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GROWTH AND ADJUSTMENT IN CHILE: A LOOK AT THE 90s

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1.Introduction.

In the middle of the seventies, Chile was the first country in Latin America to start moving away from a model based on pervasive government intervention to one where the market plays a central role in resource allocation and production and consumption decisions. This move towards a market economy was accompanied by restoring order in the public finances in an attempt to reduce inflation to single digit levels and put the macroeconomic situation under control. The changes accomplished since then have been dramatic. By the middle of the seventies, as a result of the cumulative effects of 40 years of interventionist policies and the disregard for the macroeconomic fundamentals, the Chilean economy was a highly distorted one, dominated by a very large and intrusive public sector, and facing severe macroeconomic unbalances that had its roots in a high public sector deficit, which reached 25 percent of GDP in 1973. Also price controls and rationing were widespread and the financial sector was repressed through the use of controls on nominal interest rates at levels that were far below inflation.

The Chilean economy went through a major political and economic crisis in the early 1970s. Following a deep recession in 1975, there was a period of recovery and rapid growth that lasted until 1981 when a new crisis developed. After a costly adjustment effort, growth resumed again in 1984. The average growth rate between 1985 and 1997 was 7.4%, with 1997 growth at 7.4% (Figure 1). This period of high growth was interrupted in recent years as a result of severe external shocks (capital inflows, terms-of-trade, contagion of the Asian, the Russian, the Brazilian and the Argentinean crises) and the domestic policy response to these shocks.[1] Figures 1 to 14 presents the evolution of the main macroeconomic indicators since 1994, Table 1 resumes the same information.

There is not a unique cause for the post-1997 growth slowdown with many competing hypotheses. The first puts the blame on the bad luck resulting from a series of external shocks: term-of-trade losses and a slowdown in capital inflows following the Asian crisis. A second hypothesis blames the slowdown on the policy responses to the deterioration in the external environment. In particular, the inability to achieve a more

[1] For a review of the period at different stages and from different points of view see the papers in Bosworth et. al. (1994) and Larraín and Vergara (2000a).

balanced mix of monetary and fiscal policy during the 1997-98 period ended up putting all the weight to reduce expenditures on monetary policy with detrimental effects on sectors heavily dependent on the interest rate cost (small and medium enterprises and the construction sector). A related hypothesis is that the stanch defense of the exchange rate band resulted in high interest rates with similar costs on the most exposed sectors. Finally, a third explanation is that the slowdown resulted from the completion of a high growth cycle associated to the structural reforms introduced in the 1985-1995 period. In accordance with this last hypothesis, the favorable supply shock linked to the structural reforms of the previous twenty years unleashed a period of high productivity growth that was completed by the second half of the 1990s. The purpose of this paper is to evaluate Chile's macroeconomic performance in the second half of the nineties concentrating on examining the role played in it by each of these competitive hypothesis.

The rest of the paper is organized in five sections. Section 2 uses a Solow's growth accounting framework to identify the factors contributing to growth from 1951 to 1997, that is just before the slowdown. Section 3 reviews the main developments in policies and macroeconomic development in the 1990s to set the stage for the analysis carry out in the next two sections. Section 4 uses a framework based on non-structural VAR models to analyze the main factors accounting for the post-1997 slowdown of the economy. Section 5 uses a small macroeconomic structural model to assess the economic consequences of some of the actions undertaken in 1997-1998. Finally, section 6 presents the main conclusions.

2. Growth Accounting: Explaining GDP Trends.

The favorable growth record of Chile in the period 1985-1997 has attracted the attention of researchers and policy makers interested in learning from a successful transformation in a Latin American country. The Chilean model was also of interest beyond Latin America as it provided a clear contrast with the East Asian model, by relying more on a private market economy guided by rules, rather than by discretion. Because of it, it was argued that it requires a smaller government than the East Asian model, and therefore economizes on human capital and government capacity. For this reason it might perhaps have more relevance for the typical developing country. However, in a natural resource rich country like Chile, it is natural to question if the success is due to the results of the economic policy implemented, or only a consequence of a period of good luck in the "commodity lottery"[2].

To answer this question we study the factors contributing to the Chilean growth record of this period. This is a field where much work has been done in recent years extending the standard Solow model of the 1950s. New work in this area has been more of the cross sectional variety and it has been based in the now fairly standard "new growth theory framework" (Barro and Sala-i-Martin, 1995; Fischer, 1993). Within this framework, a sudden jump in the rate of growth, as the one observed in the period 1985-1996 in Chile, has to be attributed to a change in the rate of growth of capital accumulation, or a temporal increase in the rate of growth of employment above the rate of growth of the labor force, or a jump in the rate of growth of total factor productivity (TFP) or a combination of these three factors. Of course, the rate of increase in the capital accumulation can be affected by changes in the prices of export commodities.

Lefort and Solimano (1994) and Meller, O'Ryan and Solimano (1996) used this type of framework for the case of Chile. Here we summarize first their results and then we present some new evidence on this matter. Meller, O'Ryan and Solimano (1996) show that in the pre-reform period, 1951-73 in their study, TFP growth was small when compared with GDP growth, while in the period 1984-89, period that they define as of recovery and re-consolidation of reforms, TFP growth was 0.79 percent per year and the main factor contributing to growth was the growth in labor input. In contrast, in the 1989-

93 period, a period defined by the authors as one of sustained growth, the growth of TFP was 2.39 percent per year, accounts for one third of the rate of growth of GDP. For the same period, the contribution of capital accumulation alone was close to one half of the rate of growth of GDP, 3.5 percent compared with 7.1 percent.

Lefort and Solimano (1994), following the work of Fischer (1993), also endogenize the rate of growth of factor inputs and of TFP. They relate the rate of growth of these variables to macroeconomic factors, economic reforms and external shocks. They find that macroeconomic instability, measured by the inflation rate and the standard deviation of the inflation rate, has a negative effect on the rate of growth of factor inputs and in the rate of change of TFP[3]. They also find that the volatility of the real exchange rate, measured by its standard deviation, has a negative effect on the rate of change of TFP and that trade liberalization and financial deepening have a positive effect on the rate of change of TFP. Indeed, the latter variable "is the most important factor in explaining the change in total factor productivity growth, both in the whole sample and in the period 1974-1989" (Lefort and Solimano, p. 25).

The rate of change in the terms of trade variable has a positive effect in the rate of capital accumulation for the period 1974-89. When they proceed to study the robustness of their findings the authors conclude that macroeconomic factors and TFP growth chiefly affect capital formation.

We examined the factors accounting for the growth record of Chile re-estimating the extended production function framework of Lefort and Solimano, but extending the sample up to 1997, and then use the estimated equation to compute the factors contributing to growth for six sub-periods (1951-60; 1961-70; 1971-80; 1981-85; 1986-95; and 1995-97). In Table 2 we report the results.

From Table 2 it can be observed that the acceleration of growth during the high growth periods, 1986-95 and 1995-97, is in a mayor part due to a quantum jump in the rate of growth of total factor productivity, which alone on average accounts for more than half of the rate of growth of GDP, a result higher than the one reported by Meller, O'Ryan and Solimano (1996) just for the period 1989-1993. In order of importance, the second

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2 Bulmer-Thomas (1994).

most important factor is capital accumulation, which contributes with more than 40% of the total.

The question that one could ask is to what extend the above reported growth really reflects sustained growth, rather than just recovery. There is no way to answer this question short of developing a full general equilibrium model for the period. It is clear, however, that as the economy was approaching full employment towards the end of 1997, to sustain the growth process would have required: (1) to maintain a high rate of growth of capital formation; (2) to keep improving the allocation of resources and the incentives for economic agents to increase efficiency; and, (3) to increase the contribution originating in human capital accumulation. However, Chile suffered another string of external shocks and some economic policy slippages -a string of large increase in minimum wage starting in May 1998, expansionary fiscal policy just when the current account deficit had to be reduced- that derailed the economy from the high growth path. In the next section we study the 1990s period with some detail.

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[3] Lefort and Solimano (1994) also find that the response of the rate of change of factor inputs and of TFP to inflation is nonlinear with a higher response to high inflations.

3. Macroeconomic Policies and Developments in the 1990s: An Overview

By the end of the 1980s when the transition to a democratically elected government was in process, the Chilean economy was having a solid economic performance behind strong macroeconomic fundamentals and micro policies that promoted integration to the world economy and competition. On the macroeconomic side, the public sector debt was manageable and there was a fiscal surplus, monetary policy was geared to avoid an acceleration of inflation and to keep, with the help of the fiscal surplus, a competitive real exchange rate. In 1989 growth was 10.6%, the unemployment rate was 7.1% (it has been 12% in 1985), inflation reached 21.4% and the current account deficit was 2.5% of GDP.[4]

The new coalition government that took power in March 1990, in a strategic move, decided to embrace the market-oriented open-economy policies of the past administration and wisely implemented early on a stabilization program to slowdown an economy that by the late 1980s was clearly overheating with inflation accelerating. It was the responsibility of the recently installed Board of the now independent Central Bank to bring inflation under control. The newly independent Central Bank, created in October 1989, began operating in December 1989, only three months before the Presidency was transferred from Pinochet to Aylwin, and undertook as its main task the gradual reduction of inflation. Gradualism was based on the concern that a rapid reduction of inflation would introduce serious distortions in relative prices in an economy where there was widespread indexation of key prices to past inflation. Although the Central Bank's main objectives are to achieve price stability, to ensure the proper functioning of the domestic, and of the external payment system, the existence of a robust financial system and solid external accounts allowed the central bank to concentrate mainly on the inflation objective. In terms of the current literature on Central Bank independence, the Central Bank of Chile is modeled on Rogoff's "Conservative Central Banker" (1985)[5]. Chilean

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[4] For a description of monetary policy during this period see Fontaine (1991).

[5] In this model, the Central Bank board behaves as minimizing a quadratic loss function. The arguments of the function are the departure of the inflation rate from its target and the departure of the current account deficit from its target (or the unemployment rate from its target in Rogoff's model). But *de facto*, the Central Bank has been assigning greatest weight to the inflation term, resulting in conduct similar to that observed for the "Conservative Central Banker" of Rogoff.

law gives the Central Bank independence to set its own targets as well as to choose the instruments it deems appropriate for achieving those targets[6]. Furthermore, in contrast to other independent Central Banks created recently, the Central Bank of Chile is also responsible for the exchange rate system and for exchange rate policy.

The Central Bank initially set itself the objective of gradually reducing inflation. Later on it set as an objective to achieve inflation rates similar to the ones observed in industrial countries, while maintaining current account deficits that will not jeopardize the stability of the external payment system[7]. But whenever the two objectives enter into conflict, as was the case in 1996, the inflation target was given priority.

The inflation objective for the coming year is chosen by the Central Bank and announced to the Congress and to the country during the first fifteen days of September of each year. At first, that objective was stated in terms of a range for the CPI inflation rate for the period Dec-Dec of the coming year. Then, starting in September 1994, the Central Bank moved toward setting a point estimate for the inflation objective. Finally in September of 1999 it announced that from now on the objective was to maintain an inflation rate in the range of 2% to 4%, allowing only for temporary deviations from these bounds and at the same time it abandoned the exchange rate band system replacing it by a floating rate. In the initial years although the target was announced, there was not an explicit declaration of how policy was going to be conducted. However, lately the system has converged to a fully-fledged inflation-targeting regime. The inflation target is the ultimate objective of policy, while an inflation forecast now made public, is the intermediate objective, and the interest rate is the main instrument for achieving those objectives.[8]

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[6] This is by omission more than by commission as the Central Bank's charter spell out its objective of achieving price stability but it does not specify who set the inflation target.

[7] Massad (1998) defines this level as 4% of GDP when the current account is measured using normal terms of trade levels. Unfortunately, normal is not defined in the same paper. Morandé (2001a) states that the current account objective was 2 to 4% up to 1995 and between 4% and 5% between 1996 and 1998.

[8] For reviews and descriptions of monetary policy during this period see Corbo and Fischer (1994), Corbo (1998), Budnevich and Pérez (1995), Massad (1998) and Zahler (1998). A review of the international experience with inflation targeting during the same period can be found in Bernanke et al. (1999).

When the independent Central Bank started to operate in late 1989 it had inherited a passive crawling peg exchange rate band system that had been in operation since the middle of the 1980s. In that system, the mean point of the band was adjusted by the differential between domestic and foreign inflation in a sort of constant central parity for the real exchange rate. The width of the band at that time was 5% in each direction of the central parity. As the Central Bank started to operate with the objective of achieving a target inflation rate, many times this objective run into difficulties with the objective of targeting also a level for the real exchange rate. Achieving this second objective was increasingly a problem as the combination of low international interest rates and "good domestic policies" in Chile resulted in a quantum jump in capital inflows. As a result, during the 1990s, a conflict between the inflation and the real exchange rate objectives surfaced repeatedly and, although the inflation objective was given priority, the Central Bank also struggled to avoid an excessive real appreciation. To this end, in most of this period it actively intervened in the foreign exchange rate market, implementing an aggressive and costly policy of foreign reserve accumulation, accompanied by the sterilization of the monetary effects of this accumulation. At other times it accommodated a real appreciation with a downward adjustment of the central parity and reduced the slope of the central parity by introducing a discount related to the rate of growth of productivity[9]. It was also during the time of high capital inflows that the Central Bank also introduced an unremunerated reserve requirement for capital inflows.

The problem inherent to the pursuit of inflation and exchange rate targets, simultaneously, is well known. Within the exchange rate system, as long as the observed value of the exchange rate is well within the band, the uncovered interest rate parity condition provides a link between the interest rate and the exchange rate. Specifically, as long as the exchange rate is within the band, any adjustment of the domestic interest rate results in a movement of the nominal exchange rate. Therefore, for all practical purposes, exchange rate policy can not be independent[10]. Moreover, conflicts with the Ministry of

[9] Arguing a Harrod-Balassa-Samuelson effect the discount was estimated to be a 2% annual appreciation. More recent estimations obtained values of 0.7%, see Délano and Valdés (1998).

[10] During most of the 1990s, the exchange rate system took the form of a diagonal exchange rate band. The central parity of the band was adjusted passively, on a daily basis, by the difference between the domestic and international inflation. The width of the band was increased to 10 percent on both sides of central parity

Finance arose when an increase in domestic interest rates caused a sharp nominal and real exchange rate appreciation. In those cases, it is correctly argued that such an appreciation could lead to a deterioration in the profitability of exports and, eventually, damaging the long-term sustainability of the export-led growth process.

Chile did not suffer the effects of the tequila crisis and the extension of it to Argentina thanks to its continuous access to foreign financing and very favorable terms of trade (Table 1). With the economy by now delivering growth above 7% per year, the unemployment rate coming down rapidly and annual inflation decreasing continuously through the period, public support for the economic policies began to increase. Difficulties in the macroeconomic front stated to emerge in early 1998 when as a consequence of severe external shocks, difficulties in articulating a coordinate response from monetary and fiscal policy, and several speculative attacks on the currency a period of very high interest rates emerged that ultimately resulted in a sharp slowdown.

Various factors were behind the slowdown in growth, being the deterioration in the external environment one of the key ones (drop in terms-of-trade and contagion from the series of emerging market crises). As shown in Table 1, terms of trade went down 15.2% between 1997 and 1999. But this was not all, in the eve of the Asian crisis 33.1% of Chilean exports went to Asia and they went down 25% in the same period. Furthermore, in what is a mayor difference with the tequila crisis of late 1994, this time the deterioration in the external environment came when the economy was already overheating. In fact, domestic expenditure was growing at an average four-quarter rate of 14.4% during the last two quarters of 1997 and the first of 1998. The spending boom was fueled by a combination of a private sector-led spending boom, overgenerous public sector wage increases, a sharp increase in the minimum wage, and another foreign financed lending boom. However, in what is a mayor difference with the situation of the early 1980s now the financial system was much stronger thanks to a well designed and enforced supervision and regulation system and to the existence of well-capitalized

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in January 1992. Up to July 1992, central parity was established in terms of the value of the US dollar. However, starting then, it was set in terms of a basket of currencies. Moreover, starting in November 1995, a further 2 percent per annum started to be subtracted from the central parity to accommodate an estimate for trend appreciation of the equilibrium real exchange rate.

banks. But still so, the overheating was there and, as a result, the excess of domestic spending over national disposable income, that is the current account deficit, reached 7.4% of GDP in the year ending in the third quarter of 1998. In parallel the real exchange rate had suffered a sharp appreciation, typical of an economy where there was increasing demand pressures in the non-tradable market.

The deterioration in the external environment coincided with a very expansionary cycle of the economy and it set in motion several speculative attacks on the exchange rate system, this time of the exchange rate band. Although the explicit exchange rate band had a very wide width, 12.5% on each side of the central parity, and the market exchange rate was well into the lower part of the band, the Central Bank was implicitly targeting a level of the exchange rate as an additional tool, on top of the short term interest rate, to keep inflation within the target and to avoid an excessive appreciation of the exchange rate that could contribute to widen the current account deficit (Morandé, 2001b).

By the time of the Asian crisis, the Chilean economy was overheating behind a foreign financed boom in private domestic spending and expansionary fiscal and monetary policies. Indeed, with inflation coming down, the Central Bank in a series of cuts reduced the policy interest rate, starting in February 1997, from 7.5% to 6.5%. The latter level was set in October of the same year. Three arguments could be used to justify these reductions in the policy rate. First, inflation was coming down and was well within the target-band; therefore the Central Bank could have been quite confident that future inflation was not a problem. Second, that the terms of trade shock was going to provide enough restraint and therefore with the inflation under control there was room to introduce a more expansionary policy. Third, that due to the high costs of sterilization, the Central Bank could have decided to stop sterilizing the monetary effect of the foreign reserve accumulation. Indeed, from end-January 1997 to end-October 1997 the Central Bank cumulated more than US$ 3 billion in foreign reserves. As it is shown in the appendix, fiscal policy was also expansionary during this period. In particular, as shown in Figure 15, measures of quarterly fiscal impulse indicate that fiscal policy was expansionary during almost the whole period between 1997.II and 1999.II. Maybe more relevant, is the clear difference that can be appreciated when one compares the fiscal impulse for the period before and after 1997.II. Marcel et. al. (2001), using annual data,

show that half of the deterioration in the fiscal accounts during the 1997-1999 period can be accounted for a more expansionary fiscal policy and the other half by the cycle and the temporary deterioration in the price of copper.

By the third quarter of 1997, when the Asian crisis emerged, domestic expenditure was growing at a 12.0% and GDP at a 8.7% (both four-quarter-rate-of-change) and the current account deficit in the year up to the third quarter of 1997 had reached 4.5% of GDP (Table 3). Furthermore, with the deterioration in the external environment and the resulting reduction in terms of trade the prospects were for a further rise in the current account deficit. In these circumstances, the appropriate response was a monetary and fiscal policy mix capable of providing appropriate restraint while facilitating the real depreciation required for switching. With an exchange rate that was already in the lower part of the exchange rate band, the correct mix here called again for a restrictive fiscal policy and a monetary policy geared towards assisting a nominal and real depreciation of the currency. However, the budget submitted to and approved by Congress was extremely expansionary as it was built under the assumption of a growth rate of 7% for the year 1998. Moreover, there were some additional fiscal decisions not directly affecting the budget, but that might have had a perverse effect over the evolution of private sector expenditure and wage arrangements. The minimum wage was raised more than 40% in May 1998, many months after the Asian crisis had emerged and the public-sector wages were raised 6% in 1998. The sharp minimum wage adjustment together with the generous increase in public sector wages of the same year gave a bad signal to private sector workers and made switching more difficult and costly in terms of unemployment. A more conservative budget along with lower wage adjustments may have helped to adjust domestic demand without having to rely exclusively on monetary policy. In these circumstances, monetary policy was confronted to an important trade-off between the inflation target and a deteriorated real activity scenario given the deterioration of external environment.

The first episode of an attack on the peso coincides with the development of the Asian Crisis when the sharp increases in domestic interest rates all across Asia and the capital flight that was developing resulted in a mayor downfall in regional stock markets that also reached Latin America with record falls in Brazil, Argentina and Mexico on

Monday October 27. Later that week severe pressure started to build on the Latin American currencies and stock markets, especially so on Brazil, Argentina and Mexico. By early 1998 as the plunge in the Asian currencies was exacerbating and Indonesia's political problems increasing, the contagion came with more force to Latin America through Brazil and Argentina. At this time, the observed value of the market exchange rate was well within the lower half (the most appreciated) part of the band. However, the Central Bank was in a difficult position, with an expansionary fiscal policy for the year already approved in Congress and with an overheating economy, it was reluctant to allow the exchange rate to depreciate within the band out of a fear that a high pass-through from the depreciation to inflation was going to put in jeopardy the inflation target for the following year[11]. This fear of depreciation, that is of letting the exchange rate to depreciate within the exchange rate band, is clearly stated in a recent paper by the then and now Chief Economist of the Central Bank:

"At first, in early 1998, the main fear of the Central Bank was that the rapid depreciation of the peso in progress was a serious threat to the inflation target set for the year's end. This concern was based on the high pass-through from the peso depreciation to domestic inflation when the local demand was growing at annual rates of over 12%, estimated then at 0.6" Morandé (2001b, page 4).

Sometimes the fear of depreciation was linked to its potential balance sheet effects (Public Statement of the Central Bank, December 23, 1998).

Given this fear of depreciation and in spite of the refusal of the fiscal authorities to revise the level of government expenditures for the year 1998, the Central Bank decided to lean against the wind selling foreign reserves first and later on, starting in early January of 1998, with a series of increases in the policy interest rate. Between end-November 1997 and end-January 1998 the level of foreign reserves fell US$ 2 billion, equivalent to more than 10% of the initial stock. This result provides evidence in favor of the view that the policy coordination failure between monetary and fiscal policy had its share of responsibility in the costly adjustment of the 1997-1998 period. The raise in the policy real interest rate, introduced a little later, was quite steep raising it from a level of 6.5% in January to 8.5% in February, a full 200 basis points in less than two months.

[11] Indeed all through this period the market exchange rate was well within the lower, that is most appreciated, part of the band.

When the rate was raised 150 basis points on February 3rd 1998, the Central Bank also changed its operation procedures from having as an intermediate target the interest rate towards a monetary aggregate. As stated by the Central Bank Board in its statement of February 3rd:

"The administration of liquidity would be oriented towards providing enough resources for the normal functioning of the financial system, having as an objective that the inter-bank rate as a minimum be equal to the policy or reference interest rate." (authors' translation)

Not surprising as the expectation of a depreciation was increasing with the deterioration in thee external environment, the market interest rate became much higher than the policy interest rate, the latter being now a minimum value for the overnight interest rate. The operational procedure used for this purpose was the introduction of monetary targets. Later on in the year, restrictions on capital inflows were also progressively reduced in April.

The second episode of a speculative attack took place around the last week of June of 1998 when the large current account deficit (7.4% of GDP in the year ending in the third quarter of 1998) and the contagion from the developing Russian crisis put renewed pressure on the Brazilian exchange rate system. Its looming budget and current account deficits and the upcoming presidential elections made Brazil the center of the attack[12]. When the contagion from the attack on the Brazilian currency reached Chile, the Central Bank used a battery of instruments to withstand the attack. In June 25th a set of measures were announced. First, the reserve requirement on capital inflows was reduced from 30% to 10%. Second, dollar indexed Central Bank bonds were offered to facilitate the coverage of private sector exchange rate risks and to relieve the pressure in the spot foreign exchange market. But in a move that took everybody by surprise, the Central Bank decided to narrow the exchange rate band from 12.5% to both sides of a central parity to an asymmetric band with 3.5% lower band and a 2% upper band. The Central

[12] The logic of this attack on the Brazilian currency can be derived from a second-generation model of currency crisis (Obstfeld, 1996 and Krugman, 1996). In this models private agents anticipate that the government faces a clear trade-off between the benefits of holding the exchange rate fixed (which was by then the key anchor for inflation) and the cost associated to defending it with high interest rates with election approaching in October of 1998. Thus, although the Brazilian Central Bank decided to fight the attack with high interest rates, most likely this defense was not credible given the upcoming elections and the already weak public finances.

Bank statement at the time justified the move as a way of reducing the volatility in foreign exchange and financial markets. As the market interest rate was the main instrument used to defend the narrow band, domestic interest rates increased substantially reaching monthly levels close to 4.5% in real terms. The deterioration of the Russian situation and the continuous pressure on the Brazilian currency made the move to reduce the width of the band a very costly undertaking as the high interest rates required to defend the narrower band had detrimental effects on sectors sensitive to a sharp increase in interest rates.

A third attack on the peso developed after the Russian crisis of August 1998 and when the pressure on the Brazilian real was taking renewed force, from the end of August to the middle of September of 1998. However, by now the very high interest rates of the previous months were having their toll on domestic spending which was starting a sharp contraction helping in the process to achieve a sharp reduction in the current account deficit. Thus, the four-quarter rate of change of domestic expenditures came down from 18.1% in the first quarter of 1998 to 9.2% in the second quarter, 2.8% in the third quarter, and –11.6% in the fourth.

Following this attack, the Central Bank decided to raise the policy interest rate and to make it binding again by providing enough liquidity to an economy that was slowing down very fast[13]. Thus, the policy interest rate, that had not been relevant for the determination of the interest rate since January was now raised to 14% on September 16th bringing the market rate close to it. At the same time it was announced that the exchange rate band was going to converge by the end of the year to a wider, symmetric band, of +-5% around a central parity. With these changes the pressure on the exchange rate started to ease. Effectively, the nominal exchange rate remained close to the middle point of the band for the rest of the year.

Now we will examine the main dynamic that build up during this period. Table 3 and Figure 16 present the quarterly evolution of the main macroeconomic variables for the 1997-2000 period and Table 4 shows the cumulative change for the main macro variables with respect to their values in the second quarter of 1998. In particular, as can

be observed from these tables, after a peak in early 1998 GDP and domestic spending (private consumption, public consumption and total investment) started to comedown rapidly.

The identification of the possible sources of the slowdown is not an easy task as many factors were present at the same time. A primary exploration can be done by computing the differences between the actual values of each component of the GDP and simulated ones under the alternative scenario of each component growing at the GDP average growth rate of the previous 14 years. The results of this analysis are shown in Table 5 - the values are reported as percentage of the GDP value obtained under the assumption that all variables grew at the previously observed average growth. As can be observed, the major decelerations came from private consumption and fixed investment[14].

Carrying out the same decomposition using quarterly data permits us to take a closer look at the factors behind the slowdown. Unfortunately, Chilean quarterly national accounts provide a demand decomposition with only four terms: total consumption (private and public consumption plus change in inventories), fixed investment, imports of goods and non-factor services and exports of goods and non-factor services. In spite of the loss incurred by lacking a finer disaggregation, a big advantage of working with quarterly data is that the possible break point can be more closely observed.[15] As break point we use the first quarter of 1998, the peak in the level of domestic spending, allowing us to capture possible differences in the timing of the slowdown between different variables. The benchmark scenario is one were each component grows at a rate equal to the average quarter-to-quarter growth rate of GDP during the previous fourteen years. In line with the previous results, the major deceleration during 1998 came from total consumption, and fixed investment. Real imports' slowdown was very severe but in our analysis this means a positive contribution to GDP growth (Table 6).

However, this analysis does not permit us to separate the deceleration between exogenous innovations in the variable and changes caused by endogenous responses to

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[13] Also on September 3rd , to reduce the opportunities of the banks to speculate against the peso the period considered for the computation of minimum reserve requirements was reduced from 30 days to 15 days.

[14] The import figure is positive because from an accounting perspective a lower imports value imply a higher value of the GDP

[15] Seasonally adjusted data is used.

shocks in other variables. To recognize the cause (or causes) of the slowdown it is necessary to take a closer look at those exogenous innovations.

As an approximation to these effects, we followed the analysis carried out by Blanchard (1993) to identify shocks to GDP components during the 1990-91 recession in the US.[16] We estimated a quarterly VAR model including three components of GDP: total consumption[17], fixed investment and net exports. The first two variables were expressed as four-quarter rate of change and the latter as percentage of trend GDP, which was measured as an exponential trend of seasonally adjusted GDP. An additional variable was included, the four-quarter rate of change of GDP, but its lags were not included as explanatory variables; this step is made just to obtain its forecast errors[18].

To identify the structural shocks, following Blanchard, we assume that every variable is affected only by its structural shock and by the current GDP structural shock. GDP is assumed to be independent, so it is not affected by the other shocks[19]. To compute the effect of the GDP structural error on the rest of the variables we estimated 3 equations, one for each forecasting error, including as explanatory variable the GDP shock. These regressions were estimated using Two-Stage-Least-Squares (TSLS) (the instruments used were the GDP growth of the main trade partners, the change in the US dollar LIBO rate and the rate of change in the terms of trade[20]). The structural errors are reported as cumulative standardized errors in Table 7.

As can be observed from Table 7, the results through some important light on the forces behind the slowdown. First of all, it must be mentioned that starting in the third quarter of 1998, net exports show large positive shocks, which remain so during the entire period. This implies that external demand was an important source of dynamism during the period under study. For the GDP our exercise shows that, apart from the negative shock of the previous months of 1998, there were no important cumulative shocks, thus its evolution is well explained by the dynamic relationship of the different

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16 Walsh (1993) carries out an alternative and more elaborated analysis.

17 That corresponds to the sum of private consumption, inventory investment and government consumption.

18 For an explanation of this methodology see Blanchard (1993).

19 This implies that the forecast error is exactly the structural shock.

20 We used different sets of instruments and the results were robust to these changes. Also the results hold when the estimation was carried out using OLS instead of TSLS.

aggregate demand components. Fixed Investment shows small negative shocks, and only by the end of the exercise starts to show large and growing negative shocks; so, we can infer that there were no important adverse or positive shocks in this case. And finally, total consumption exhibits some negatives but no too large shocks during 1998, but they fade away during 1999, ending the year with a small negative cumulated shock. In this case, consumption appears to have been affected by some negative shocks the second semester of 1998.

4 Sources of the Slowdown: Results from a Non-Structural VAR Model.

A further step to understand the post-1997 slowdown is made through the use of a non-structural VAR model. In this case we estimate a non-structural VAR including six endogenous and two exogenous variables.[21] The endogenous variables are the interest rate of the PRBC-90[22], the gap between core inflation rate and the linearized target inflation rate, the 12-month rate of change of nominal money (M1A), the real exchange rate 12-month rate of change, a monthly measure of the current account (as % of GDP), and the 12-month rate of change of a monthly activity index (IMACEC).[23] The exogenous variables were lags of the logarithm of the terms of trade, and lags of the external inflation –expressed as 12-month rate of change.[24] Alternatively, we also estimated a VAR including the 12-month rate of change of the monthly aggregate expenditure (AGEXP) instead of overall economic activity among the endogenous variables (IMACEC).[25] The variables included here have been frequently used in the analysis of monetary policy through VAR systems in Chile. Recent references of VAR estimation for Chile that also present surveys of previous works on the theme are Valdés (1997), García (2000) and Cabrera and Lagos (2000).[26]

These non-structural VARs were used to simulate different alternative scenarios starting from two different break points. The first break point is September 1997 and the second is June of 1998.

In the first period, we estimate the VAR up to September 1997 and then simulate the model forward using for the exogenous variables their observed values. These simulated values are used as benchmark for comparisons with simulations that use alternative scenarios for the exogenous variables. The results of the dynamic simulation are very interesting. Comparing the observed values of the IMACEC with the dynamic

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[21] For a review of the VAR methodology see Hamilton (1994), Greene (200), and Stock and Watson (2001).

[22] This corresponds to the rate of Central Bank's 90-day indexed bonds.

[23] The lags were selected according to the Akaike info criteria. All the individual equations presented a good fit of the data, with R^2 higher than 0.8 in almost every case.

[24] The monthly terms of trade were obtained from the work of Bennett and Valdés (2001). When a different measure of the monthly terms of trade computed by the authors was used, the results did not significantly changed.

[25] The authors computed monthly aggregate expenditure.

[26] We follow closely the structure used by Valdés (1997) in his work.

forecasts we observe no great differences up to April 1998; but this is not the case for AGEXP. When aggregate expenditure is used, its dynamic forecasts are not very good; in fact the strong acceleration of its growth observed during the first months of 1998 is not explained by the VAR (Figure 17).

After the third quarter of 1997, the current account steadily decreased during the simulated period. This major deficit is almost entirely captured by the dynamic simulations, especially when the aggregate expenditure is added.

In the case of the real interest rate, the results are qualitatively similar to the case of AGEXP. The dynamic forecasts are very different from the actual values, and the difference is very important from January 1998 up to the last point of the simulation. The divergence coincides with the time when the Chilean peso suffered a strong pressure, and the overnight interest rate increased sharply in the middle of January. After the pressure on the currency was reduced thanks to the very high overnight and short term interest rates, the Central Bank reacted officially changing the interpretation of the policy interest rate from a guide for the overnight interest rate to a floor for the same rate. Simultaneously, the policy rate was raised. The different policy response is not explained by the dynamic forecasting errors of domestic spending (AGEXP) or of the current account; an alternative simulation using the observed values of both variables does not eliminate the difference[27]. So, according to this preliminary evidence, monetary policy exhibited a different reaction, understanding as normal what is implied by the VAR.[28] Because the model is very simple, we cannot extract strong inference, but the simulations give us an insight to the possible explanations for the slowdown. Another completely different question is the justification for this "different" monetary policy reaction. To further address this question it will be necessary to introduce a series of different considerations later on in the paper.

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[27] Corbo (2001) shows that the current account deficit was effectively another target variable for monetary policy during the 90s in Chile. This view is also supported in the empirical results reported in section 5 below.

[28] This raises the question about how good estimator of the policy reaction function is the correspondent equation of the VAR. If we assume that monetary policy is forward-looking, the equation implies that the right-hand variables include the entire set of information available to the policy makers and that the estimation method gives us consistent estimators.

Then we simulate starting in October of 1997 the effect on the endogenous variables listed above of alternative external environments. The alternative scenarios take into account different elements of the effects on Chile of the change in the external environment. The alternative scenarios are simulated from October 1997 up to June 1998. The period of simulation includes the aggregate expenditure and current account boom of the first months of 1998 and the sudden stop of capital inflows after the third quarter of 1997. It also includes the first speculative attack over the peso that occurred in January 1998.[29]

There are four alternative scenarios; the first scenario fixes the terms of trade at their September 1997 value and for the other exogenous variable uses its observed values, the solution for the current account balance is obtained from the model (Scenario 1).[30] The second one examines the external financing shock by fixing the value of the current account balance at its September 1997 value and using the actual values again for the exogenous variables (Scenario 2). A third scenario combines the two previously described, that is it fixes both variables, the terms of trade and the current account, at their September 1997 values (Scenario 3). Finally, we carried out a fourth exercise taking the observed values of the current account instead of the estimated equation of the VAR, that is we force the adjustment in the current account that actually took place (Scenario 4).[31]

As it is shown in Figures 18 to 21, the results from the alternative scenarios are quite robust. In the case of IMACEC, this variable is closely tracked by each one of the simulations, especially for the period up to February 1998. In the case of aggregate expenditure and the market real interest rate, the simulated values deviate substantially from the actual values. In particular, their actual values are well above the ones obtained from the dynamic solution of the model in all the scenarios studied. We conclude that there was an over expansion of domestic expenditure that is not explained by our historical structure. As it was stated before, the increase in the real interest rate started in

[29] For a description of the period see Section 3.
[30] This scenario is equivalent to eliminate all the endogenous variables' shocks.
[31] These scenarios were simulated using the VAR including the IMACEC and the VAR including the aggregate expenditure, so we could check the robustness of the results.

January 1998 is not explained either, even if we take into account the actual values of the current account and the aggregate expenditure growth.[32]

How can we interpret these finding? Generalized volatility on the emerging markets can be one possible answer. Interpreting the apparent overshooting in aggregate expenditure is more difficult, as by the time there were already clear signals of a mayor deceleration of world activity. An expansionary fiscal policy may be the lost piece of the puzzle.[33]

A second set of simulations is carried out to analyze the effects of the post July 1998 shock that followed the Russian and Brazilian crises. For this purpose we estimate the VAR model up to June 1998 and simulate it forward up to March 1999. This time interval is even more interesting than the previous one because it includes the second episode of severe exchange rate pressure, August and September of 1998. During this period the overnight interest rate reached values as high as 63% (expressed at an annual nominal rate) and the exchange rate target zone was narrowed as a way of providing a signal that the Central Bank was not going to allow a sharp depreciation of the currency at a time when the pressure on the peso was intensifying. Here after solving the model forward to derive a benchmark solution we simulate two alternative scenarios.[34] The first one replaces the equation of the real interest rate in the VAR model by the observed real interest rate (Scenario 5). That is, we take the observed real interest rate as exogenous in order to analyze if the decline in real activity of the following months can be explained by monetary policy.[35] The second scenario keeps the June 1998 value of the real interest rate fixed. That is it turns off any response of monetary policy eliminating both the endogenous monetary policy response and the exogenous monetary policy shock (Scenario 6). It must be noted that both scenarios include the observed values of the exogenous variables to control for any additional external shock that may have occurred during the simulation period.

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[32] Massad (1998) recognizes that the current account deficit was another objective for the Central Bank.

[33] A more detailed analysis of the fiscal stance during the period is presented in the Appendix.

[34] Both alternative scenarios are very similar to the ones included in Bernanke et al. (1997).

[35] Here is included the endogenous response to the other shocks and also any possible monetary policy shocks. It must be noted also that the benchmark case of the dynamic simulation includes only the endogenous response of the real interest rate to the rest of the variables of the economy. As all the shocks are ignored, there is no endogenous response to exogenous shocks on the other variables.

The results for this second period are quite interesting. First of all we will look at the evidence for the real interest rate. The more interesting evidence comes from the comparison of the observed values and the ones obtained from the dynamic solution (Figure 22). The difference is very clear, both the September hike and the posterior reductions are not similar to the dynamic derived from the historical values. The difference observed during the first months of 1999 could be explained as the endogenous response of monetary policy to a deteriorated real activity resulting from the very high interest rate of the previous months.[36] A consideration similar to the one exposed for the first simulation period applies here; analyzing the policy response in terms of its compatibility with the previous behavior is not necessary equal to another in terms of rationality or optimality. Also, new information that arrived during this period is not included in the simulations and so we cannot control for them.

We now study the results of the model when the overall economic activity index (IMACEC) is replaced by the aggregate expenditure index (AGEXP). The dynamic solution shows a smooth and steady deceleration but does not exhibit negative growth rates. The results are completely different if we look at the simulation obtained when the observed values of real interest rate are used. In this case the expenditure index shows an abrupt slowdown, slightly smoother than the observed but showing the same dynamic up to February-March 1999.[37] One can infer from this result that there is evidence that the posterior slowdown was the result of monetary policy actions, both at the beginning of the simulation period and during the months just before the simulation period. When the IMACEC is used as the economic activity variable instead of domestic expenditure (AGEXP) the results are qualitatively similar but there is one problem. Due to the lag structure of the real interest rate variable in the equation for the IMACEC, the point forecast for December 1998 is abnormally high. If we ignore the effect of this month, the simulated values are somewhat lower than the actual ones, but significantly closer than the values obtained with the dynamic simulation and under the alternative scenario with

[36] An additional consideration to explain this reductions can be inferred from the deceleration of the observed and the core inflation.

[37] When the same scenario is simulated for a longer period the recovery implied by the model is faster than the observed. This difference might be the result of the previously unobserved - in the sample used for the estimations - real interest rate and some type of nonlinear effects of monetary policy on real activity not captured by the VAR model.

the real interest rate fixed at its June 1998 level. The picture that we have here is almost exactly equal to the one derived from the analysis previously stated for the expenditure index. Based on this evidence we can say that the mayor part of the deceleration of real activity during the period can be explained by external factors –mainly terms of trade– and the high real interest rate path. Results of the simulations of Scenarios 5 and 6 are presented in Figures 23 and 24.

One additional point needs to be addressed, in January 1998 and in August-September of the same year there was an important deviation of the market real interest rate (the PRBC-90 that is the same rate used in our estimations) from the policy interest rate ("tasa de instancia"). During both periods the policy rate was raised after the market rate reached its peak. This is related to a change in policy. Up to January 1998, the "tasa de instancia" was closely related to the overnight rate and the real market interest rate (the PRBC-90 rate) as monetary policy was geared to provide enough liquidity to move the overnight rate towards the policy rate. However, when the currency was attacked in January 1998 the Central Bank abstained from providing enough liquidity to keep market rates close to the policy rate. Thus, the market rates were left to adjust to defend the currency. The disconnection between the market rates and the policy rate without any previous warning is an important change in the interpretation of monetary policy, which could have had important effects in balance sheets and private behavior. After the February 3rd, 1998 meeting of the Central Bank's Board, there was an increase in the policy rate and its interpretation was officially changed, now it was defined as a floor rate for the overnight inter-bank rate. To analyze the implications of this change, we carry out an experiment where we keep the relation between the market rate (PRBC-90) and the policy rate that existed before September 1997, that is we assume that the way of carrying out monetary policy had not changed. For this purpose, we estimated a linear relationship between the policy rate and the market rate[38], and the estimated equation was used to obtain forecasts of the market rate for the period from October 1997 up to December 1998, which are shown in Figure 25. During January and July-September 1998 the observed values of the market rate (the PRBC-90 rate) lie outside of the +- 2 standard errors band. But the implications are quite different for both periods. In January, the

[38] The estimation was carried out using monthly data from June 1995 up to September 1997.

change was abrupt and the sharp increase in market rates most likely took economic agents by surprise resulting in important losses for agents that were indebted in local currency at market rates. In contrast, by defending the currency against the attack, agents that were short in dollars were protected from a capital loss[39]. In July 1998, the market real interest rate (el PRBC-90) started to rise slowly, following increases in the overnight rate. The difference reached a maximum by mid-September and disappeared when the policy rate was raised at the September 16th Board's meeting.

As it was explained in the previous paragraph, the January and September episodes are quite different. By September the market already knew that the market rate could be significantly higher than the policy rate, but in January nobody could have been aware of that because the official interpretation was completely different. This non-announced change of methodology was not a minor one. As is pointed out by Le Fort (2000), given that in accordance with the banking law the lending interest rate in Chile has a ceiling, the joint existence of a floor policy rate and a legal ceiling on the lending interest rates may result in leaving a fraction of the borrowers unable to obtain financing from the formal market. These were the high risk and high cost of intermediation borrowers including among them the small and medium size enterprises that had reduced access to foreign financing. This also means that just looking at the market real interest is misleading because some agents faced an unobserved interest rate much higher than the market rate or were just unable to borrow.

Caballero's (2001a) interpretation is related to ours. Apart from the reduced supply of financial resources due to the monetary-policy-induced credit crunch, the much reduced access to external markets forced large enterprises –that were credit worthy in the internal financial market- to look for internal resources, making the resulting squeeze of medium and small firms even worst. This means that at least part of the explanation of the slowdown could have been an adverse supply shock due to financial constraints. This shock was exogenous to the borrowers but its origin can be attributed, partially at least, to monetary policy actions. But the reduction of core inflation during 1999 implies that the aggregate demand effect must have been larger. Most likely, this effect was exacerbated

[39] Indeed, the December 22nd statement of the Central Bank clearly recognized that during 1998 the Board of the Central Bank was concerned with the balance sheet effects of a sudden and abrupt depreciation of the

by portfolio adjustment towards dollar assets in anticipation of an eventual exchange rate adjustment that was postponed through the high real interest rates.

peso.

5. Macroeconomic Policies in the 1997-1999 period: Evaluation with a Small Structural Model.

From the analysis of previous two sections some questions arise about the appropriateness of the policy response to the increased pressure over the peso. We saw that the Central Bank faced the problem of fulfilling its main responsibility –achieving and maintaining a low inflation- in a situation in which the currency was under attack and the economy was overheating. Lacking the help from a contractionary fiscal policy, all the weight of the expenditure reduction had to rely on monetary policy and, at the same time, the exchange rate adjustment that has to accompany the expenditure reduction to avoid a sharp increase in unemployment was postponed due to a fear of depreciation. The latter fear was linked to the estimated inflationary effects of the depreciation in an economy that was overheating when the first attack came.

In this section we use a small semi-structural model of the Chilean economy to throw more light into this episodes. This type of model has been widely used in the study of Chilean inflation, see for example Corbo (1985, 1998), Corbo and Fischer (1994), and Edwards (1993). Corbo and Schmidt-Hebbel (2001) use a model like this to assess the role played by the inflation targeting policy during the inflation reduction of the 1990s. The model corresponds to a short run version of a traditional small open economy model. Models of the same type are used in policy evaluations by researchers and Central Banks. See for example Hargreaves (1999) for New Zealand, Beechey et al. (2000) for Australia, and Cunningham and Haldane (2000), Bank of England (1999), and Dhar et al. (2000) for UK.

The model used here follows closely the one used in Corbo and Schmidt-Hebbel (2001), but we made some modifications to address the issue of interest here that is, the effect of the change in policy during 1998. As we want to assess policy changes that took by late 1997 and early 1998, the data set includes only information publicly available by the end of the third quarter of 1997.

There is some international evidence about the use of revised data to evaluate or to study policy decisions made in a specific time moment. For example, Runkle (1998) presents evidence that revisions of US data are important and that the differences between the first estimates and the final values are sometimes large. Recent work by

Orphanides (2001), focusing on estimated Taylor rules, also emphasizes the striking divergences that could emerge when policy actions are evaluated with ex-post data instead of real-time data

The estimated model is presented in equations 5.1 up to 5.9 below.

$$(5.1)\quad p_t^S = a_0 + a_1 w_t + a_2 \hat{e}_{t-1} + a_3 gap4_t + a_4 p_{t-1}^E + a_5 p_{t-1}^S$$

$$(5.2)\quad w_t = (1 - r_w)\left(b_0 + b_1 p_{t-1} + (1 - b_1) p_{t-1}^E\right) + r_w w_t$$

$$(5.3)\quad gap_t = g_0 + g_1 ltot_t + g_2 prbc_{t-2} + g_3 ck_t \cdot d96 + g_4 gap\_socios_{t-1} + g_5 gap_{t-1}$$

$$(5.4)\quad ca_t = d_0 + d_1 gap_t + d_2 ltot_t + d_3 ltcr_t + d_4 ca_{t-1}$$

$$(5.5)\quad p_t^E = c_0 + c_1 tar_{t+4} + c_2 p_t$$

$$(5.6)\quad \hat{e}_t = f_0 + f_1 p_{t-1} + f_2 p_{t-1}^* + f_3 ca_t + f_4 drin_t + f_5 \hat{e}_{t-1}$$

$$(5.7)\quad prbc_t = (1 - r_{prbc})\left(m_0 + m_1\left(p_{t+3}^S - tar_{t+3}\right) + m_2 ca_{t+2}\right) + r_{prbc} prbc_{t-1}$$

$$(5.8)\quad p_t = p_t^S + shock_t$$

$$(5.9)\quad ltcr_t = ltcr_{t-1} + p_t^* + \hat{e}_t - p_t$$

Where:

p_t^S = Core inflation, 4-quarter rate of change.

p_t = CPI inflation, 4-quarter rate of change.

p_{t+1}^E = Expected rate of inflation, 4-quarter rate of change, for period t+4 in base of information available at period t.[40]

w_t = 4-quarter rate of change of the average wage rate.

$\hat{e}_t$ = 4-quarter rate of change of the nominal exchange rate, in pesos per dollar.

p_t^* = External inflation in dollars, 4-quarter rate of change.

[40] Measured as the difference between nominal rates and real rates charged on 91-365-day bank deposits.

gap_t = Gap between the seasonally adjusted quarterly GDP and its trend measured using the Hodrick-Prescott filter, expressed as percentage of the trend.[41]

$gap4_t$ = 4-quarter moving average of gap_t.

tot_t = 4-quarter moving average of the log of the terms of trade.

$prbc_t$ = Real interest rate of the Central Bank's debt with 90 days of maturity (PRBC-90) expressed as annual rate.

ck_t = Capital inflows of the year ending in period t, as a percentage of the nominal GDP.

ca_t = Current account of the year ending in period t, as percentage of the nominal GDP.

$drin_t$ = Quarterly change in the foreign reserves of the Central Bank, in dollars.

tar_t = Inflation target announced by the Central Bank[42].

$shock_t$ = Actual divergence between core inflation and CPI inflation.

$gapsocios_t$ = Gap between the seasonally adjusted quarterly GDP of the main trade partners and its trend measured using the Hodrick-Prescott filter, expressed as percentage of the trend.

$ltcr_t$ = Logarithm of the real exchange rate.

d96= Dummy variable that takes the value of one from the first quarter of 1996 until the end of the sample.[43]

Each equation was estimated separately from each other in order to avoid spill over effects from specification errors in a particular equation to the estimation of other equations in the model. The estimation of equation (5.7), as it is explained in Clarida et al. (1998) and in Corbo (2001), is more complicated because there is an endogeneity problem as two right hand variables depend on observed values of the left-hand variable. Following previous work on the issue we used generalized method of moments (GMM) to obtain consistent estimators of the coefficients.[44]

Analyzing Alternative Scenarios

As was cited before, Morandé (2001b) mentions some concerns about the ability to reach the inflation target as the main reasons pushing the Central Bank to try to avoid a mayor depreciation of the peso when the attack on the currency first developed in late

[41] Trend GDP was computed up to the third quarter of 1997.

[42] Computed by the authors linearizing the official target expressed as a December-to-December rate of change.

[43] The equations include the lagged own value because of persistence due to measurement and due to structural behavior.

1997. In fact, during the last days of 1997 and the first days of January 1998, the nominal exchange rate depreciated more than 11%. Had this depreciation been permanent, the resulting effects on the inflation rate –the target of monetary policy- would have depended on the pass-through coefficient. To analyze this episode we start by trying to answer the question of the effect of depreciation on inflation by late 1997. To do this we made use of the estimated model. First of all, in order to analyze if the model fits the out-of-sample data we solve the model dynamically for the year 1998 as a whole. The results are very different from the historical ones. This could be because of flaws on the model or because the "structure" of the model changed after this period. In order to assess this point we made further analyses by replacing equations with the observed values of some key variables, the results are very interesting. The mayor differences came from two variables: the nominal exchange rate and the monetary policy real interest rate. In fact, even if we take into account the observed values of the other variables, both equations give poor forecasts. The model-simulated values for the nominal depreciation are higher than the actual values while the simulated values for the real interest rate are lower than the actual values. In the same simulation exercise, the rest of variables perform quite well after taking into account the differences in the interest rate and in the nominal devaluation.

If the problem is just with the two mentioned variables, then replacing them by their actual values should eliminate the problem; this also will serve as a test for the remaining equations of the model. As we expected, the use of the actual values of the interest rate and the nominal depreciation without further modifications of the model gives us forecasted values of the inflation rate very close to the actual ones. So we conclude that imposing the new trajectory of the nominal depreciation and of the real interest rate that emerged after the third quarter of 1997, the model explains quite well the short run structure of the economy. The simulated values from this amended model are used as a benchmark to evaluate alternative policies.

The following step was to define the alternative scenarios to be considered for the counterfactual simulations. The first and simpler one is the dynamic solution of the model

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[44] For a review of generalized method of moments see Hamilton (1994), Greene (2000) and Matyas (1998). For a review of previous works about estimation of monetary policy reaction functions, see Clarida et al.

using the estimated equations for the nominal depreciation and for the real interest rate. As already mentioned, nominal depreciation is above the actual depreciation, core and headline CPI inflations are well above their actual values, and the real interest rate is much below the actual interest rate. These findings are consistent with the ones derived from the analysis using the reduced-form-VAR models described in section 4. Thus, the structural changes associated to the reduction in the unremunerated reserve requirement on capital inflows, in the exchange rate policy, and in the design of monetary policy - interpretation of the monetary policy interest rate- had important effects, changing the parameters of the equations, and changing the values of the variables most closely affected by policy actions. The most important point to single out is that with the old structure, the shock was bound to result in an acceleration of inflation that would have left the inflation rate for 1998 much above the annual target resulting in a lost of credibility for monetary policy. This finding supports the point that monetary policy actions of the first semester of 1998 were a response to an anticipation of an acceleration of inflation above the target. One could mention that during this period there was a continuous tension between an expansionary fiscal policy and the need to adjust the real exchange rate to facilitate the real depreciation that has to accompany the expenditure reduction while keeping inflation within the target. In this coordination game within the independent Central Bank and the Ministry of Finance the society was forced to pay a higher cost in terms of output gap and unemployment than otherwise.

The second alternative scenario consists in making use of the uncovered interest parity to compute the nominal depreciation expected by the market that was implicit in the spread between peso and dollar rates for the same maturity and type of instrument. Although the empirical evidence in favor of the uncovered interest rate parity is weak, a recent paper of Flood and Rose (2001) shows that it works quite well for periods of high inflation and crisis. We use the uncovered interest rate parity to obtain alternative paths for the nominal exchange rate devaluation. We use two different assumptions to compute the behavior of the exchange rate during 1998[45]. One consists in computing the nominal

(1998) in the case of developed countries and Corbo (2001) in the case of Latin American countries.

[45] Just to check the robustness of the conclusions, we also compute a third different scenario for the exchange rate by applying the actually observed monthly depreciations to the level computed for February

exchange rate from the uncovered interest rate parity condition for February 1998, and then using the previously estimated equation to obtain the values for the rest of the year. The second assumption is that after February the exchange rate follows a random walk with a drift, the latter measured as the difference between internal and external inflation[46]. No matter what assumption for the rest of the year is made, the results are qualitatively the same: an inflation rate well above the target and the effectively observed one. Even more, the differences are important and represent as much as one third of the target set for the year; the results are presented in the Table 8, both as deviations from the benchmark and as percentage of the target.[47]

Table 8 contains also two additional columns recalculating the second scenario but replacing the reaction function by the one presented in Corbo (2001), who used the same data definition but over a longer period[48]. The results confirm our analysis and also indicate some kind of instability of the monetary policy reaction function. Effectively, Corbo's estimated reaction function implies a stronger reaction of monetary authorities to expected deviations of inflation from the target. A primer interpretation of this difference can be exactly the stronger response during the period under study.

As the size of the pass-through coefficient form depreciation to inflation played a central role in setting monetary policy it is important to finish with a comment on this topic. According to our estimation, the pas-through coefficient resulted smaller than the 0.6 value mentioned in Morandé (2001b). Our estimate value for the impact effect coefficient is 0.09 and for the total or long run effect is 0.28, less than half of Morande's value. However, it could be claimed that in an economy that was overheating the pass-through could be higher. But at the same time it could be argued that as the equilibrium exchange rate had increased due to change in fundamentals, there was more capacity to absorb a depreciation with less effect on inflation.[49]

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under the assumption of UIP. In this way we obtained a monthly series of the nominal exchange rate used to derive the 4-quarter depreciations included in the model.

46 Which is equivalent to assume PPP for the rest of the year.

47 Another robustness test was made by using the actual depreciation rates to compute the nominal exchange rate for the whole year. Obviously this series contains a lot more of information that anyone could have supposed by January 1998.

48 In his estimations he included information up to the end of 1999.

49 Unfortunately in our empirical work we were unable to find a relation between the pass-through coefficient and the cycle.

The reduction in the pass-through is not a phenomenon exclusive of the Chilean economy. Cunningham and Haldane (2000) shows that in Europe there were three remarkable experiences between 1992 and 1996 in which after pronounced changes in the nominal exchange rate (both appreciation and depreciation) CPI inflation did not show major changes. Taylor (2000) argues that the extent of the adjustment of prices to changes in costs depends on expectations about how persistent will be these changes and under an environment with reduced inflation persistence, these are perceived to last for a shorter period.[50]

We proceed now to study the role of monetary policy in the period that goes from the second quarter of 1998 up to the end of 1999. Our interest here is again to try to understand something about the possible reasons behind the sharp contraction of monetary policy that occurred during the third quarter of 1998 in the middle of high pressure on the Chilean peso. We focus our analysis on the trajectory of the inflation rate under alternative monetary policies, as the latter has been the main objective of monetary policy. An alternative explanation for the sharp raise in interest rate could have been, as claimed by Morandé (2001a), to reduce the size of the current account deficit. We will try to throw some light into these issues. For this purpose we re estimated the model with the information available up to the end of the second quarter of 1998, we also recalculate the trend GDP with this new information.[51] The estimated equations did not show major changes in the values of the estimated coefficients, so it also served as a robustness test for the entire model.

To address the possible influence of a concern for an acceleration of the inflation rate in the decision to defend the peso and therefore to resist a depreciation, we simulate a scenario similar to the one used for the exercise that we carried out for the previous period. That is, we made use of the uncovered interest rate parity condition to compute the expected devaluation rate in August and September of 1998 and then we use the estimated value to compute the nominal exchange rate values in the hypothetical scenario

[50] Taylor mentions a work by J. McCarthy from the Federal Reserve of New York that documents the declining pass-through for nine OECD countries when compares the period 1976-1982 with the more recent ranging from 1983 up to 1998. Goldfajn and Werlang (2000) present a comprehensive study analyzing possible determinants of the magnitude of the pass-through.

[51] The trend GDP was obtained using the Hodrick-Prescott filter.

of no defense of the currency. The values of October, November and December of 1998 were computed using the monthly depreciation rate effectively observed. To compute the trajectory during 1999 we assume two alternative scenarios, the first one makes use of the estimated equation for the nominal devaluation (Scenario 7) and the second one assumes PPP (Scenario 8). As can be observed from Figure 26, the forecasted values under scenario 7 are below the linearized target, but under scenario 8 the value is close to the target.[52] From this exercise we conclude that the risk of missing the inflation target was not evident, and in any case it was much lower than it was the case in January 1998.

We investigate now some of the real costs of the alternative strategies. For this purpose we compare the forecasted output gaps under a base scenario, which corresponds to Scenario 7, allowing for the nominal devaluation and with monetary policy obtained using the estimated reaction function. The alternative scenario (Scenario 9) corresponds to the simulation of the model using the observed values of the real interest rate for the entire period.[53] The differences in the simulated values of the output gap are very large (Figure 27). In fact, during all the year 1999, the output gap with the effective real interest rate is well below the benchmark, and the same result is valid in the case of the real interest rate (Figure 28). If we compute the cumulative difference between both trajectories, the result is approximately –10.5 percentage points.[54] From here we conclude that had the nominal devaluation been allowed, real output would have been on average much higher than what was under the extremely contractionary monetary policy that was instead followed. It should be mentioned also that in both scenarios the simulated reduction in the current account deficit is not as abrupt as was effectively observed.

Moreover, as the adjustment was carried out mainly through interest rates, firms without access to dollar-denominated liabilities suffered the mayor burden of the adjustment while the firms with net dollar liabilities were protected from the adjustment. This was an implicit cost of the strategy of relying mostly on monetary policy to face the threat of an acceleration of inflation and of reducing the size of the current account deficit.

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[52] In both scenarios the real interest rate of the PRBC-90 is modeled with the estimated reaction function.

[53] Alternatively the model was also solved using also the actual values for the nominal exchange rate, the results did not significantly change.

6. Conclusions

The sharp slowdown of the Chilean economy starting in the second quarter of 1998 has been a source of heated debate. This slowdown is related to a series of negative shocks and the policy response to these shocks. In particular, during this period Chile suffered a series of external shocks -terms of trade, increase in country risk, and contagion from the Asian and Russian crises- and at the same time it had the highest interest rates of the decade. At the time Chile was using an inflation-targeting monetary policy framework but also all along the Board of the Central Bank was keeping a close look to the size of the current account deficit. The main concern here has been that a high current account deficit makes the country vulnerable to a sharp reversal in capital inflows. Most likely the crisis of the early 1980s provided much support for this concern.

The deterioration in the external environment coincided with a very expansionary cycle of the economy and it set in motion several speculative attacks on the exchange rate system, by this time an exchange rate band. Policy adjustment to the shock and to the successive attacks was not easy, as the cooperation between fiscal and monetary policy was fairly weak. Indeed, it is shown in the paper that the period of adjustment coincides with an expansionary fiscal policy and therefore both policies worked at cross-purposes.

Much of the slowdown is traced down to a sharp reduction in private investment and in consumption. The results of the analysis carried out using both a non-structural VAR model and a small structural model of the Chilean economy indicate that much of the dynamic of the Chilean economy of the post-1997 period can be explained by the external shocks and the policy response to these shocks. The main episodes studied are the ones related to attacks on the Chilean peso (January 1998, June 1998 and September 1998).

The results of the simulations with the VAR model estimated up to June 1998 and simulated up to March 1999 show that aggregate expenditures was bound to decelerate as a result of the shocks, however, its rate of growth did not become negative. In contrast, the simulation values obtained when the observed values of real interest rate are used instead of the ones obtained from the VAR equation aggregate expenditures shows an abrupt slowdown, slightly smoother than the observed but showing the same dynamic up

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[54] Output gap is measured as the deviation from potential output as percentage of potential or trend output.

to February-March 1999.[55] One can infer from this result that there is strong evidence that the posterior slowdown was the result of monetary policy actions, both at the beginning of the simulation period and during the months just before the simulation period.

We use the small macro model to analyze the policy response to the speculative attack. With respect to the speculative attack of January 1998 we find that with the old structure, the shock was bound to result in an acceleration of inflation that would have left the inflation rate for 1998 much above the annual target resulting in a lost of credibility for monetary policy. This finding supports the point that monetary policy actions of the first semester of 1998 were a response to an anticipation of an acceleration of inflation above the target. This result is robust to alternative assumptions about the size of the exchange rate adjustment. In contrast, when we use the same model to analyze the August –September episode we find that allowing the exchange rate to depreciate did not impose a high risk of inflation acceleration and therefore some other reasons have to be found for this policy. It is found also that the cost of this policy in terms of the gap between actual and potential output was significant.

[55] When the same scenario is simulated for a longer period the recovery implied by the model is faster than the observed. This difference might be the result of the previously unobserved - in the sample used for the estimations - real interest rate and some type of nonlinear effects of monetary policy on real activity not captured by the VAR model.

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APPENDIX
FURTHER COMMENTS ABOUT THE ROLE OF FISCAL POLICY

In this appendix we discuss briefly two additional points that were mentioned in the paper: the coordination between fiscal and monetary policy, and the estimation of the fiscal impulse for the period.

Fiscal and Monetary Policy Coordination during the 1997-1998 period.

In almost every modern economy, there are two macroeconomic policies interacting, fiscal and monetary, each one using its own instrument(s) to achieve certain goals. With the emergence of central bank and monetary policy independence, the coordination of fiscal and monetary policy becomes a central issue in the evolution of any economy. In fact, under certain circumstances the lack of coordination between both policies could generate results contrary to the general purpose of the central orientation of the policies or to a higher cost in terms of the output gap (or unemployment) or output volatility.

There is a growing literature modeling and characterizing this point, which emphasizes the existence of a game and then treats the situation as a problem of strategy and coordination. Different studies had put emphasis in different elements that may lead to sub-optimal outcomes. Frankel (1998) highlights the problems that may arise when there are differences in the model used to analyze the economy, so even without different preferences, policy actions may differ. Bennett and Loayza (2000) analyze a case when there are different preferences, but with the same model; assuming a fiscal authority concerned the most about unemployment and a monetary authority concerned the most about inflation.

How can we apply this idea to add some light to the economic situation in Chile during the first months of 1998? First of all, we must remember that the 1998 budget approved in the Congress in 1997 was expansionary. In fact, the assumption made about GDP growth was above what was a prudent assumption in light of the highly uncertain evolution of the world economy, mainly because the hard pressure posed over the emerging economies by the Asian crisis. Moreover, there were some additional fiscal decisions, not directly affecting the budget maybe, that might have had a perverse effect

over the evolution of private sector expenditures and wage arrangements. The high adjustment made to the minimum wage, which was highly resisted by the employers, and the very high adjust to the public sector employees' wage give a bad signal to private sector workers. In a situation with a very high current account deficit in front of a sudden stop of net capital inflows, this was not a good idea. The required adjustment on aggregate expenditure would be extremely difficult in a situation with an expansionary budget and with a major wage pressure on the labor market.

A more conservative budget along with lower wage adjustments may have helped to adjust domestic demand without necessity to put all the pressure over monetary policy. Even more, as there was a high concern about a possible overvaluation of the peso, a moderate expansion of aggregate expenditure could have helped to avoid a large nominal and real depreciation, reducing inflationary pressures. Under this scenario, monetary policy was confronted to an important trade-off between the inflation target and a deteriorated real activity scenario given the large deterioration of the external environment.

Estimating of the Fiscal Impulse.[56]

For the estimation of the fiscal impulse we consider the Central Government accounts.[57] This definition includes the Treasury, the ministries and the transferences from and to local governments, public enterprises and public universities. This definition is useful for our purpose because: i) local governments are not able to raised debt, and if they present a deficit, it must be financed by the Central Government; ii) Universities are relatively small (in financial terms) when compared with the public sector; iii) Public enterprises have, in their majority, a superavit which is considered in the Central Government accounting, and; iv) The Central Bank is an independent institution.

Another topic that deserves special attention when estimating fiscal indicators is the selection of the fiscal aggregates to be considered above the line, because choosing different aggregates may lead to different conclusions. In this study, we select those aggregates that seem to have the most direct impact over domestic absorption, taking as an starting point the selection carried on by the Government Budget Office (Dipres) in

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[56] This section draws on work in progress by Oscar Facusse.

[57] These data are available at the Dirección de Presupuestos de Chile Website (www.dipres.cl).

the estimation of the Structural Budget Balance[58]. One adjustment was necessary. We leave out copper incomes, because its inclusion may lead to a completely opposite conclusion about right fiscal stance. For example, if copper prices are, for a certain period, higher than an arbitrarily chosen neutral price this would imply that the government apply a contractive policy at that time, when actually, the effect over demand of this positive terms of trade shock would be just the opposite (i.e. an expansion of aggregate demand). Thus, the income and expenditure aggregates were constructed as shown in Table A.1.[59]

One last point that deserves attention before constructing the fiscal impulse is the estimation of the potential product. For this exercise we use the Hodrick-Prescott filter, although we recognized all the limitations that this method imposes (i.e. ending points problem) but considering its simplicity we conclude it would be a good proxy for the potential product.

With all this in mind, we proceed to the construction of the annual fiscal impulse. The results are shown in Table A.2.

The calculations were carried on using two similar methods. The first one, that is how the Total Impulse variable was calculated, was following the IMF method and using trend revenues and expenditures as defined in the last Chilean selected issues (IMF, 2001). The second method calculates total impulse (Total Impulse 2) using the following equation:

$$FI_t = [(E_t - E_{t-1} - g_0(YP_t - YP_{t-1}) - (I_t - I_{t-1} - t_0(Y_t - Y_{t-1})] / Y_t$$

Where:

E_t: Adjusted Expenditures in period t.

I_t: Adjusted Incomes in period t.

YP_t: Potential Product in period t.

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58 For the estimation of the structural budget balance for year 2002, DIPRES changed its procedures to estimate recognition bonds. However, for this study, the old methodology is the one that best suits our requirements.

59 For more details, see Marcel et al. (2001).

Y_t: GDP

g_0: average of adjusted expenditure to potential product for years 1992-1997.

t_0: average of adjusted income to GDP for the same period.

The two indicators present, as expected, extremely close results, which indicate that the government pursued an expansive fiscal policy for the period 1995-1999, but with a more expansive stance for the period after 1997.

The two measures are presented because our next step was to estimate the quarterly fiscal impulse for the relevant period, which is 1997:I-2000:IV. Here we used equation presented before. The objective is to figure out what happened with the fiscal accounts during the economic slowdown. The methodology is exactly the same we presented before, but in quarterly basis [60]. Here, g_0 and t_0 corresponds to the quarterly average for 1996 and the differences $(X_t - X_{t-1})$ are considering changes in four quarters.

60 Quarterly GDP was seasonally adjusted before detrending with HP filter. Here the fiscal aggregates were constructed without adjusting by the FEPP due to lack of quarterly data, although the results do not present significant changes.

Table 1
Macroeconomic Indicators: 1974-2000

	GDP Growth (Real, %) (1)	Domestic Expenditure Growth (Real, %) (2)	Trade Balance (% GDP) (3)	Current Account Balance (%, GDP) (4)	Export Volume Growth (%) (5)	Public Sector Balance (%, GDP) (6)	Real Price of Copper (1990=1) (7)	Real Price of Oil (1990=1) (8)	Inflation (%, Dec-Dec) (9)
1974						-5,4%	1,678	1,185	369,2
1975	-13,3%	-21,1%	1,0%	-6,8%	2,5%	-2,0%	0,921	0,966	343,3
1976	3,2%	-0,5%	6,5%	1,5%	24,3%	4,0%	1,001	1,055	197,9
1977	8,3%	12,9%	0,3%	-4,1%	12,0%	0,4%	0,879	1,082	84,2
1978	7,8%	9,7%	-2,8%	-7,1%	11,8%	1,6%	0,851	1,001	37,2
1979	7,1%	10,4%	-1,7%	-5,7%	14,2%	4,8%	1,098	2,001	38,9
1980	7,7%	10,5%	-2,8%	-7,1%	14,5%	6,1%	1,062	2,070	31,2
1981	6,7%	12,4%	-8,1%	-14,3%	-9,0%	0,8%	0,775	1,836	9,5
1982	-13,4%	-23,8%	0,3%	-9,8%	4,5%	-3,4%	0,645	1,639	20,7
1983	-3,5%	-8,6%	5,1%	-5,7%	0,1%	-3,0%	0,686	144,2	23,1
1984	6,1%	8,7%	1,9%	-10,9%	2,2%	-4,3%	0,579	1,359	23,0
1985	3,5%	-2,4%	5,4%	-8,6%	12,4%	-2,6%	0,599	1,312	26,4
1986	5,6%	4,9%	6,2%	-6,7%	10,1%	-2,1%	0,598	0,70,6	17,4
1987	6,6%	9,8%	6,3%	-3,6%	6,7%	-0,2%	0,759	0,880	21,5
1988	7,3%	7,7%	9,1%	-1,0%	11,6%	0,2%	1,061	0,687	12,7
1989	10,6%	13,3%	5,4%	-2,5%	16,1%	1,3%	1,107	0,798	21,4
1990	3,7%	2,9%	4,2%	-1,6%	8,6%	3,6%	1,000	1,000	27,3
1991	8,0%	6,2%	4,3%	-0,3%	12,4%	2,4%	0,876	0,841	18,7
1992	12,3%	15,0%	1,7%	-2,3%	13,9%	2,9%	0,850	0,812	12,7
1993	7,0%	10,8%	-2,2%	-5,7%	3,5%	2,1%	0,702	0,701	12,2
1994	5,7%	5,5%	1,4%	-3,1%	11,6%	2,3%	0,838	0,645	8,9
1995	10,6%	16,2%	2,1%	-2,1%	11,0%	3,8%	1,027	0,671	8,2
1996	7,4%	7,9%	-1,6%	-5,1%	11,8%	2,0%	0,783	0,786	6,6
1997	7,4%	9,1%	-2,1%	-5,0%	9,4%	1,0%	0,778	0,735	6,0
1998	3,9%	3,9%	-3,4%	-5,7%	5,9%	-1,2%	0,580	0,502	4,7
1999	-1,1%	-10,0%	2,5%	-0,1%	6,9%	-2,3%	0,547	0,692	2,3
2000	5,4%	6,6%	2,1%	-1,4%	7,5%	-0,6%	0,597	1,046	4,5

Source: (1), (2), (3), (4), (5) (7), (9), (10), (11), (12), (13), (14) from Central Bank of Chile (2001). (6) From Larraín and Vergara (2000b), corresponds to Non-Financial Public Sector Balance. (8) Own elaboration in base of Central Bank of Chile, USA WPI used as deflator. (15) Obtained from Bennett and Valdés (2001).

Table 1 (cont.)
Macroeconomic Indicators: 1974-2000

	Unemployment Rate National (% of Labor Force) (10)	Unemployment Rate Great Santiago (% of Labor Force) (11)	Real Exchange Rate (1986=100) (12)	Nominal Exchange Rate ($/US$) (13)	Real Interest Rate (%, annual) (14)	Terms of Trade (1986=1) (15)
1974						2,077
1975	14,9	16,2		4,9		1,261
1976	12,7	16,8		13,1		1,387
1977	11,8	13,2	57,1	21,5		1,254
1978	14,2	14,0	68,1	31,7		1,207
1979	13,6	13,6	70,2	37,2	22,9	1,444
1980	10,4	11,8	60,8	39,0	13,4	1,343
1981	11,3	11,1	52,9	39,0	14,7	1,169
1982	19,6	22,1	59,0	50,9	15,5	1,066
1983	14,6	22,2	70,8	78,8	11,1	1,161
1984	13,9	19,2	74,0	98,5	9,2	1,077
1985	12,0	16,3	90,9	160,9	9,1	1,032
1986	10,4	13,5	100,0	192,9	7,6	1,000
1987	9,6	12,3	104,3	219,4	7,2	1,147
1988	8,0	10,9	111,2	245,0	7,4	1,552
1989	7,1	9,1	108,6	267,0	8,9	1,575
1990	7,4	9,6	112,7	304,9	12,7	1,382
1991	7,1	7,4	106,4	349,2	8,3	1,283
1992	6,2	6,0	97,6	362,6	8,3	1,273
1993	6,4	6,3	96,9	404,2	9,3	1,255
1994	7,8	6,8	94,2	420,2	9,3	1,423
1995	6,6	6,6	88,9	396,8	8,5	1,573
1996	5,4	6,2	84,7	412,3	8,8	1,376
1997	5,3	6,6	78,2	419,3	8,4	1,418
1998	7,2	9,0	78,0	460,3	10,9	1,259
1999	8,9	13,8	82,3	508,8	8,2	1,203
2000	8,3	14,0	86,0	539,5	7,4	1,228

(3) and (4) Computed using old National Accounts (base 1977) and Balance of Payments statistics up to 1984. (10) Corresponds to the National Statistics Institute (INE) for the entire country. (11) Computed quarterly by the Economics Department of the Universidad de Chile. (14) It corresponds to the indexed rate charged on 90- to 365-day loans in the banking sector.

Table 2
Factors Accounting For Growth

Period	Labor	Capital	TFP	Total
1951-1960	0.99	1.33	0.64	2.96
1961-1970	0.74	1.61	1.39	3.74
1971-1980	0.4	0.79	0.09	1.28
1981-1985	0.74	0.5	-2.95	-1.71
1986-1995	0.87	1.56	3.97	6.4
1995-1997	0.69	4.8	3.01	8.5

Source: Authors' own calculations.

Table 3
Macroeconomic Indicators: 1996.I-2000.IV

	GDP Growth (Real, %) (1)	Domestic Expenditure Growth (Real, %) (2)	Trade Balance (% GDP) (3)	Current Account Balance (%, GDP) (4)	Export Volume Growth (%) (5)	Public Sector Balance (%, GDP) (6)	Real Price of Copper (1990=1) (7)	Real Price of Oil (1990=1) (8)	Inflation (%, 4-quarter) (9)
1996-I	8,9	12,6	1,4	-2,97	7,0	4,6	0,9	0,7	7,9
1996-II	7,5	7,7	2,1	-3,20	19,1	2,0	0,8	0,7	8,4
1996-III	5,5	3,0	-4,0	-3,74	13,1	1,9	0,7	0,8	6,8
1996-IV	7,7	8,7	-5,9	-5,12	8,9	0,9	0,7	0,9	6,5
1997-I	5,0	2,0	3,8	-4,09	14,5	5,0	0,8	0,8	7,0
1997-II	6,1	9,1	0,6	-4,32	2,2	0,9	0,9	0,7	5,6
1997-III	8,7	12,0	-4,8	-4,48	8,1	2,1	0,8	0,7	5,7
1997-IV	9,8	13,1	-7,4	-4,95	12,9	-0,5	0,7	0,7	6,3
1998-I	8,8	18,1	-3,5	-6,63	6,1	3,9	0,6	0,6	5,6
1998-II	6,3	9,2	-3,0	-7,29	10,6	0,6	0,6	0,5	5,4
1998-III	3,4	2,8	-5,9	-7,40	5,4	-0,3	0,6	0,5	5,1
1998-IV	-2,5	-11,6	-1,5	-5,67	1,7	-2,5	0,5	0,4	4,4
1999-I	-2,8	-14,8	3,6	-3,95	6,6	1,3	0,5	0,4	3,8
1999-II	-3,7	-14,0	3,2	-2,43	6,3	-2,2	0,5	0,6	3,9
1999-III	-1,8	-9,9	0,1	-1,00	5,2	-1,0	0,6	0,8	3,2
1999-IV	4,0	-0,3	2,9	-0,12	9,4	-3,2	0,6	0,9	2,5
2000-I	5,5	5,4	4,9	-0,02	10,2	4,4	0,6	1,0	3,2
2000-II	6,0	11,0	0,4	-0,95	3,9	0,4	0,6	1,0	3,6
2000-III	5,6	5,7	0,6	-1,04	9,7	-1,7	0,6	1,1	4,0
2000-IV	4,5	4,7	2,2	-1,41	5,7	-2,3	0,6	1,1	4,6

Source: (1), (2), (3), (4), (5) (7), (9), (10), (11), (12), (13), (14) from Central Bank of Chile (2001).
(6) Obtained from DIPRES, corresponds to Central Government Balance. (8) Own elaboration in base of Central Bank of Chile, USA WPI used as deflator. (15) Obtained from Bennett and Valdés (2001).

Table 3 (cont.)
Macroeconomic Indicators: 1996.I-2000.IV

	Unemployment Rate National (% of Labor Force) (10)	Unemployment Rate Great Santiago (% of Labor Force) (11)	Real Exchange Rate (1986=100) (12)	Nominal Exchange Rate ($/US$) (13)	Real Interest Rate (%, Annual) (14)	Terms of Trade (1986=1) (15)
1996-I	6,6	6,1	86,9	410,4	9,1	1,073
1996-II	6,6	7,2	84,2	408,2	9,5	1,057
1996-III	6,8	5,9	83,8	411,2	9,4	0,958
1996-IV	5,4	5,7	83,8	419,3	9,3	0,975
1997-I	5,8	6,6	80,5	418,0	9,1	1,046
1997-II	6,6	6,7	79,1	417,9	8,8	1,094
1997-III	6,7	6,7	76,8	415,5	8,6	1,064
1997-IV	5,3	6,5	76,3	425,9	8,5	0,981
1998-I	5,3	6,7	77,8	451,5	10,3	0,942
1998-II	6,1	6,9	77,6	454,4	10,6	0,951
1998-III	6,8	11,1	78,4	468,8	15,2	0,926
1998-IV	7,2	11,4	78,2	466,4	11,6	0,897
1999-I	8,2	12,9	79,0	487,2	9,4	0,868
1999-II	10,8	15,4	78,7	489,8	8,4	0,871
1999-III	11,4	14,4	83,6	518,1	7,3	0,902
1999-IV	8,9	12,4	87,8	540,0	7,6	0,910
2000-I	8,2	13,1	83,1	512,6	7,6	0,917
2000-II	9,4	14,4	83,0	519,8	7,7	0,906
2000-III	10,7	15,0	88,4	553,2	7,5	0,904
2000-IV	8,3	13,4	89,6	572,4	7,2	0,899

(10) Corresponds to the National Statistics Institute (INE) for the entire country. (11) Computed quarterly by the Economics Department of the Universidad de Chile. (14) It corresponds to the indexed rate charged on 90- to 365-day loans in the banking sector.

Table 4
Cumulative Change in Selected Macroeconomic Aggregates

	Change From 1998.II				
	1998.IV	1999.I	1999.II	1999.III	1999.IV
Gross Domestic Product	-3,9%	-4,0%	-3,6%	-2,6%	-0,3%
Absorption	-10,3%	-12,6%	-14,2%	-12,1%	-10,1%
Total Consumption	-9,8%	-11,1%	-12,2%	-7,9%	-4,5%
Fixed Investment	-11,8%	-16,3%	-19,2%	-22,5%	-24,0%
Net Exports	54,9%	69,6%	83,4%	77,5%	80,8%
Exports	0,6%	2,6%	6,4%	5,4%	10,1%
Imports	-15,1%	-17,8%	-19,0%	-18,0%	-15,7%

Seasonally Adjusted Data

	Change From 1998.II				
	1998.IV	1999.I	1999.II	1999.III	1999.IV
	Difference (percentage points)				
Unemployment Rate	0,3	2	3,1	4,7	4,8
Core Inflation (1)	0,187	0,44	-0,169	-1,286	-2,382
Real Interest Rate	4,18	0,63	-1,13	-2,23	-3,25
Capital Flows (% GDP) (2)	10,07	7,75	-4,52	1,63	4,05
Capital Flows (% GDP) (3)	-1,45	-0,18	-2,84	-2,39	-3,95
	Change (%)				
Real Money M1A	-5,8%	-9,5%	-8,3%	-5,1%	-1,4%
Real Money M2A	3,0%	2,6%	1,5%	5,7%	8,1%
Terms of Trade	-2,7%	-5,7%	-8,7%	-8,5%	-5,2%
Employment	0,1%	-1,2%	-2,4%	-3,7%	-3,4%

(1) 4-quarter change

(2) Quarter

(3) 4-quarter moving average

Source: Authors' own elaboration in base of Central Bank of Chile (2001) and *Economic and Financial Report*, various issues.

Table 5
Decomposition of the Slowdown: Annual Values

	Government Consumption	Private Consumption	Inventory Investment	Fixed Investment	Exports	Imports	GDP
1998	0,07%	-2,40%	-1,15%	-2,71%	-1,62%	4,25%	-3,57%
1999	0,03%	-9,34%	-5,59%	-11,65%	-2,94%	17,91%	-11,57%
2000	0,07%	-11,55%	-4,34%	-14,19%	-4,08%	20,50%	-13,59%

Source: Authors' Elaboration in base of a methodology used by Hall (1993).

Table 6
Decomposition of the Slowdown: Quarterly Values

	GDP	Total Consumption	Fixed Investment	Net Exports	Exports	Imports
Mar-98	-1,09%	-0,90%	-0,08%	-0,11%	-1,78%	1,68%
Jun-98	-2,68%	-4,87%	-1,16%	3,35%	-1,11%	4,46%
Sep-98	-4,71%	-7,63%	-3,12%	6,04%	-1,76%	7,81%
Dic-98	-9,61%	-15,41%	-6,02%	11,81%	-2,35%	14,16%
Mar-99	-11,69%	-17,79%	-7,92%	14,02%	-2,31%	16,33%
Jun-99	-13,10%	-19,83%	-9,29%	16,02%	-1,67%	17,69%
Sep-99	-13,43%	-17,98%	-10,70%	15,25%	-2,73%	17,99%
Dic-99	-12,66%	-16,83%	-11,59%	15,76%	-1,86%	17,62%
Mar-00	-13,95%	-17,21%	-10,93%	14,19%	-1,63%	15,82%
Jun-00	-14,70%	-15,94%	-10,75%	11,98%	-3,07%	15,05%
Sep-00	-15,25%	-19,95%	-10,80%	15,49%	-2,14%	17,63%
Dic-00	-15,69%	-20,45%	-10,71%	15,47%	-2,66%	18,13%

Source: Authors' Elaboration in base of a methodology used by Hall (1993).

Table 7
Cumulative Shocks on GDP and its Components

	Accumulated Normalized Shocks			
	GDP	**Total Consumption**	**Fixed Investment**	**Net Exports**
1997.IV	**0**	**0**	**0**	**0**
1998.I	**-1,17**	**0,12**	**-0,70**	**0,16**
1998.II	**-0,41**	**-0,98**	**-0,14**	**0,18**
1998.III	**-0,99**	**-1,40**	**-0,61**	**1,67**
1998.IV	**0,22**	**-2,33**	**-0,60**	**3,08**
1999.I	**0,85**	**-3,04**	**-0,50**	**3,61**
1999.II	**0,59**	**-1,65**	**-1,08**	**3,32**
1999.III	**-0,42**	**-0,82**	**-2,65**	**3,65**
1999.IV	**-0,96**	**-1,19**	**-3,12**	**4,05**

Source: Authors' elaboration.

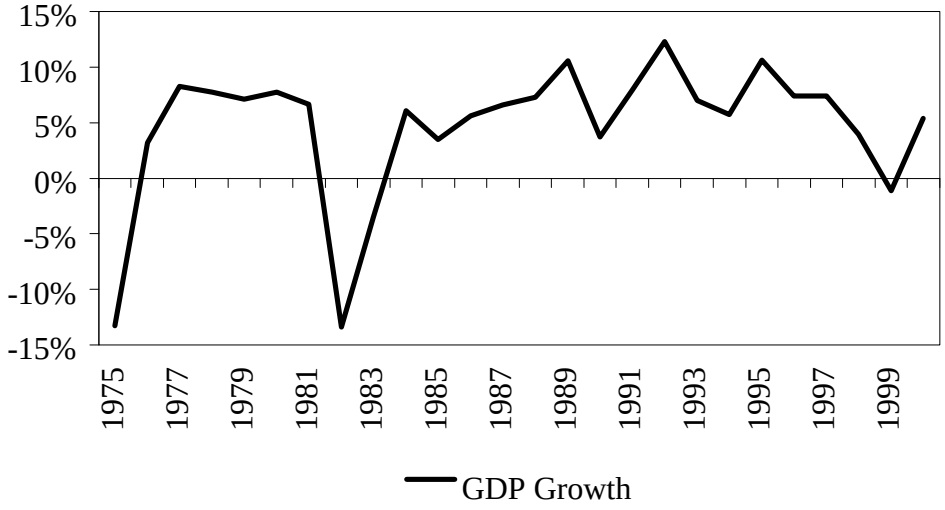
As the errors are normally distributed with mean 0 and variance 1, the standard deviation of the cumulative errors is equal to the square root of the numbers of periods. For example, the standard deviation of the cumulative error up to 1998.IV is 2 (square root of 4).

Table 8
Structural Model Simulations: Inflation
(%, 4-quarter rate of change)

	Dynamic Simulation		No Defense Scenario				No Defense Scenario using Corbo (2001)*			
			Using Equation 5.6		Assuming PPP		Using Equation 5.6		Assuming PPP	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
98.I	0.0	12.8%	0.0	12.8%	0.0	12.8%	0.0	12.8%	0.0	12.8%
98.II	0.1	18.4%	0.4	24.0%	0.4	24.0%	0.4	24.0%	0.4	24.0%
98.III	0.3	20.8%	0.6	27.5%	0.7	28.5%	0.6	26.6%	0.6	27.5%
98.IV	0.8	24.7%	1.1	30.9%	0.9	28.0%	0.9	27.0%	0.8	24.2%

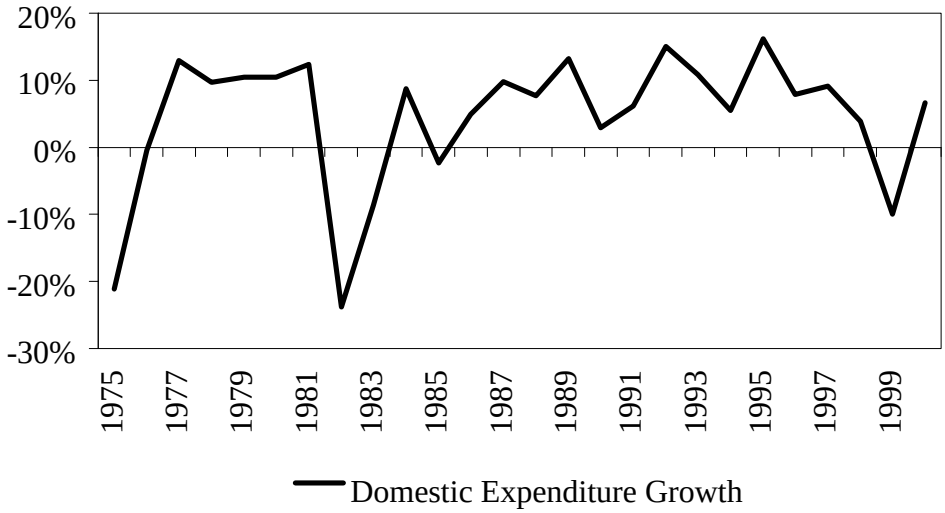
Source: Authors' elaboration in base of the estimated model presented in the paper.
(a) Result expressed as deviation in percentage points from the benchmark.
(b) Difference between the result and the linearized target expressed as percentage of the target.
*** The monetary policy reaction function estimated in the model (equation 5.7) is replaced by the equation presented by Corbo (2001).**

Figure 1
GDP Growth
(%, Annual rate)



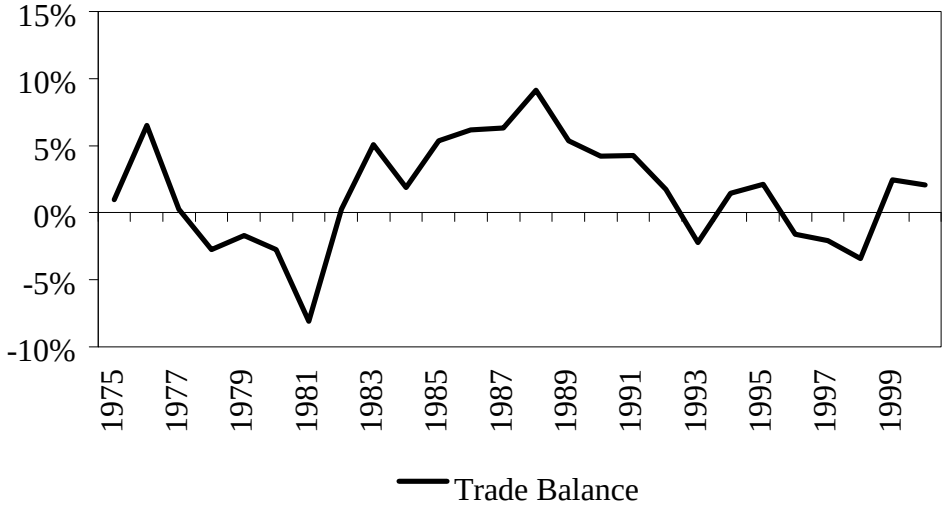
Source: see Table 1.

Figure 2
Domestic Expenditure Growth
(%, Annual rate)



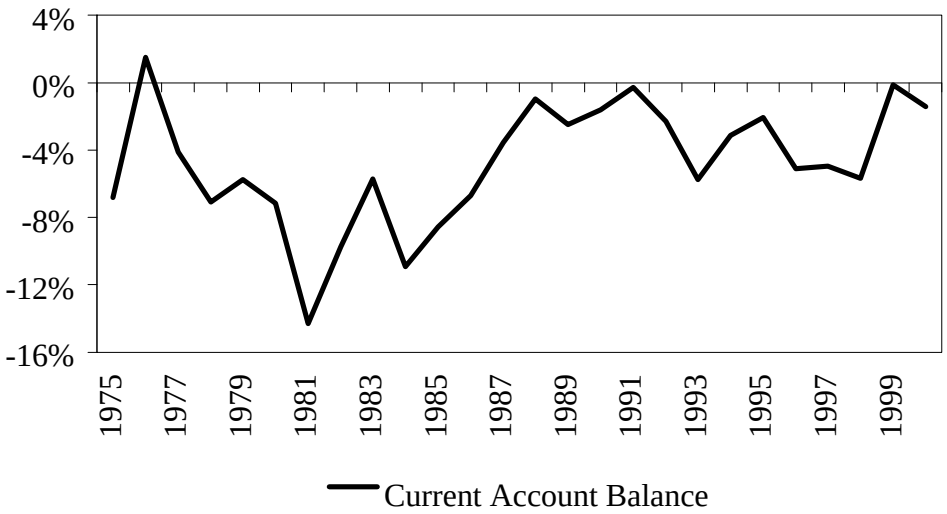
Source: see Table 1.

Figure 3
Trade Balance
(% Nominal GDP)



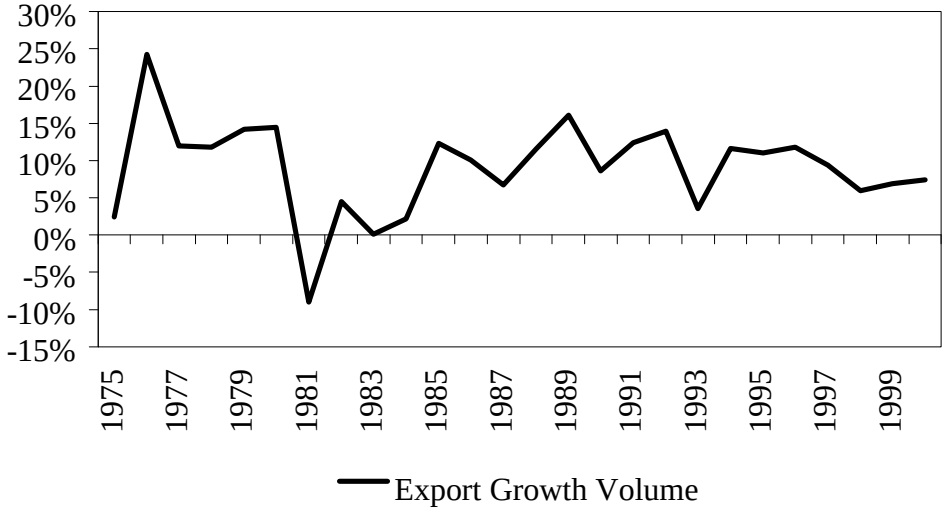
Source: see Table 1.

Figure 4
Current Account Balance
(% Nominal GDP)



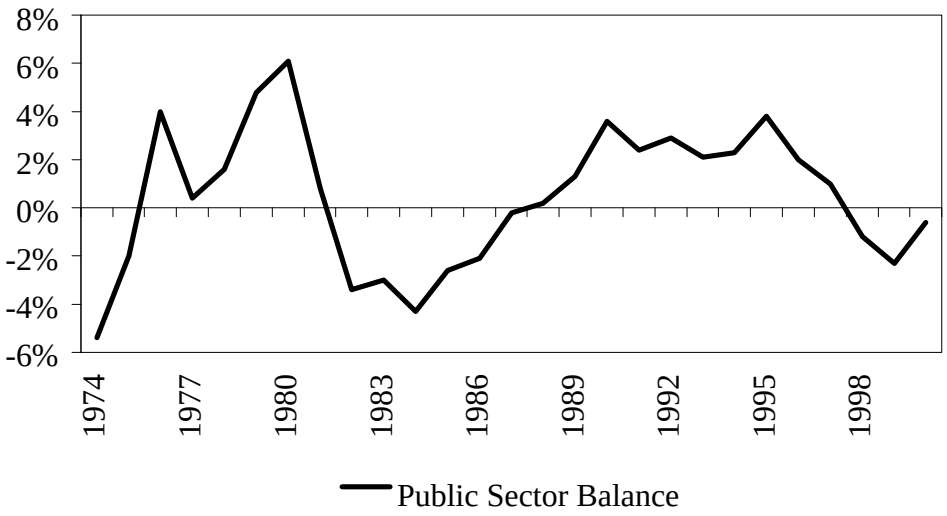
Source: see Table 1.

Figure 5
Export Volume Growth
(%, Annual Rate)



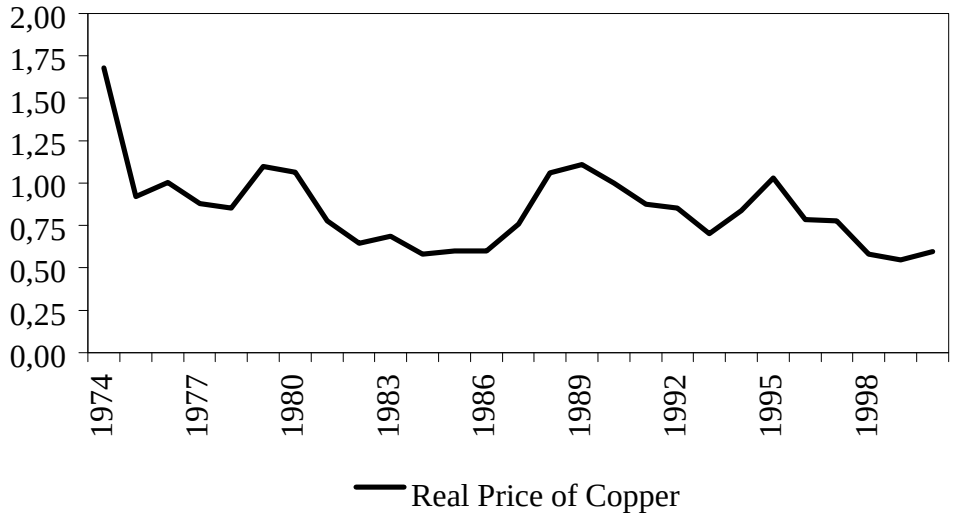
Source: see Table 1.

Figure 6
Public Sector Balance
(% GDP)



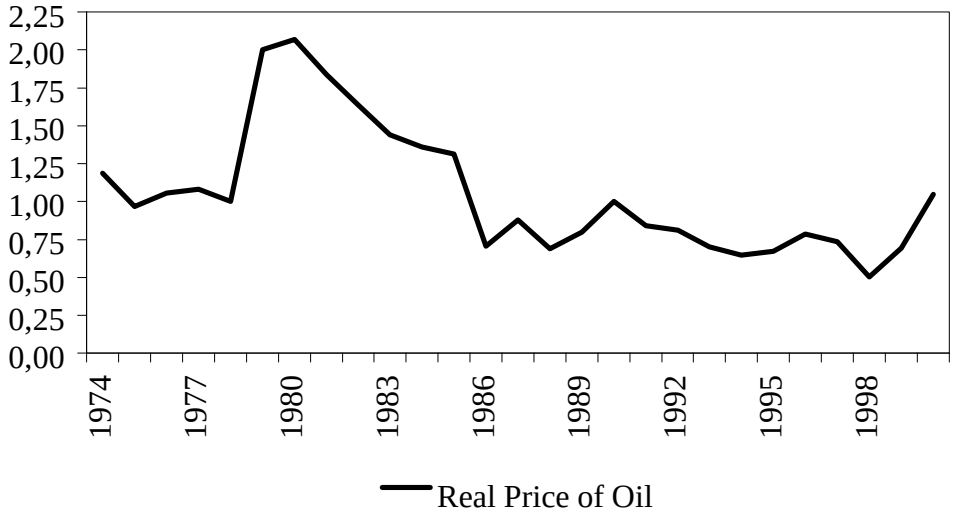
Source: see Table 1.

Figure 7
Real Price of Copper
(Index, 1990=1)



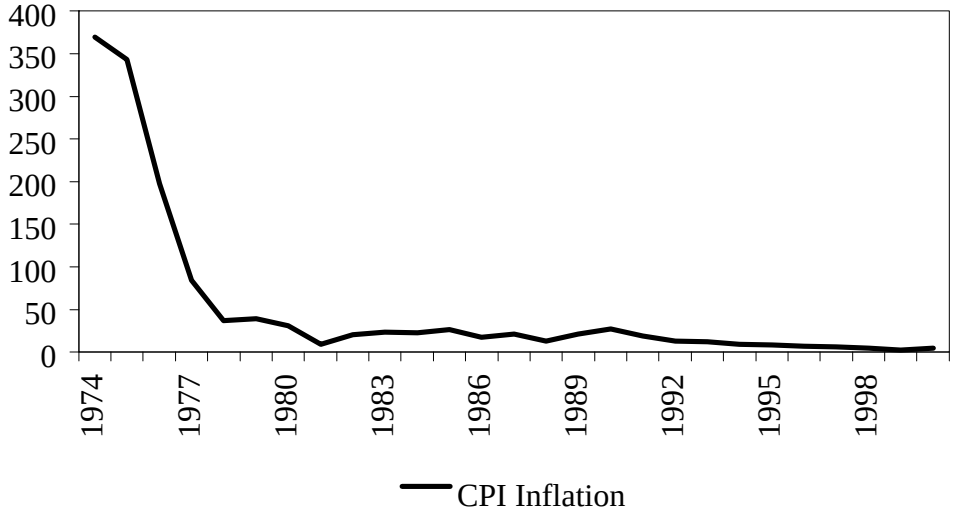
Source: see Table 1.

Figure 8
Real Price of Oil
(Index, 1990=1)



Source: see Table 1.

Figure 9
CPI Inflation
(%, December to December rate of change)

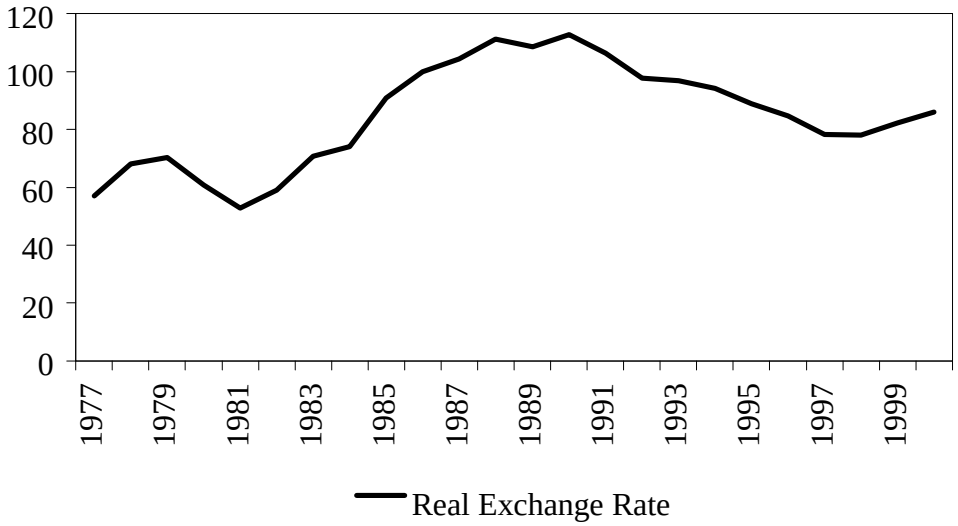


Source: see Table 1.

Figure 10
Unemployment Rate
(%, national rate)

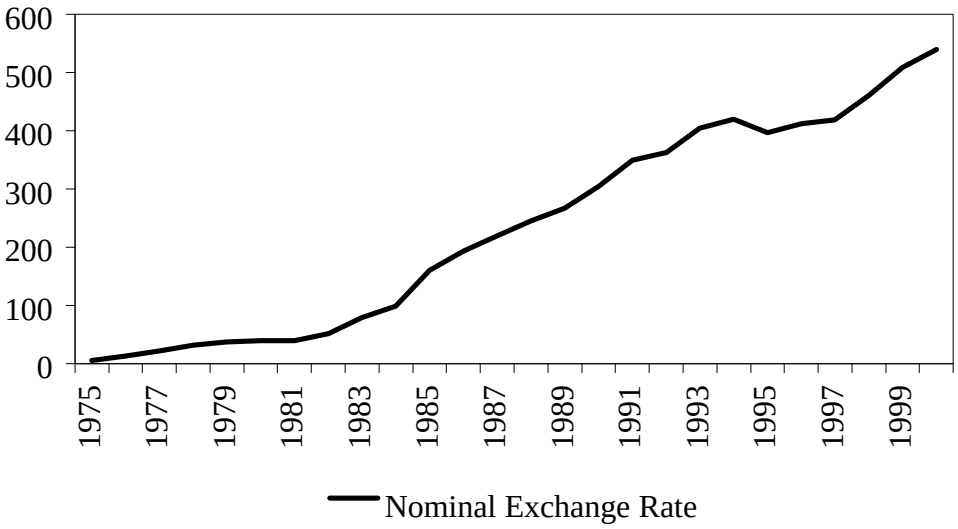
Source: see Table 1.

Figure 11
Real Exchange Rate
(1986=100)



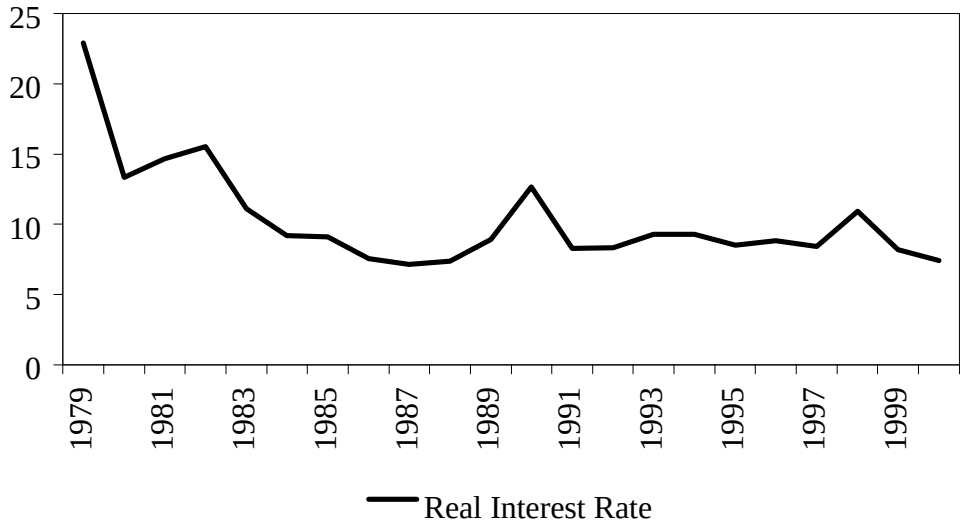
Source: see Table 1.

Figure 12
Nominal Exchange Rate
(Chilean pesos per dollar)



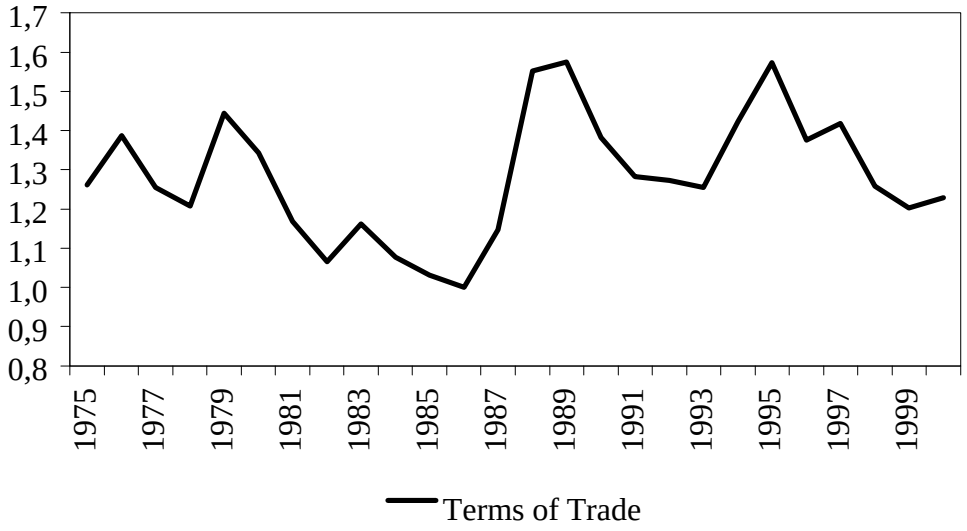
Source: see Table 1.

Figure 13
Real Interest Rate
(%, Annual)



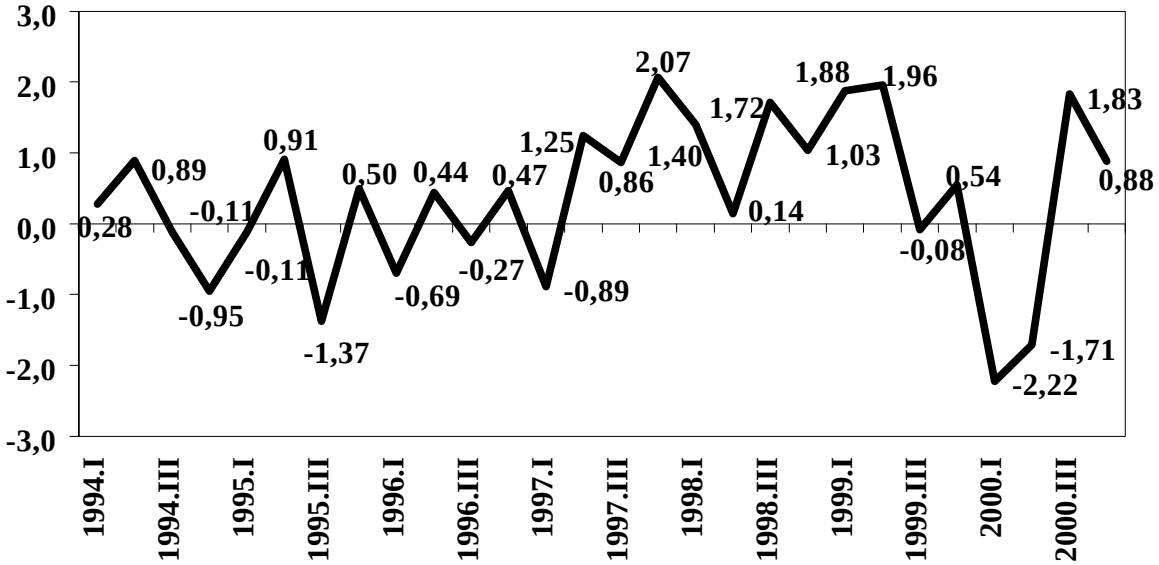
Source: see Table 1.

Figure 14
Terms of Trade
(1986=1)



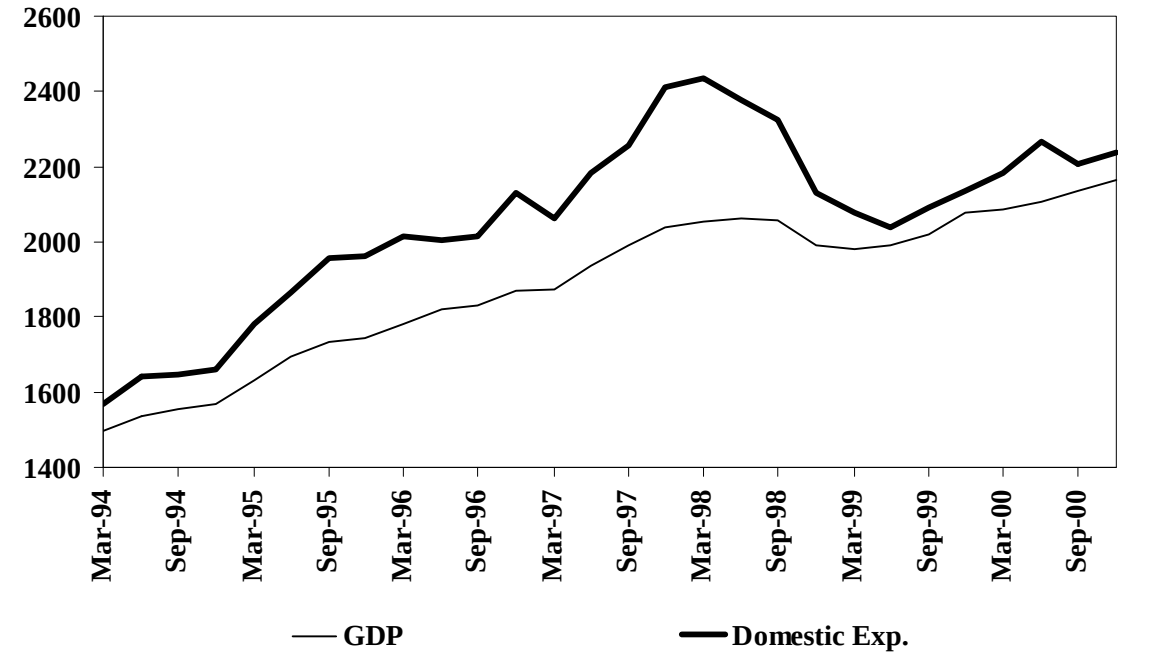
Source: see Table 1.

Figure 15
Quarterly Fiscal Impulse
(% of GDP)



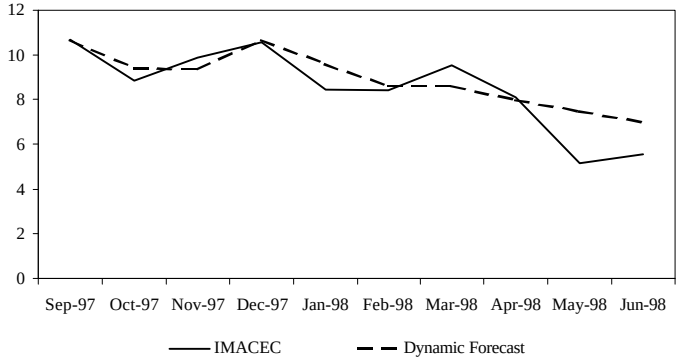
Source: Authors' own elaboration.

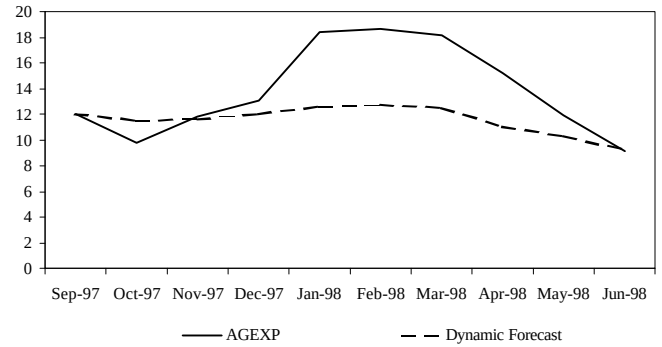
Figure 16
GDP and Domestic Expenditure Growth
(Billions of 1986 pesos, seasonally adjusted data)



Source: Authors' own elaboration. Seasonally adjusted using X-12 ARIMA.

Figure 17
Actual and Dynamic Forecasts, VAR model
October 1997-June 1998





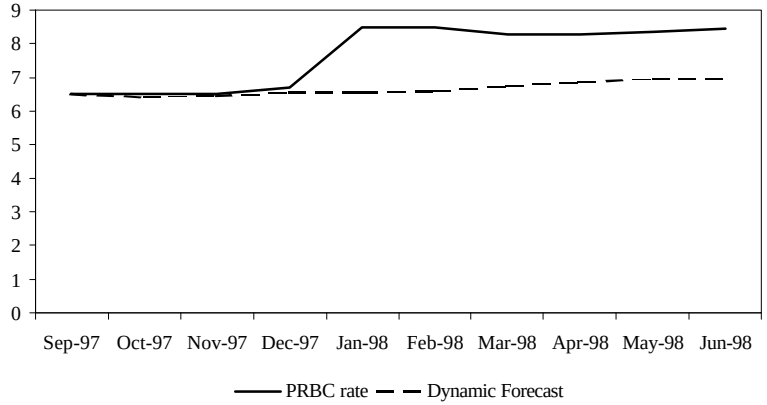
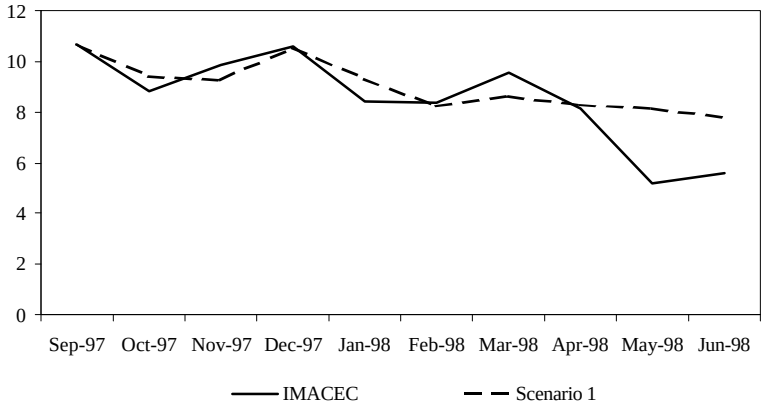
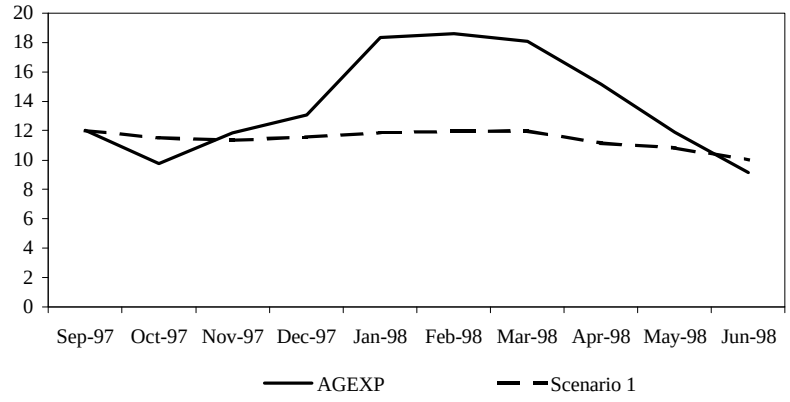


Figure 18
Actual and Scenario 1, VAR model
October 1997-June 1998





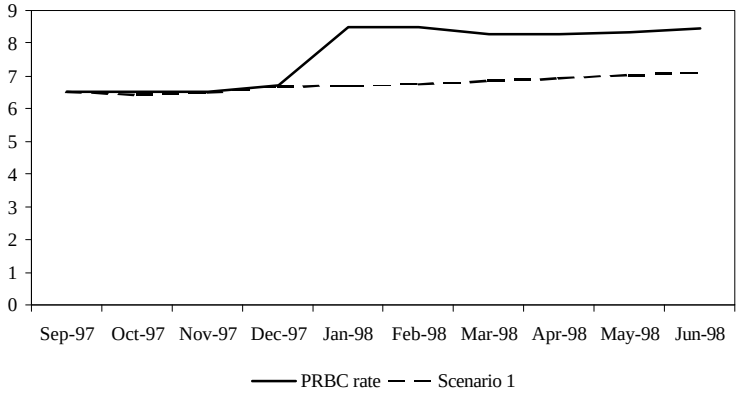
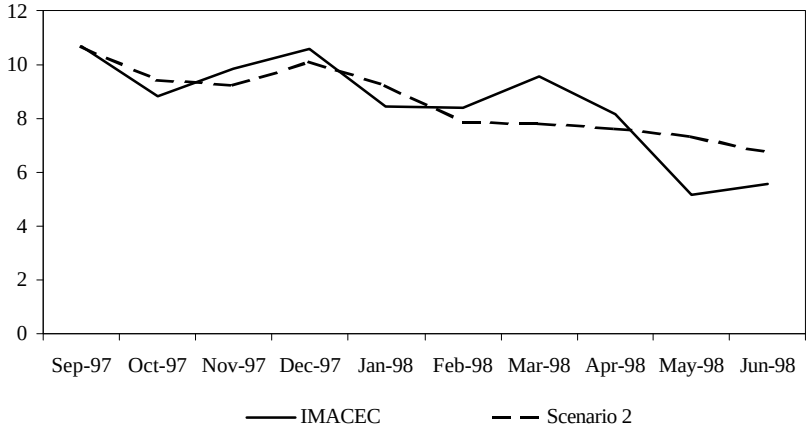
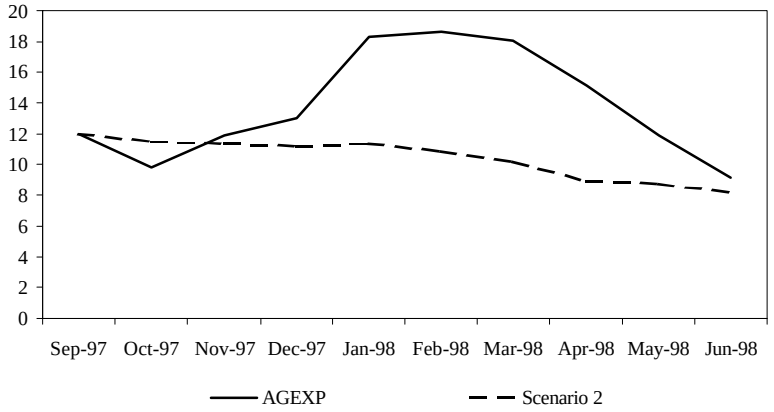


Figure 19
Actual values and Scenario 2, VAR model
October 1997-June 1998





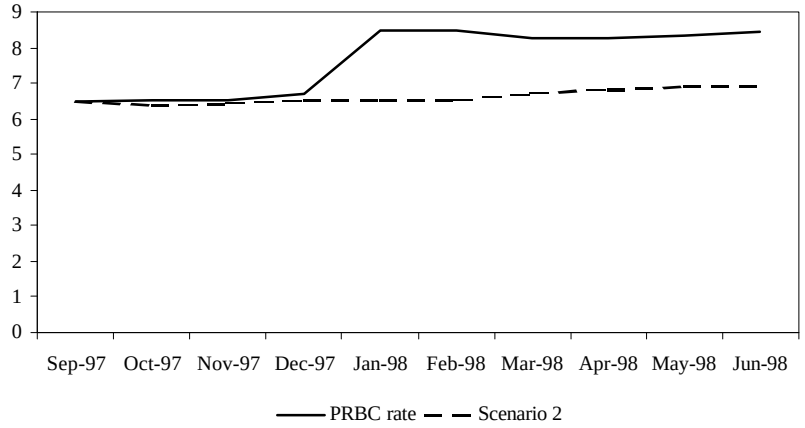
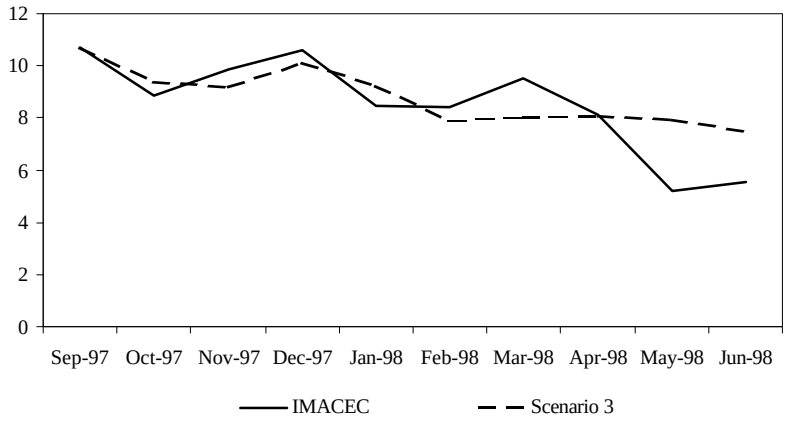
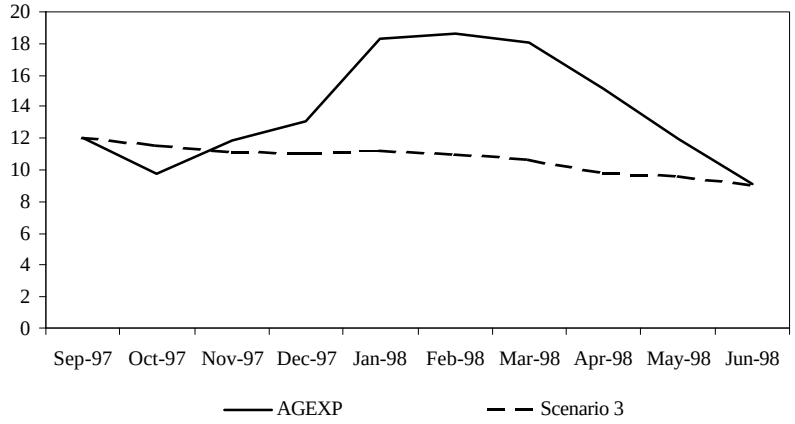


Figure 20
Actual values and Scenario 3, VAR model
October 1997-June 1998





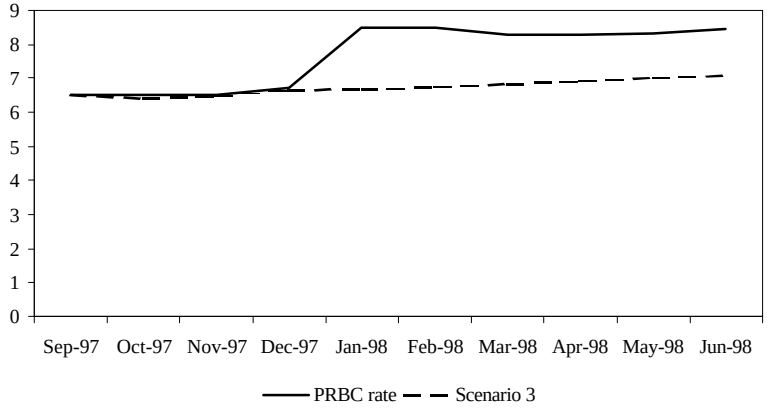
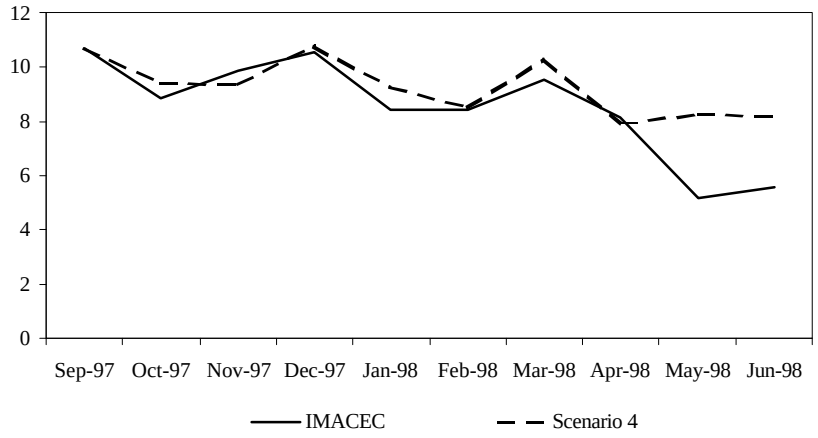
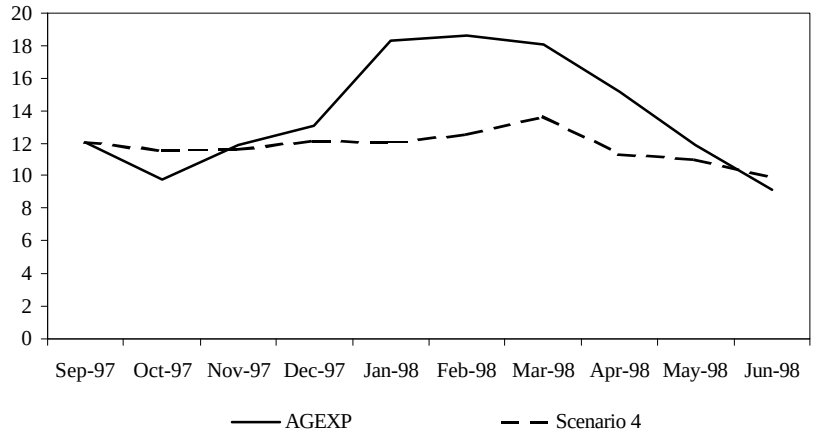


Figure 21
Actual values and Scenario 4, VAR model
October 1997-June 1998





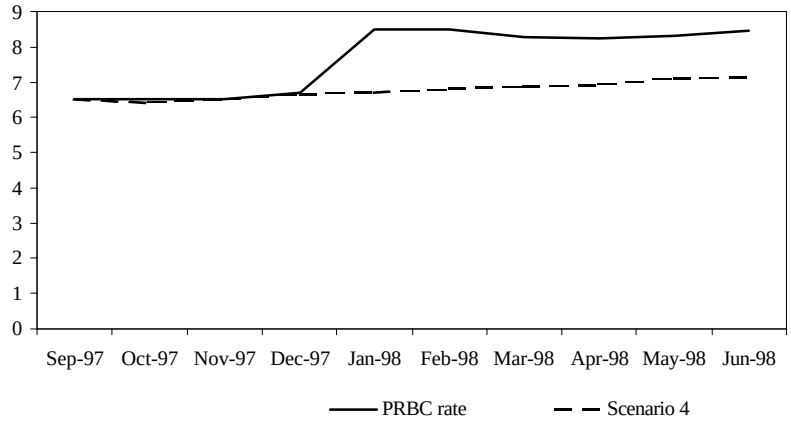
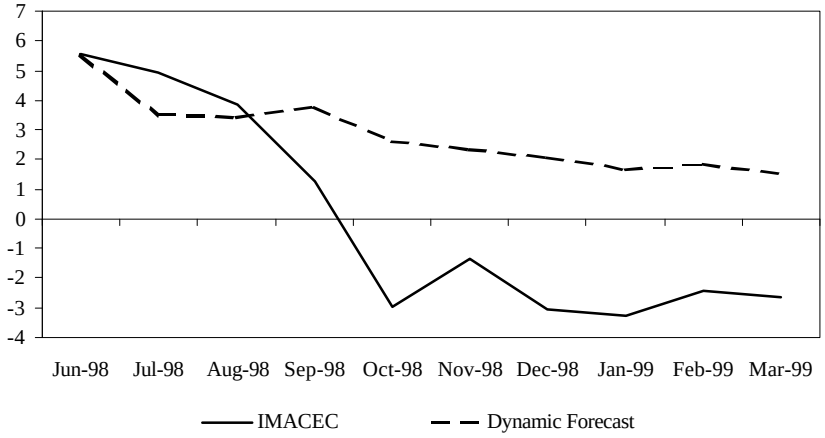
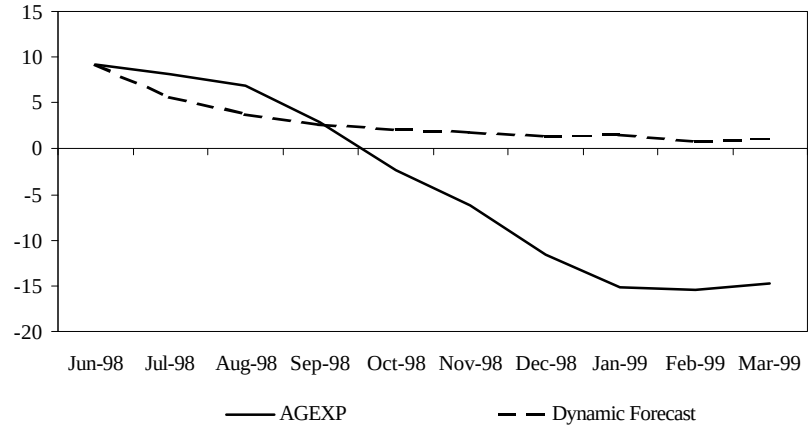


Figure 22
Actual and Dynamic Forecasts, VAR model
July 1998-March 1999





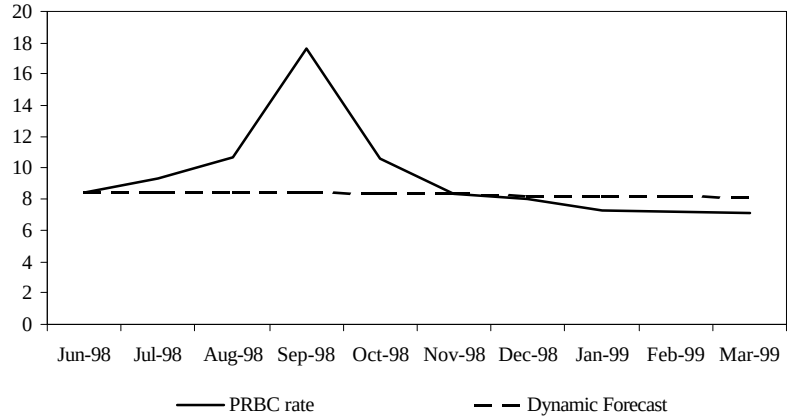
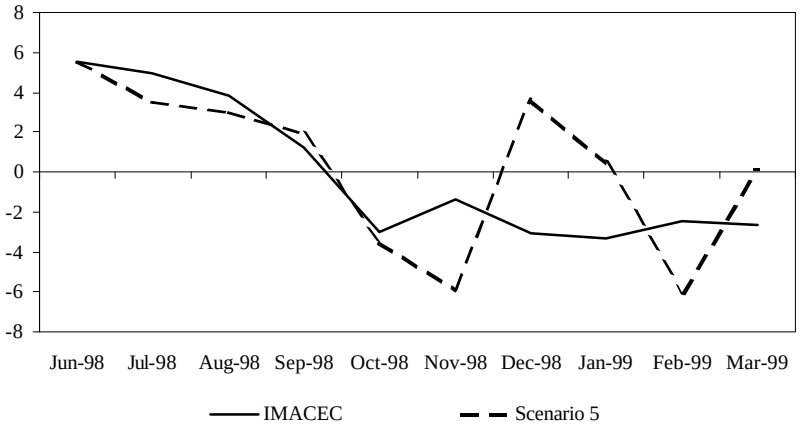
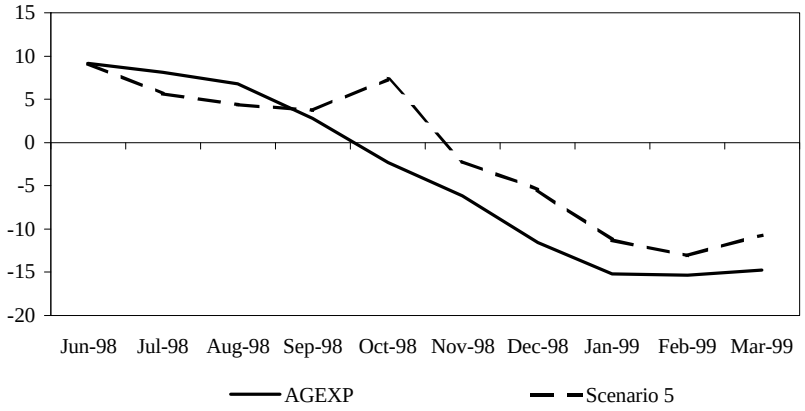


Figure 23
Actual values and Scenario 5, VAR model
July 1998-March 1999





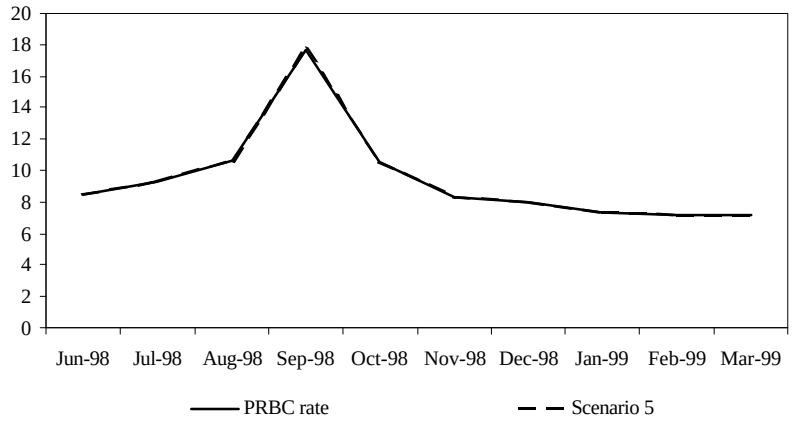
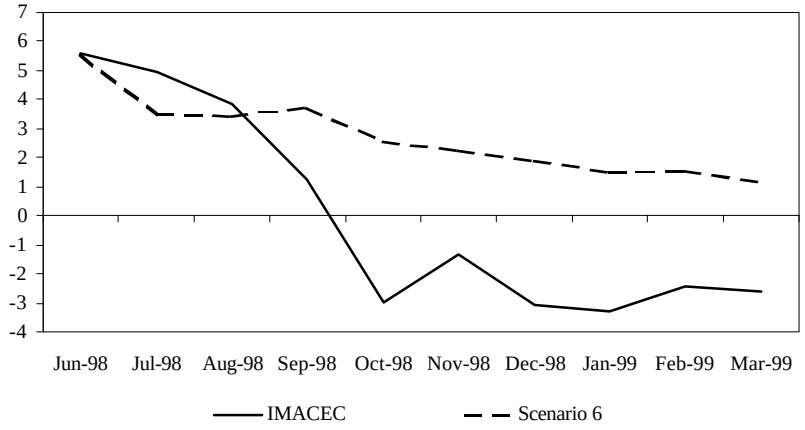
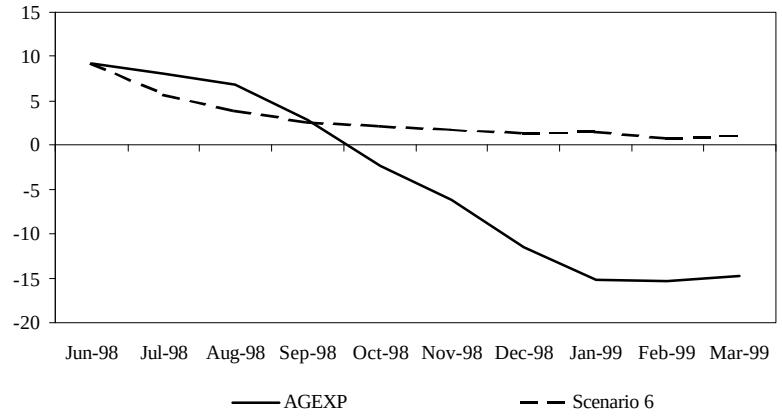


Figure 24
Actual values and Scenario 6, VAR model
July 1998-March 1999





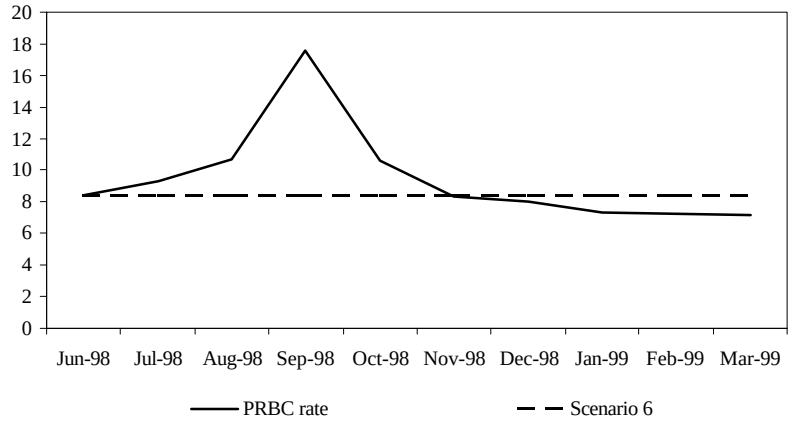
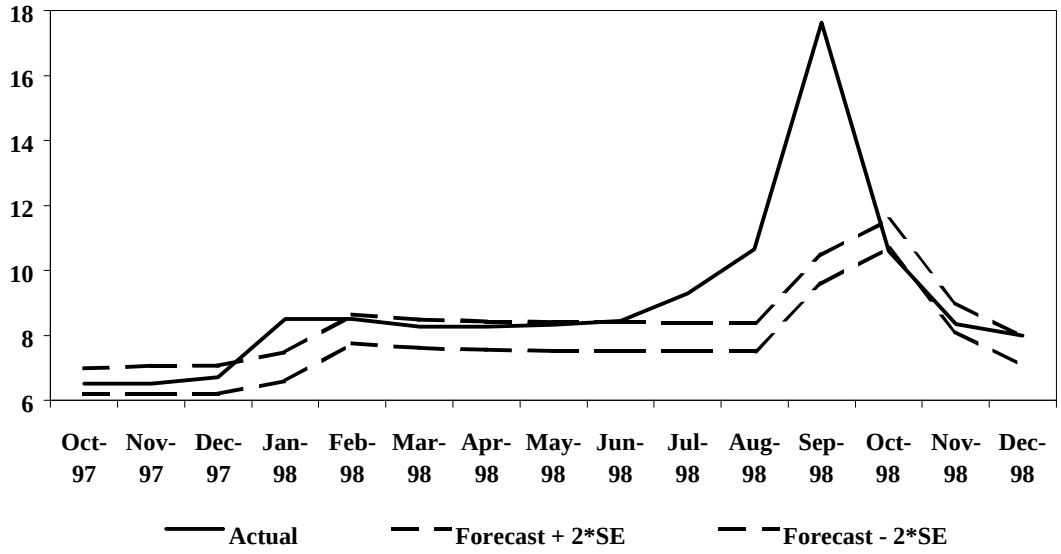
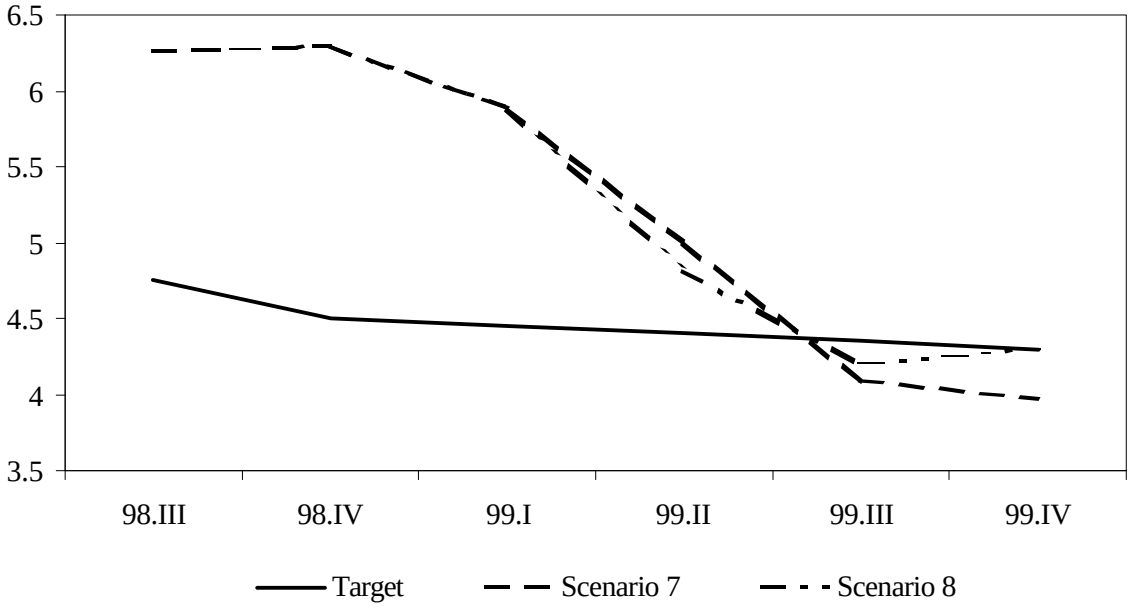


Figure 25
PRBC-90 rate and Forecasts based on Policy Rate
(%, Annual rate)



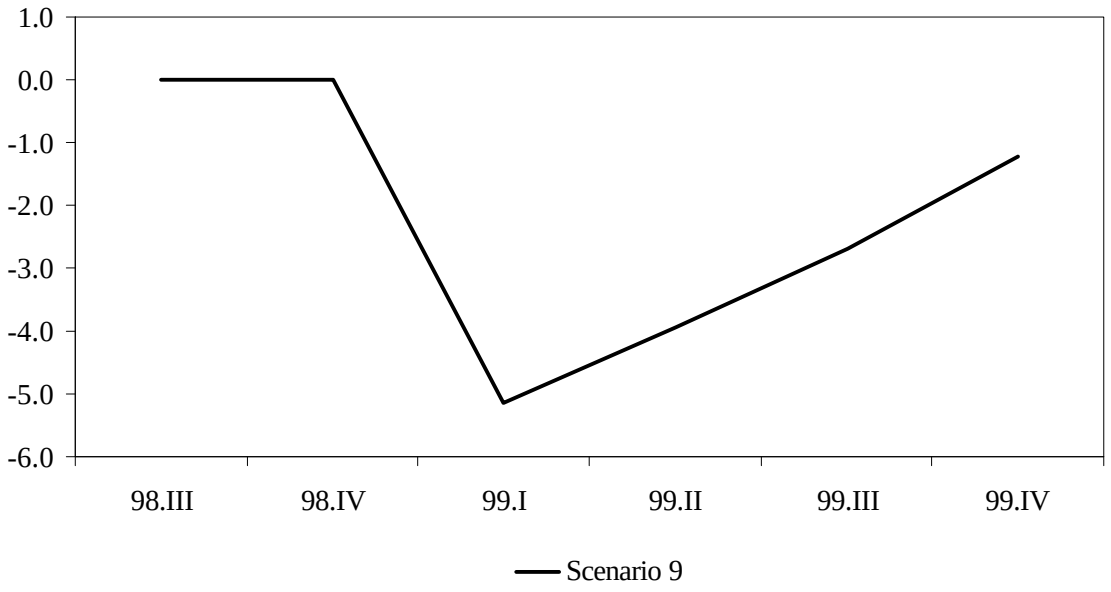
Source: Authors' own elaboration.

Figure 26
Core Inflation: Scenario 7, Scenario 8 and Linearized Target
(%, 4-quarter rate of change)



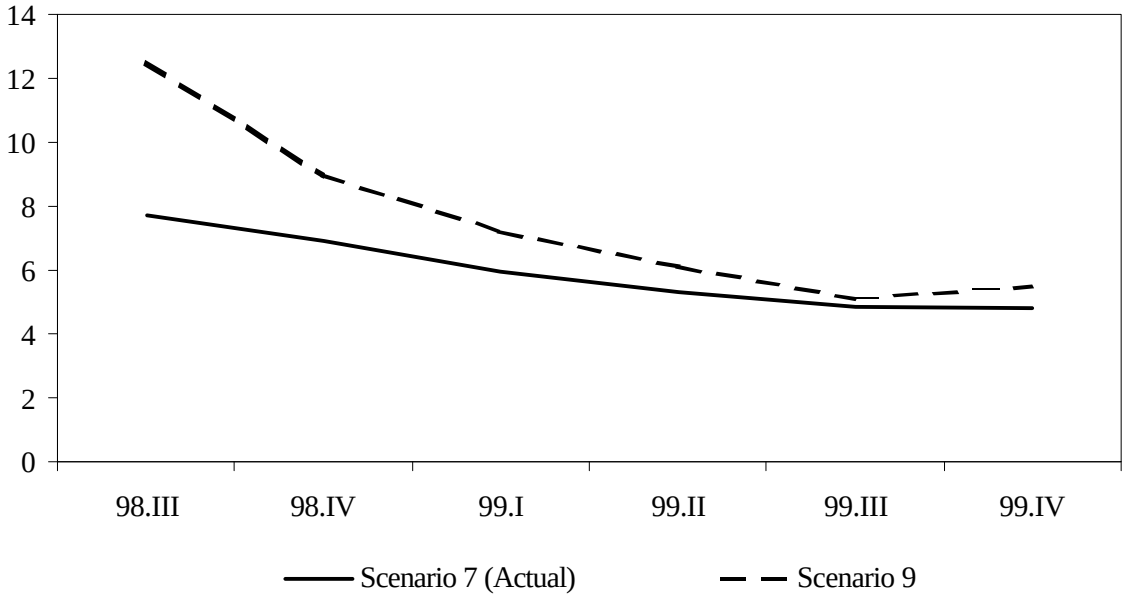
Source: Authors' own elaboration.

Figure 27
Output Gap: Scenario 9
(Difference from scenario 7, percentage points of trend GDP)



Source: Authors' own elaboration.

Figure 28
Real Interest Rate (PRBC-90): Scenario 9
(%, Annual rate)



Source: Authors' own elaboration.

Table A.1: Fiscal Aggregates construction

Total Income	Total Expenditure
- Loan recovering	
- Financial assets selling	- Financial Investment
- Investment return	+ FEPP[2] use of funds
- Copper net of FCC[1]	- Estimated RB Stock[3]
Adjusted Incomes	**Adjusted Expenditures**

[1] FCC is a cooper price compensation fund.
[2] FEPP is an oil price stabilization fund.
[3] Due to the pension system change implemented in 1981, the government must realize transfer to private pension funds cumulative under the previous public scheme. In this calculation, this is the stock of assets that are not supposed to have direct macroeconomic impact.

Table A.2: Fiscal Impulse
(As a % of GDP)

	1992	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Actual									
Revenue	21.76	22.57	21.63	21.20	22.69	22.34	22.36	21.53	22.07
Expenditure	20.48	20.98	20.55	19.52	20.89	20.90	22.01	23.65	23.43
Trend									
Revenue	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30	19.30
Expenditure	22.91	22.98	23.24	22.37	22.10	21.80	22.00	23.20	23.10
Actual less Trend									
Revenue	2.46	3.27	2.33	1.90	3.39	3.04	3.06	2.23	2.77
Expenditure	-2.43	-1.99	-2.68	-2.85	-1.21	-0.90	0.01	0.45	0.33
Total Impulse	**-0.06**	**-0.37**	**0.25**	**0.26**	**0.16**	**0.65**	**0.90**	**1.27**	**-0.66**
Revenue Impulse	**-0.56**	**-0.81**	**0.94**	**0.43**	**-1.49**	**0.34**	**-0.01**	**0.83**	**-0.54**
Expenditure Impulse	**0.50**	**0.44**	**-0.69**	**-0.17**	**1.65**	**0.30**	**0.91**	**0.44**	**-0.12**
Total Impulse 2	**-0.14**	**-0.39**	**0.19**	**0.14**	**0.13**	**0.68**	**0.89**	**1.27**	**-0.37**

Source: Authors' own calculations