodology

Date	Event	Comments
mid-1990	Stamp tax of 1.2% (max.) extended to all foreign credits	
June 15, 1991	20 percent URR was introduced to new foreign borrowing RR is in the same currency than the credit	Apply to foreign loans to banks and non-banks except direct trade credit, with the restriction that shipment must occur within six months. Holding period was equal to the loan maturity with a minimum of 3 months and a maximum of one year
June 27, 1991	URR can be exchanged for a paid up front fee, equal to the financial cost of the URR (using LIBOR for the calculation) URR is extended to all credits whose disbursement occurs abroad and those that will be used abroad URR is also extended to those credits that are linked to FDI projects	As these flows were exempt from the URR, this closes a loophole
January 23, 1992	URR extended to foreign exchange denominated term deposits held at commercial banks by domestic and foreign residents	Closes a loophole
May 28 1992	URR is increased to 30 percent, except for direct borrowing by firms which remains at 20% Holding period was set at one year for all flows	Cost increased proportionately more for banks than for non-bank borrowers
August 19, 1992	URR is set uniformly at 30 percent Paid-up front fee calculated at LIBOR + 2.5%	
October 30 1992	Paid-up front fee increased to LIBOR + 4%	
October 1993	Shipment of merchandise using trade credit (exempt from URR) must occur within 300 days	This enlarges the loophole of using trade credit to bypass the URR
November 1994	Up front fee becomes payable only in dollars	
July 4, 1995	Secondary ADRs become subject to the URR, since these are not longer considered as FDI. Other inward financial—non-FDI and non- primary ADRs—become subject to the URR.	Closes a loophole. (Note: since primary ADRs were considered capital additions, they were never subject to the URR.)

September 14, 1995	Period to purchase foreign exchange after selling ADRs in the domestic market is shortened to 5 days	Prior to this date, there was not a regulation forcing foreigners to take their capital out of the country after selling their stock holdings
December 1995	New foreign borrowing to prepay other loans is exempted from URR, when the new loan is of equal or shorter maturity than the remaining maturity of the (old) loan to be repaid	
June 1996	Foreign credits cannot be rolled over more than once within a year	Closes a loophole
October 23, 1996	FDI classifies as such—and is exempt from URR—only if it increases productive capacity	The FDI committee is in charge of determining whether the attempted investment classifies as FDI.
December 5, 1996	Foreign borrowing for up to US$ 200,000 (or US$ 0.5 MM per year) is exempted from URR	
March 1997	Minimum amount for exemption of the URR is reduced to US$ 100,000 in 12 months	
April 18, 1997	The remittance of funds—principal and profits—from investments by Chileans abroad is exempt from URR.	
September 22, 1997	The proceeds from closing positions in derivatives (options) in foreign markets becomes exempt from the URR	
June 1998	URR was reduced to 10 percent, except for credit lines and foreign currency denominated deposits	
August 1998	URR was eliminated for secondary ADRs.	This had the objective of recovering liquidity for ADRs, and reversing the declining volume of transactions in the local stock market.
September 16, 1998	URR was reduced to 0 percent	

Annex 3 Other measures aimed at liberalizing capital inflows

Date	Event	Comments
May 1992	Minimum solvency required to all financial and non-financial corporations aiming to issue bonds internationally (minimum solvency of A or higher)	The investment grade is given by the national risk classification commission (refers to a domestic rating)
October 1992	International issue of convertible bonds is authorized	
June 1993	The requirement for the issue of bonds was modified in the sense that rating from an international agency was required	Rating had to be equal or higher than sovereign risk
April 1994	Non-financial corporations have to be classified at least as BBB+ in order to issue bonds internationally; for banks the classification must be BBB or higher (prior classification was A for both) The minimum issue size is set at US$ 25 MM (reduced from US$50 MM) for non-banks; it stays at US$50 MM for banks	
September 1994	Financial corporations had to be classified at least as BBB+ to issue stock internationally; for debt the classification must be A/B or higher (BBB+ for subordinated debt)	
September 1994	Requirements for ADR issues are reduced from A to BBB+ and from a minimum of US$ 50 MM to US$ 25 MM (for first issues)	
November 1995	For firms issuing ADRs for a second time the minimum size is set at US$ 10 MM (from US$ 25 MM)	Prior to this date there was no rule referring to second issues (the same as first issues applied)
September, 1996	Requirements for minimum size of internationally issued bonds of non-financial corporations are reduced to US$ 10 MM.	
April, 1998	Requirements for minimum size of internationally issued bonds of non-financial corporations are reduced to US$ 5 MM. The minimum classification was reduced to BBB-	
June, 1999	Minimum maturaty requirements on internationally issued bonds of non-financial corporations are eliminated. The minimum rating for both bonds and ADR issues was lessened. Requirements of previous authorization for international bond issues are eliminated for both financial and (some) non-financial corporations	Prior to this date the minimum maturity was 4 years

Annex 4 Capital outflow liberalization

Date	Event	Comments
February 1991	- Commercial banks were permitted to increase external trade financing and use up to 25 per cent of FX time deposits for foreign trade financing - Joint-venture rules were simplified - Procedures for direct investment abroad by corporates was simplified	
April 1991	Waiting period for capital remittances for inward investment under debt-equity swap mechanism (chapter XIX) was shortened from 10 to 3 years	The waiting period could be reduced after paying a fee proportional to the discount at which the debt instruments used in the swap operation had been bought in the international market.
April 1991	Banks can invest abroad up to 40% of the funds collected as term deposits denominated in FX	
April 1991	Outward FDI by Chileans financed with foreign exchange acquired in the informal market is authorized. The period to surrender capital and profits from this investment abroad is extended from 3 to 4 months.	The only requirement for investors is to inform the CB about the transaction
March 1992	- Limit on net foreign exchange holdings by commercial banks was doubled; - Exports receipts exempt from surrender requirements were increased from 15% to 50% - Allocations of foreign exchange for a variety of payments abroad were increased - Period of advance purchase of foreign exchange for debt service was extended	
May 1992	Pension funds were allowed to invest up to 1.5% abroad.	Investment grade assets only (BBB or higher)
May 1992	It was established that between May 1992 and April 1993, the cumulative profits up to December 1992 of all foreign investments taken under chapter XIX (debt-equity swaps) could be repatriated.	Part of it could be repatriated until April 1993, and the rest within 270 days after that date.
August 1992	It was established that the capital of chapter XIX investments could be repatriated after paying a fee equal to 3% of the capital.	
August 1992	Pension funds were allowed to invest up to 3% of their portfolio abroad.	

March 1993	The restriction on profit remittances for debt-equity swap investments—those under chapter XIX—was reduced from 5 years to 1 year after investment had taken place	Applies to all investment undertaken before June 30, 1990 (only two chapter XIX operations were authorized in 1991 and before the program was discontinued)
April 1993	The restriction on capital repatriation for foreign investors other than those using debt-equity swaps (i.e., those under DL600 and chapter XIV) was reduced from 3 years to 1 year	There were no restrictions on profit repatriation for these foreign investments (only for chapter XIX)
September 1994	Banks are authorized to invest up to 20% of their capital in financial institutions abroad.	
November 1994	Limits for some institutional investors to invest abroad are raised as follows: - insurance companies: 10% of their portfolio - mutual funds: 30% of the portfolio	Investment grade instruments only (BBB or higher)
January 1995	Pension funds were allowed to invest up to 6% of their portfolios abroad.	Investment grade instruments only (BBB or higher)
May 1995	The CB authorizes pension funds to invest abroad up to 9% of their portfolios; half of this can be in equity	
July 1995	Exports receipts exempt from surrender requirements were increased from 50% to 100%	
August 1995	Chapter XIX was eliminated; hence, restrictions on capital and profit remittances are unified under the general rule of 1 and zero years for capital and profits, respectively	Note: FICEs (country funds) were always subject to a 5-year minimum stay period for capital (and zero for profits)
December 1996	The CB authorizes pension funds to invest in International Investment funds	
April 1997	The CB authorizes pension funds to invest abroad up to 12% of their portfolios. Investment abroad financed with foreign exchange acquired in formal mkt. is extended to deposits, credits, natural resources exploration and other instruments. The repatriation of capital and profits is not compulsory.	
June 1998	The treatment of formal and informal markets is fully equalized.	
January 1999	The CB authorizes pension funds to invest abroad up to 16% of their portfolios	

Annex 5. Construction of the control variables[1]

In this paper we aim to overcome some of the limitations of previous research by controlling the empirical estimations for the changes in capital account regulations, others than the imposition of the URR in 1991 and its modifications thereafter. In particular, we constructed indicators of the regulations affecting capital outflows and inflows in regards with:

(i) Mandatory period of permanence and minimum number of years before the remittances of principal and profits from foreign investment in Chile is permitted;
(ii) Solvency requirements and minimum issue size affecting Chilean corporates taping the international capital markets through the issue of bonds and shares (ADRs);
(iii) Other regulations affecting capital outflows. These include restrictions (ceilings) affecting foreign investment by Chilean pension funds, banks and insurance companies, surrender requirements for Chilean exporters, and other minor regulations.

Restrictions on remittances

The first index (i) was constructed as follows. Since the repatriation requirements for the principal (and profits) were different for those investments that occurred under the debt-equity swap mechanisms, we took a weighted average of the years of minimum permanence that applied to each type of flow. The weights used were the corresponding share of each type of foreign investment (debt-equity swap versus non-debt equity swaps) in the total during 1985-1991:Q1. The resulting index starts at 8 in 1989, drops to 3 in 1991, and continues falling to reach 1 at the end of the sample period. In the empirical analysis we use a normalized index (Figure 3.5). The normalization procedure consists of setting the highest value (the most restrictive stage) of each index at 1, and the smallest value at 0 (the less restrictive stage). This methodology is the same as the one used by BID (1997) among others.[2]

Solvency and size restrictions on international issues

The second index (ii) is constructed by multiplying two sub-indices, one referring to minimum solvency requirements and the other to minimum size issue. The latter was constructed by taking the ratio between the size issue required at each time, and the minimum over the whole sample period—thus, this ratio fluctuated between 1 (end of the sample period) and 10 (beginning of the sample period). Since different types of issues (ADRs, bonds by banks, and bonds by non-banks) have different requirements, the share of each type of issue in the total weighted the resulting numbers during 1997-98[3]. The minimum solvency requirements (AAA, BBB+, etc.) were translated into a numerical scale by decreasing the index in 1.0 each time that the restrictions were relaxed. The starting value (when issues were prohibited) was set equal to 10, and intermediate values were found by fixing the end value—when restrictions were the lowest—in 1.0 and working backwards. The resulting index starts at 100 and drops to 1.7 towards the end of the sample period (Figure 3.4).

Restrictions on other capital outflows

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1 The information needed for constructing some of the indices described below is reported in Annexes 2, 3 and 4.
2 This procedure is also used in the next indexes.
3 We used 1997-98 to calculate the weights because did not have data on primary ADRs for previous years.

The third index (iii) was constructed by fixing the starting value at 11, and decreasing the index each time that a significant change occurred. This methodology is the same than the one used by Cardoso and Goldfajn (1997) when constructing a capital control index for the case of Brazil. The resulting index decreases to 1.0 towards the end of the sample period.

Composed indexes of restrictions on capital flows

The fourth index (used in the empirical part of this paper) is a composed index of all the restrictions on capital flows (inflows or outflows), and was constructed as the simple average of the three normalized indexes mentioned above.

Power Index

Following De Gregorio et.al (1999), in this paper we included a power index aimed at measuring the effectiveness of the URR—alternatively, the difficulties encountered when trying to elude or bypass it. However, instead of using a qualitative index as in De Gregorio et.al (1999), we constructed an index based on flows that paid the URR and flows that were relabeled. For this we started by identifying the kind of flow and the period when the relabeling took place. Next, we studied the behavior of each flow in the months before and after the relabeling occurred, and using this information projected the relabeled flows. Finally, we constructed the power index as the ratio between the flows that actually paid the URR and the potentially affected flows (estimated as the sum of the flows that paid URR, the relabeled flows, and errors and omissions). The resulting power index is shown in figure 3.3.

Coverage

The coverage index constructed in this paper, used in the regression analysis and in the estimation of the power index, is a step function that increases from 1.0 to 1.17 in June 1995, and falls back to 1.0 in June 1998. The increase (and drop) reflects the inclusion of secondary ADRs in the URR, and is proportional to the share of this type of inflows in the total during 1989:1-1991:6.

Relevant foreign interest rate (i)*

The relevant foreign interest rate is a weighted average of the dollar-LIBOR (i_d) and the Yen-LIBOR (i_y). This is used to reflect the option that investors had to choose the currency of their deposits at the CB. The weights are taken from the actual currency composition of reserve deposits in each period. Also, the foreign currency rates used (i_d, i_y) are a weighted average of LIBOR + ρ and LIBOR + ψ, where ψ is the premium charged on the up front fee (see annex 2), and ρ is an estimation of the country risk premium paid by Chilean corporations during the sample period.

Annex 6. 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

Table 3.1 Restrictions on Capital Flows in Chile, 1989-1998		
	On Capital Inflows	*On Capital Outflows*
Quantitative Restrictions	Unremunerated reserve requirement (URR) on selective capital inflows	—
Administrative Restrictions	Minimum solvency requirements on domestic issuers of foreign liabilities (bonds and ADRs)	Minimum permanence requirements before repatriation of capital and profits
	Size requirements on issues of foreign liabilities	Ceilings on foreign asset holdings relative to capital for financial institutions
		Surrender requirements of export proceeds

Table 5.1
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 5.2
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–ππ	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 5.3
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 5.4
Administrative Controls on Capital Account

Sample	Dependent Variable: ix_comp 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 5.5
Central Bank Policy Real Rate of Interest

Sample	Dependent Variable: D(rcb) 1989:01-1998:08							
$D(r^*)$	-0.04	-0.04	-	-	-	-	-0.04	-0.04
	(1.16)	(1.18)					(1.18)	(1.17)
$D(\hat{e}^e)$	0.01	0.01	-	-	-	-	0.01	0.01
	(0.77)	(0.77)					(0.81)	(0.78)
D(ρ)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	(1.12)	(1.15)	(0.87)	(0.86)	(0.89)	(0.90)	(1.18)	(1.17)
D(err)	-0.01	-	-0.02	-	-	-	-	-
	(0.24)		(0.47)					
D(urr)	-	0.00	-	-0.03	-	-	-	-
		(0.09)		(0.57)				
D(ext)	-	-	0.01	0.01	-	-	-	-
			(0.61)	(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	0.07	0.08	0.08	0.08	0.08	0.07	0.08
	(2.99)	(2.93)	(2.97)	(2.98)	(2.98)	(2.99)	(3.00)	(3.00)
$D(\frac{cas}{y}_{-1})$	-0.55	-0.56	-0.54	-0.53	-0.56	-0.56	-0.60	-0.61
	(1.66)	(1.72)	(1.65)	(1.68)	(1.62)	(1.67)	(1.67)	(1.70)
$PDL(\frac{y_t}{\bar{y}_t};-1;-2;1)$	2.02	2.00	2.11	2.12	2.10	1.99	1.99	1.99
	(2.19)	(2.17)	(2.18)	(2.18)	(2.20)	(2.18)	(2.18)	(2.19)
$D(rcb_{-1})$	0.16	0.16	0.17	0.17	0.17	0.16	0.16	0.16
	(3.37)	(3.32)	(3.47)	(3.49)	(3.45)	(3.35)	(3.35)	(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 5.6
Deposit Real Rate of Interest

	Dependent Variable: D(rdep)							
Sample	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)	-1.16	-1.39	-1.15	-1.27	-1.08	-1.08	-1.16	-1.17
+D(ix_other)]	(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 5.7
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 5.8
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*)	-0.00	-0.00	-0.00	-0.00	0.00	0.00
- D($\hat{e}^{e}_{t+6}$)-D(ρ)	(1.03)	(1.08)	(1.03)	(1.67)	(0.69)	(0.45)
D(err)	-0.014	-	-0.014	-	-0.024	-
	(1.78)		(1.78)		(2.57)	
D(urr)	-	-0.013	-	-0.019	-	-0.028
		(0.66)		(0.82)		(1.47)
D($\frac{e_t l_{t-1}}{y_t}$)	-4.04	-4.00	-4.07	-4.01	-1.86	-1.55
	(3.10)	(3.05)	(2.92)	(2.89)	(1.99)	(1.78)
D($\frac{ls_{t-1}}{l_{t-1}}$)	-3.91	-3.96	-5.61	-5.72	-1.97	-1.92
	(3.22)	(3.22)	(3.66)	(3.62)	(2.38)	(2.31)
D($\frac{wfk}{wy}$)	1.30	1.31	1.85	1.86	0.64	0.60
	(1.23)	(1.25)	(1.56)	(1.58)	(0.62)	(0.61)
D(ix_remit)	0.52	0.52	-	-	0.33	0.30
	(7.31)	(7.32)			(2.19)	(1.87)
D(ix_issues)	0.02	0.02	-	-	-0.01	-0.02
	(0.28)	(0.25)			(0.11)	(0.21)
D(ix_comp)	-	-	0.57	0.57	-	-
			(1.47)	(1.49)		
D(rer)	1.44	1.45	1.71	1.73	0.24	0.19
	(1.63)	(1.61)	(1.80)	(1.76)	(0.26)	(0.21)
D(tot)	0.26	0.27	0.56	0.58	0.38	0.39
	(0.69)	(0.72)	(1.65)	(1.68)	(1.58)	(1.59)
D($\frac{g}{y}$)	-1.37	-1.37	-0.79	-0.79	-1.10	-1.04
	(1.19)	(1.19)	(0.80)	(0.81)	(1.24)	(1.18)
D($\frac{y}{\bar{y}}$)	-0.50	-0.51	-0.40	-0.41	-0.51	-0.52
	(2.52)	(2.42)	(1.92)	(1.92)	(2.06)	(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 5.9
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*)	0.002	0.002	0.001	0.00	0.002	0.002
- D($\hat{e}^{e}_{t+6}$)-D(ρ)	(2.00)	(1.47)	(1.06)	(0.75)	(1.79)	(1.48)
D(err)	-0.0178	-	-0.0183	-	-0.0136	-
	(2.07)		(2.10)		(2.31)	
D(urr)	-	-0.023	-	-0.025	-	-0.019
		(1.32)		(1.42)		(1.48)
D($\frac{e_t l_{t-1}}{y_t}$)	-1.23	-1.34	-1.17	-1.13	-0.21	-0.12
	(2.12)	(2.25)	(1.84)	(2.78)	(0.73)	(0.43)
D($\frac{ls_{t-1}}{l_{t-1}}$)	-1.73	-1.87	-3.19	-3.41	-0.06	-0.17
	(3.85)	(3.87)	(5.17)	(5.30)	(0.22)	(0.57)
D($\frac{wfk}{wy}$)	1.65	1.48	1.62	1.49	1.08	1.06
	(2.17)	(2.02)	(1.62)	(1.56)	(1.40)	(1.41)
D(ix_remit)	0.06	0.05	-	-	0.04	0.03
	(0.65)	(0.44)			(0.96)	(0.64)
D(ix_issues)	-0.11	-0.11	-	-	-0.10	-0.10
	(1.92)	(2.12)			(1.70)	(1.67)
D(ix_comp)	-	-	-0.13	-0.12	-	-
			(0.63)	(0.61)		
D($\frac{cas}{\bar{y}}$)	-1.09	-1.06	-0.99	-0.98	-0.98	-0.99
	(5.51)	(5.39)	(5.06)	(5.07)	(12.03)	(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 5.10
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.

Table 6.1: Regression of interest rate differentials on URR and CB's policy rate

Dependent variable: $i_{long\text{-}term} - i_{short\text{-}term}$				
	CB's securities rates		Secondary Market Rates	
Constant	2.25	2.52	2.89	1.60
	(3.63)	(3.23)	(6.21)	(1.84)
err	0.004	0.01	-0.004	0.03
	(0.06)	(0.17)	(-0.15)	(0.64)
Central Bank's	-0.33	-0.39	-0.45	-0.27
policy rate	(-4.65)	(-3.75)	(-5.97)	(-1.79)
AR(1)	0.95	0.94	--	--
	(31.2)	(25.1)		
Adjusted R^2	0.94	0.93	0.23	0.021
Durbin-Watson	--	--	1.73	1.74
Period	1988:2-1997:12	1991:1-1997:12	1988:1-1997:12	1991:1-1997:12
N	119	84	120	84

T tests are in parenthesis.

Table 6.2: Interest rates differential due to the URR (1991-1997)

Year	Interest Rate Differential (%) (Unexplained differential per year)			
	2.67	2.50	2.00	1.50
1991	0.63	0.80	1.30	1.80
1992	2.85	3.02	3.52	4.02
1993	4.09	4.26	4.76	5.26
1994	2.28	2.45	2.95	3.45
1995	0.58	0.74	1.24	1.74
1996	2.32	2.49	2.99	3.49
1997	0.90	1.07	1.57	2.07
Average	1.95	2.12	2.62	3.12

Table 6.3: Lower economic growth due to the URR-induced interest rate differentials

Average interest differential (% per year)	Lower growth: 1991-97 average (% per year)	
	Lehmann (1991)	Bustos et.al. (1998)
1.95	0.36	0.64
2.12	0.39	0.70
2.62	0.49	0.86
3.12	0.58	1.03
Average	0.46	0.81

Figure 3.1
URR Tax Rate and URR Cost (%)

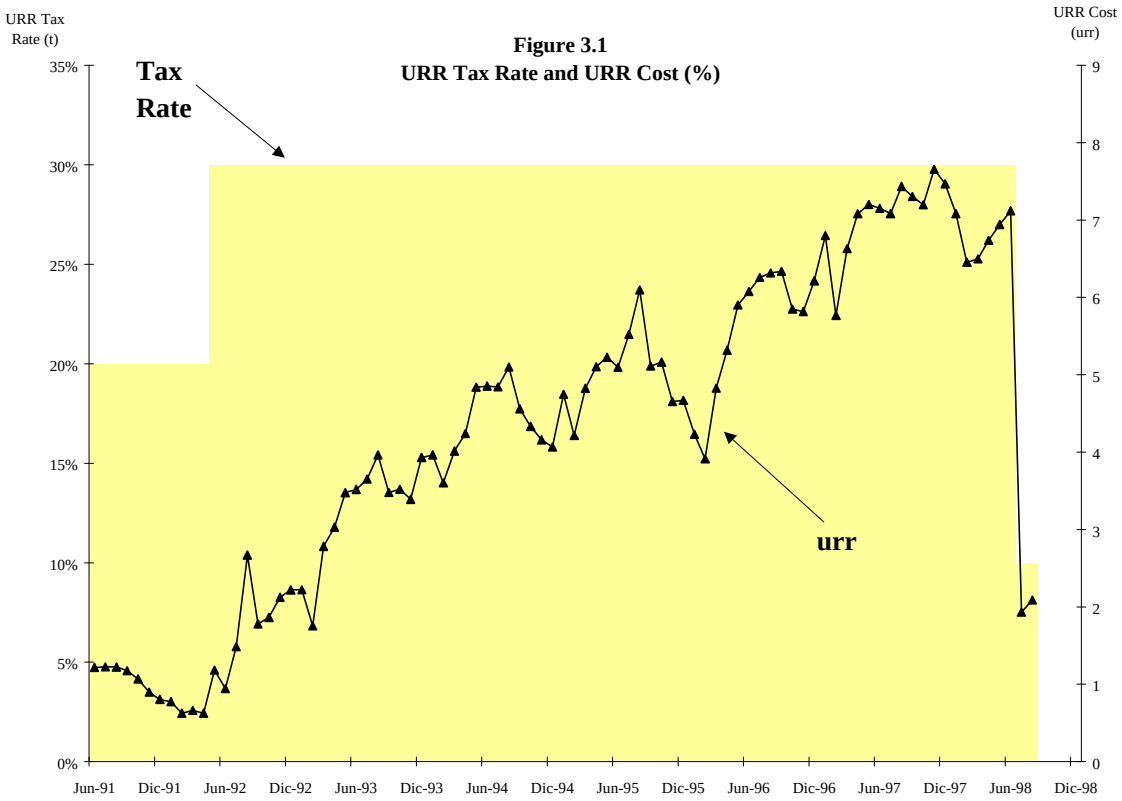


Figure 3.2
URR Deposits at the Central Bank (mmUS$)

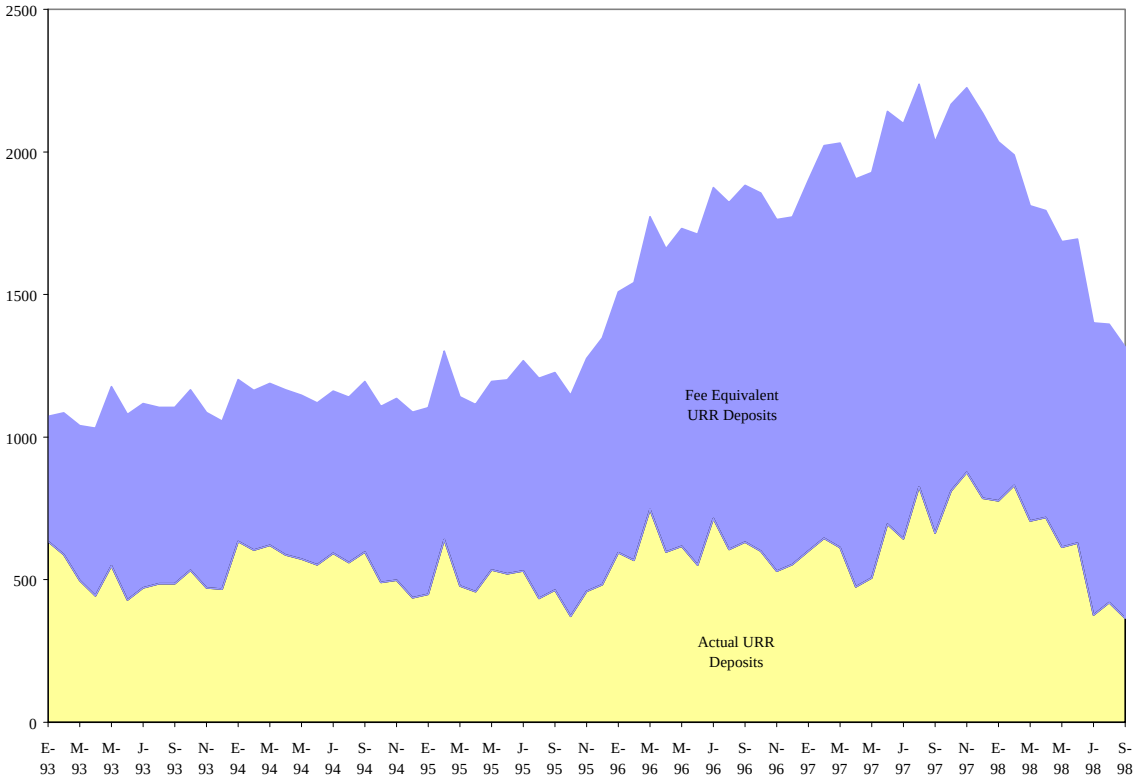


Figure 3.3

Potentially Affected Flows and Share of Effectivelly Affected Flows

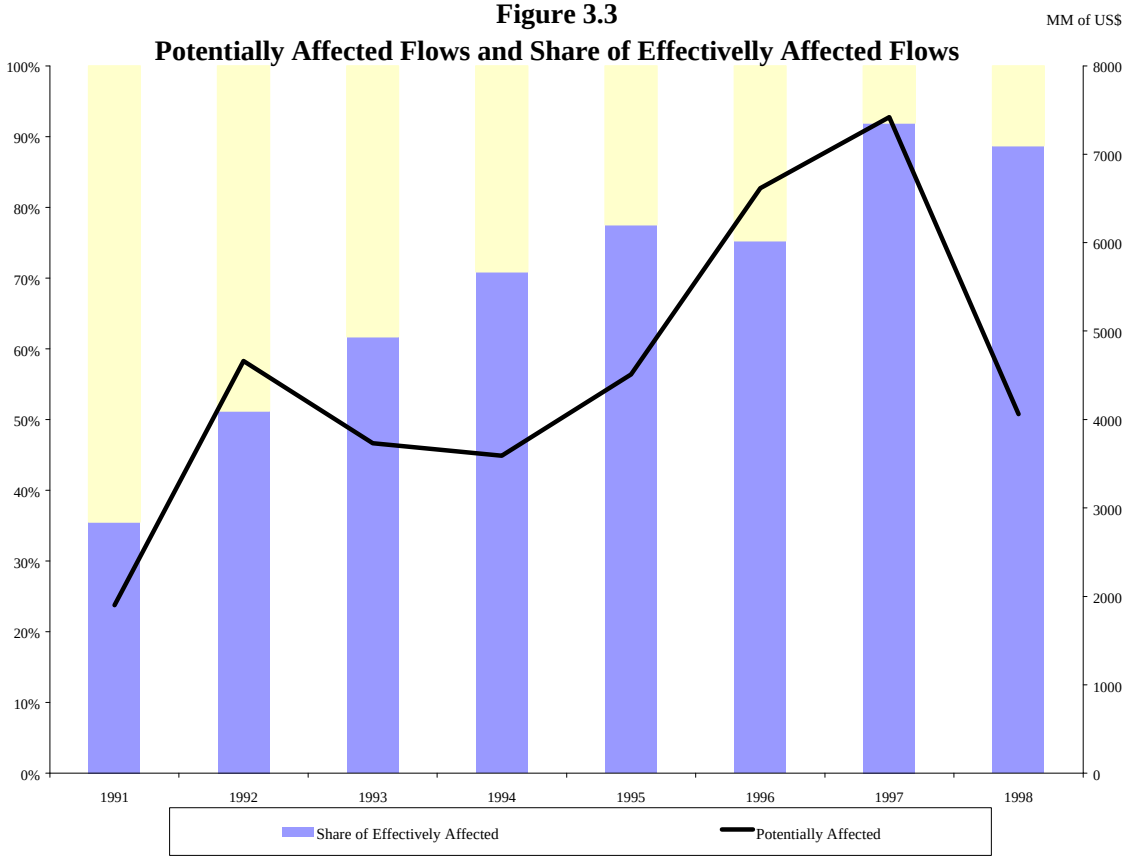


Figure 3.4
URR Cost, URR Power, and URR Effective Cost (%)

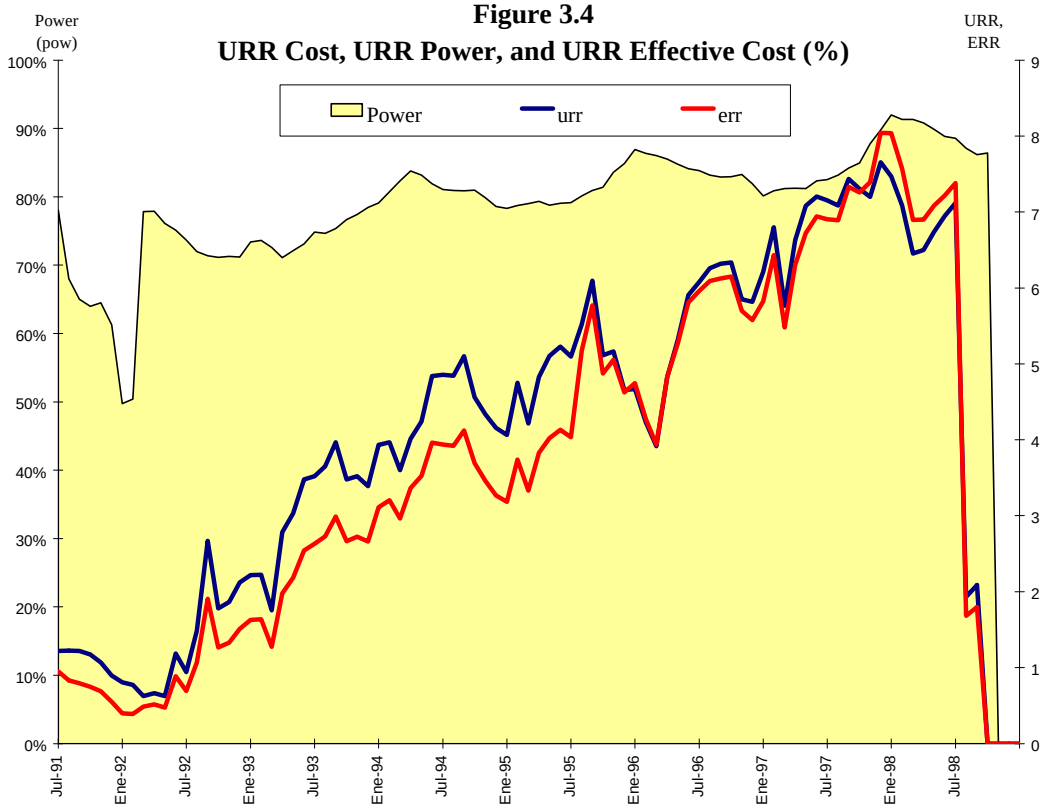


Figure 3.5
Administrative Controls in Capital Inflows and Capital Outflows

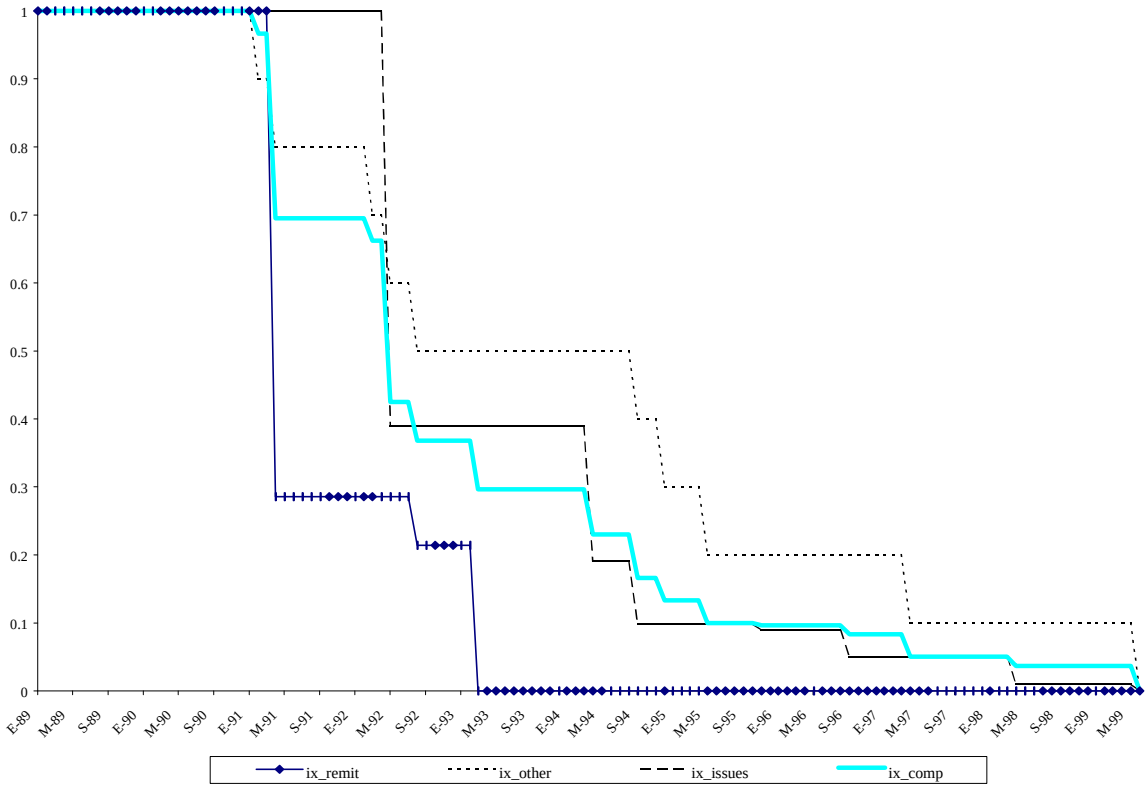


Figure 4.1

Long-Run Equilibrium in a Small Open Economy

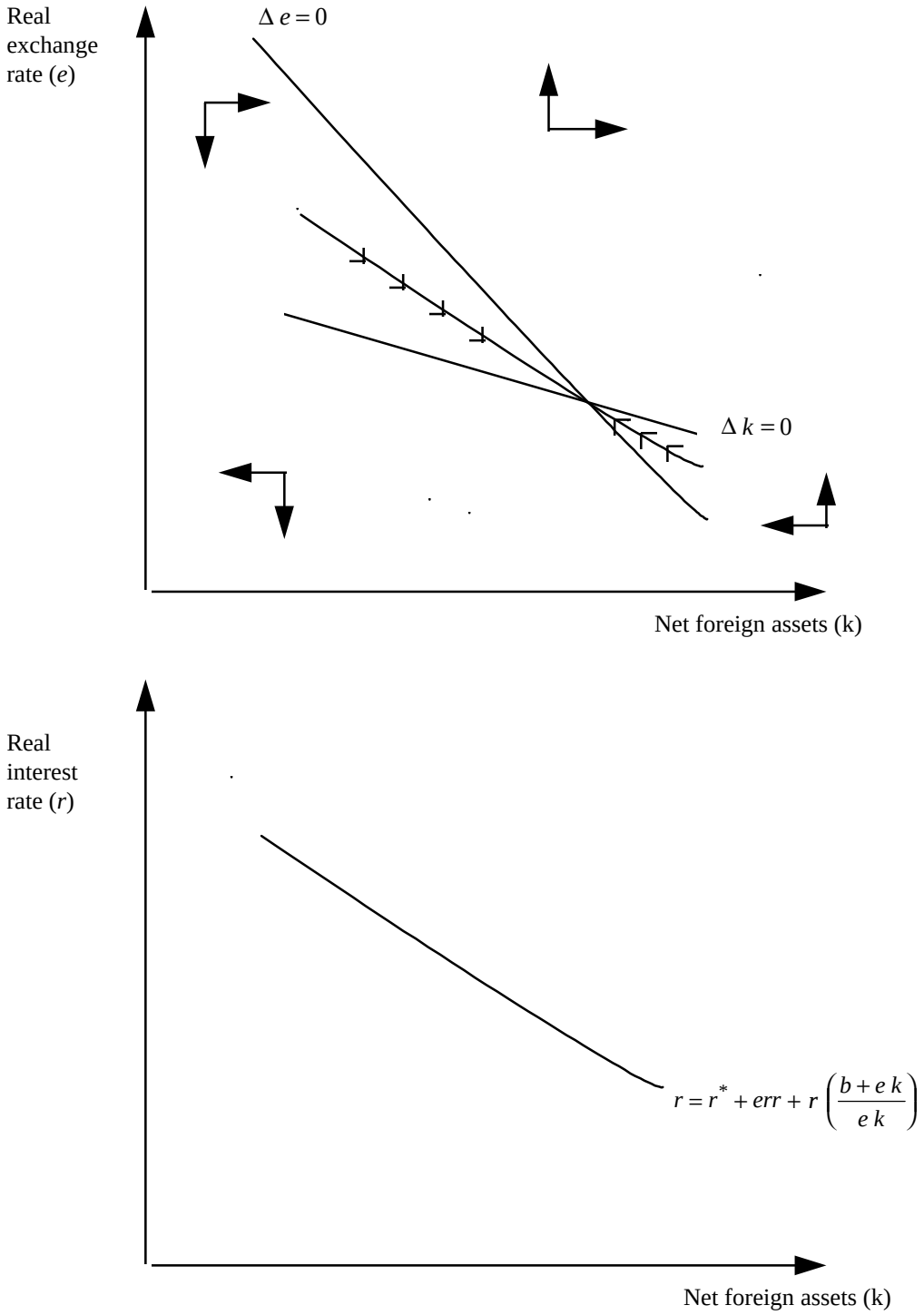
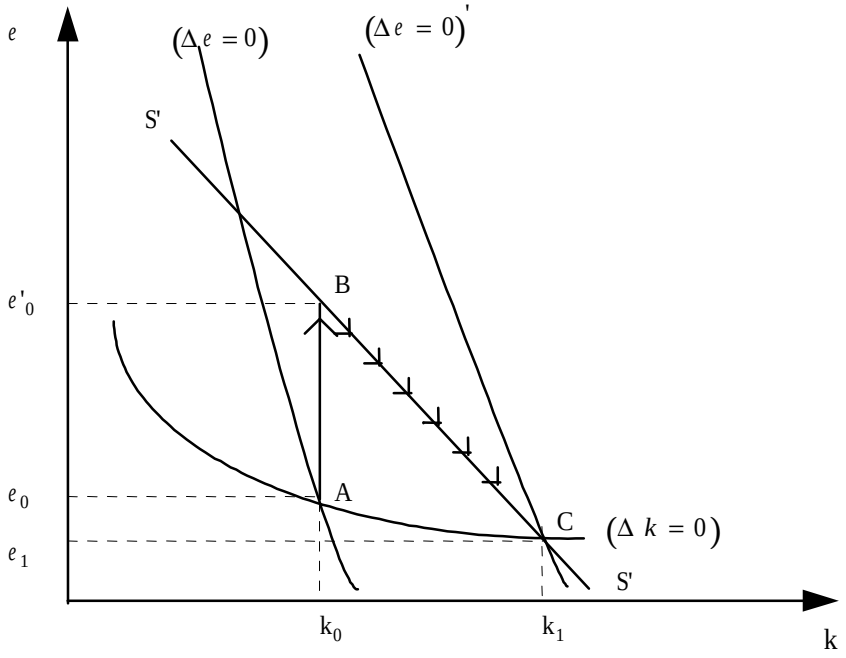


Figure 4.2

Dynamic Response to a Higher Tax on Net Foreign Assets



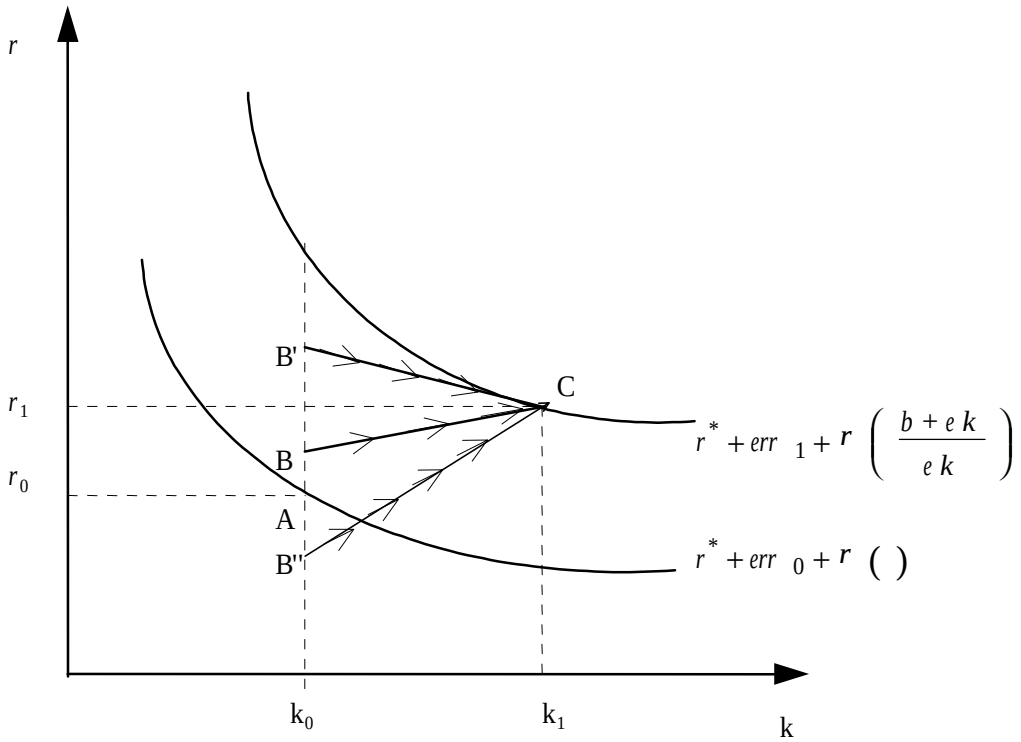


Figure 6.1

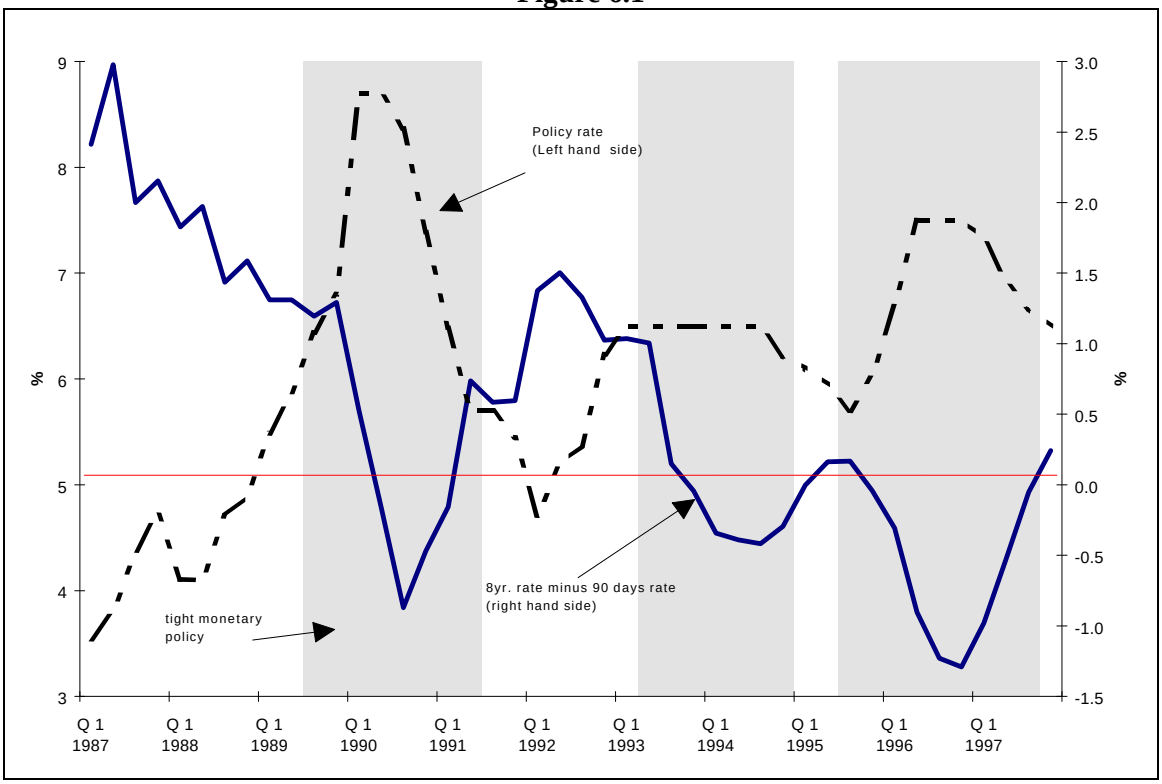
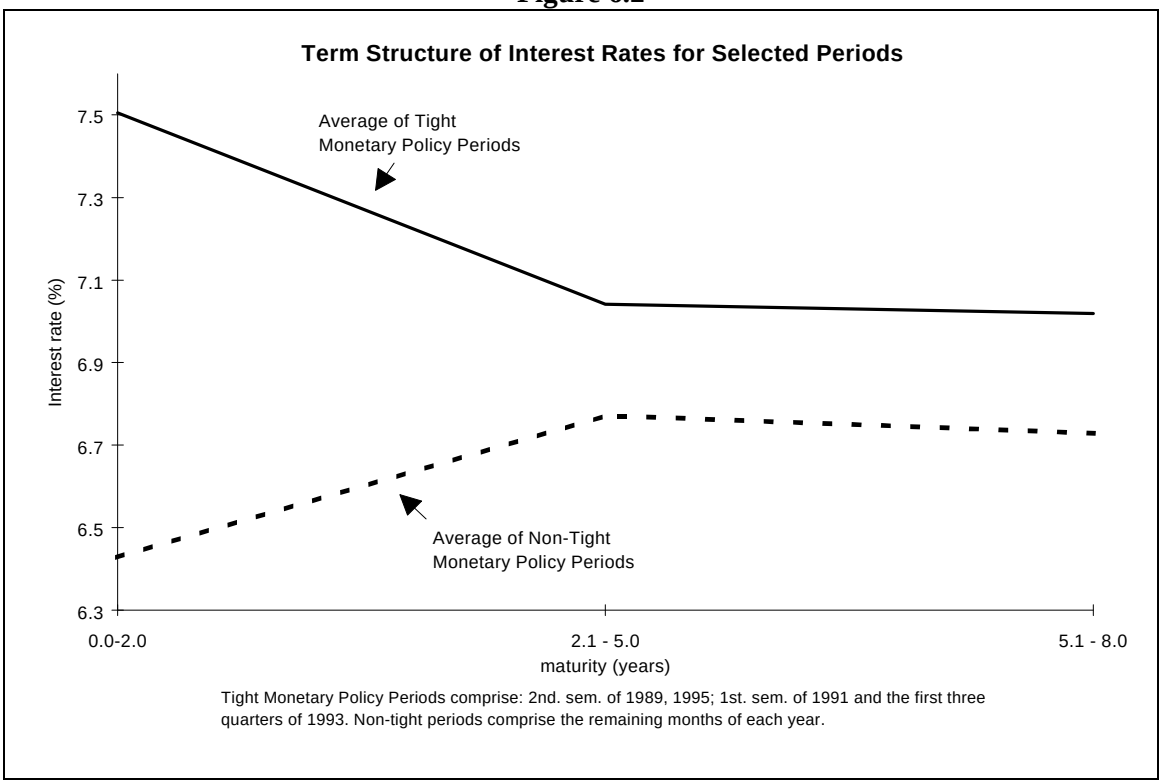


Figure 6.2



Tight Monetary Policy Periods comprise: 2nd. sem. of 1989, 1995; 1st. sem. of 1991 and the first three quarters of 1993. Non-tight periods comprise the remaining months of each year.

Figure 6.3

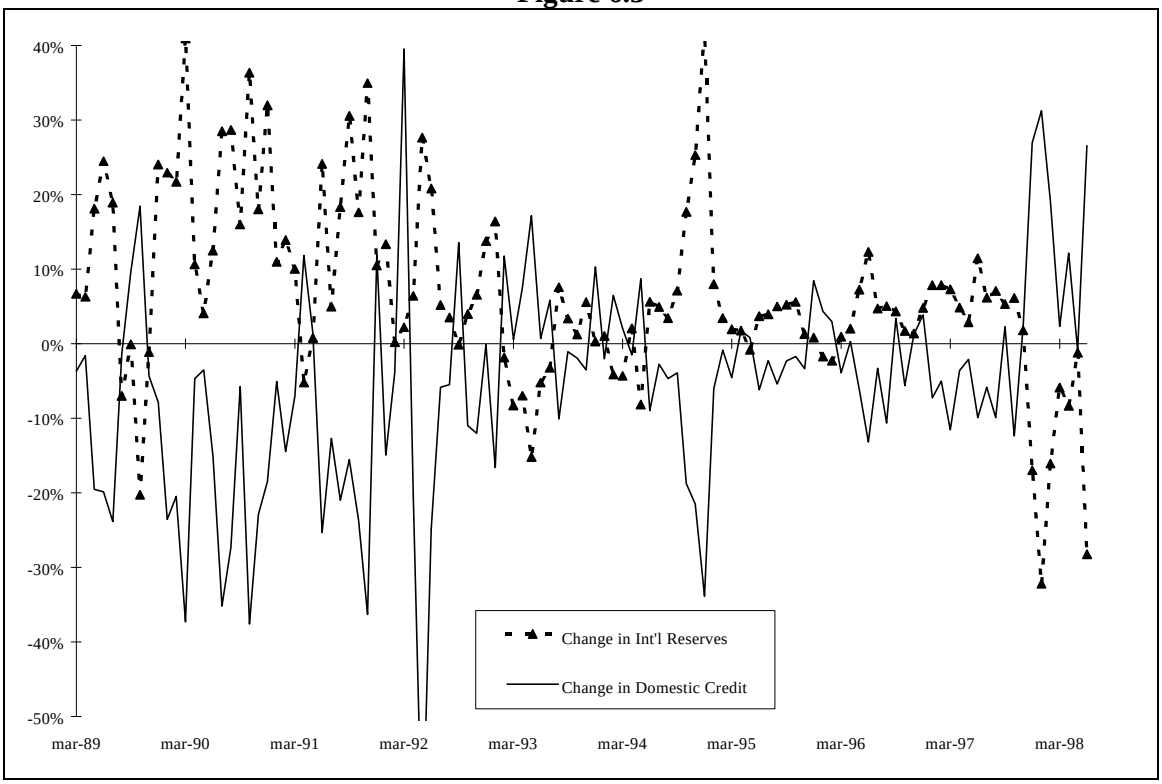
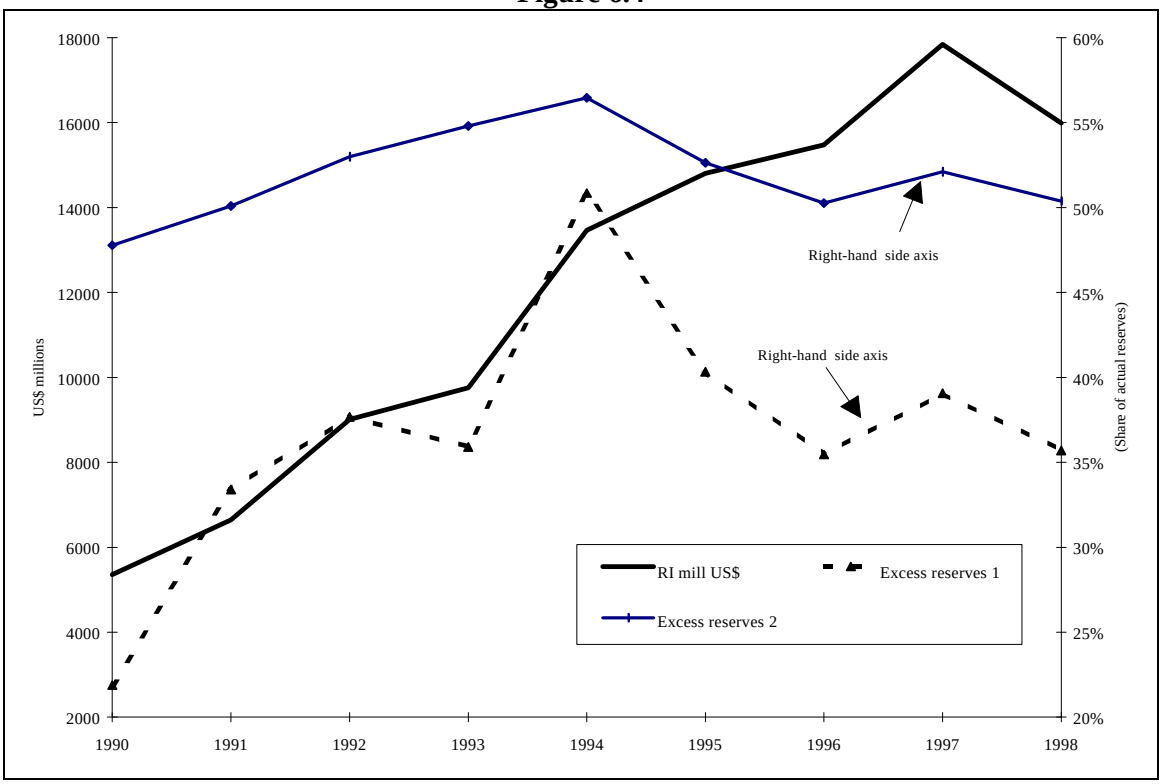
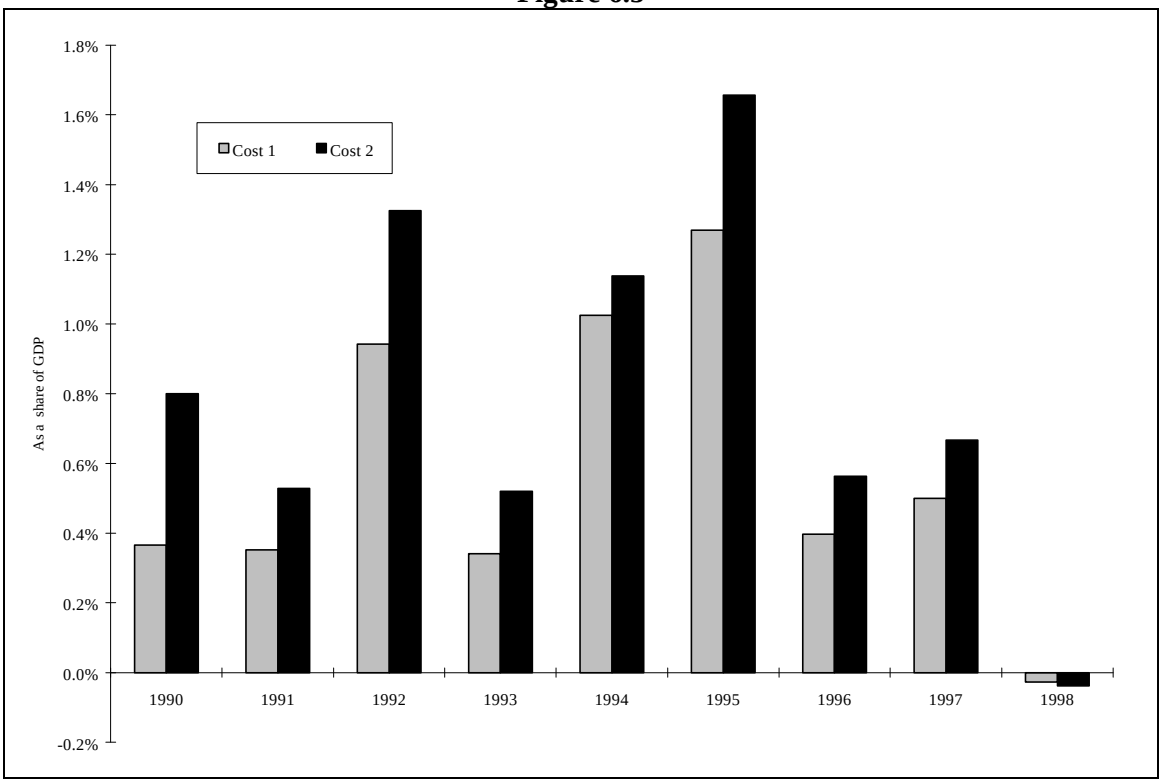


Figure 6.4



Note: Excess reserves 1 refers to the estimate based on the months of imports, while excess reserves 2 refers to the optimum based on the composition of the monetary base.

Figure 6.5



Note: Cost 1 refers to the estimate based on months of imports, while cost 2 refers to the estimate based on the optimum composition of the monetary base.