Measuring Credibility Effects During Two Stabilization Attempts in Uruguay: 1978-82 and 1990-95

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1. Introduction

Credibility is central to the understanding of the formation of the public's expectations regarding key variables in the economy. The behavior of economic agents is dictated not only by the current situation but also by their perception of the future, which incorporates the government's expected behavior as a key input.

Having credibility is a desirable attribute of any kind of public policy. In the case of disinflation, however, it takes on special importance and becomes a crucial advantage. Credibility of a pre-announced disinflation policy may reduce or even eliminate the output or unemployment cost of disinflation if it radically changes expectations at the time when the policy is enacted. In particular, in the case of an unannounced short and sharp shock disinflation, the quicker the policy-maker establishes a counterinflation reputation, the shorter will be the transition period during which expectations adjust. When inflation and devaluation expectation differ significantly from policy announcements, not only will prices be slow in coming down, if at all, thus bringing about a real appreciation and deficit in the current account, but also expected large devaluation will force capital flight.

The issue of expectation formation is therefore at the heart of the success or failure of any disinflation plan. Since even the most drastic programs take time to be implemented and to work themselves out, we should not expect a just launched program to be fully believed, especially, when the environment in which that program takes place is one characterized by chronic inflation and a number of failed programs in the past.

In this paper, the term credibility is used in a broad sense. Following Cukierman and Meltzer (1986), we define credibility as the extent to which beliefs concerning a policy conform to official announcements about this policy. Credibility is inversely related to the distance between the policy-maker’s plans and the public's belief about those plans. The smaller the distance the higher the credibility.

In testing for credibility effects, an important distinction first made by Christensen (1990) and Agénor and Taylor (1992) is between the announcement effect of a new policy (it focuses on the ability of a policy announcement to influence the public's expectations) and the implementation effect (it focuses on the effects occurring after agents have experienced that the announced policy change really has been pursued). In the former case, the researcher studies the immediate effect occurring when a change in policy is announced. In the latter case, she studies how credibility evolves over time. This distinction is important since government’s credibility may change dramatically during the stabilization attempt.

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1 Recent empirical evidence (Kiguel and Liviatan (1992) and Vegh (1992)) suggests that the timing of the recessionary costs associated with inflation stabilization in chronic inflation countries may depend on the nominal anchor which is used. Under money-based stabilizations, the recession occurs at the beginning of the program, while under exchange rate-based stabilization the recession occurs later in the program.
In this paper we present an empirical assessment of the credibility problem faced by the Uruguayan authorities in two stabilization efforts. In October 1978, Uruguay adopted a policy of active crawling peg in an attempt to reduce the rate of inflation. The plan was known as the *tablita* because the value of the dollar in the next months was published in a table in local newspapers. It was argued that such a policy could play a key role in affecting inflation expectations, and in particular in breaking the inertia of these expectations. Did this form of signalling policy intentions really help the Central Bank to affect the agents' inflation and exchange rate expectations in the right direction? In December 1990, a new stabilization attempt started. Was this program more credible than the *tablita*? Under what conditions can exchange rate target announcements be expected to command credibility?

The choice of the October 1978 program and the December 1990 program as "laboratories" in which to study credibility effects is justified by the following considerations: First, in both plans the exchange rate was used as the nominal anchor of the system, i.e., both plans can be defined as exchange rate-based stabilization programs. The plans are thus comparable on a general ground. This provides a unique opportunity to contrast the patterns of adjustment of key variables during disinflation, and in particular, to examine empirically the different ways in which the public's expectations reacted to the adoption of similar plans.

Second, both programs implied official announcements for some nominal variables in the economy. The existence of these targets will allow us to assess credibility by comparing the announced policies and the public's expectations of the corresponding outcomes. In the *tablita* stabilization, the monetary authority announced the future path of the nominal exchange rate.² The central bank announced a schedule of the value of the daily exchange rate six to nine month in advance. No public target for the rate of inflation was established; nevertheless, it was believed that inflation would quickly converge to international levels, as the rate of devaluation gradually evolved to a fixed rate.

In the 1990 stabilization program, on the other hand, there was no formal announcements on a specific monthly rate of devaluation in the first 18 months. However,

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² Exchange rate announcements are easier to monitor than money target announcements. This is because exchange rates are directly observable, unlike the money supply which is typically published only once a month and with some delay, and hence an exchange rate target conveys more information. The complicated dynamics of money demand moreover may make interpretation of money targets difficult.
the program contained an explicit inflation target. When the program was launched, in December 1990, the stated objective was to reduce inflation to 30% in one year. That objective was rapidly abandoned and by March 1991 the government switched to a gradual strategy although retaining the final objective of 30% per year. The new schedule was the following: 70% in 1991, 50% in 1992 and 30% in 1993.

Finally, it is interesting to contrast these two programs because of the remarkable differences of their outcomes. The October plan was abandoned with a large devaluation preceded by large capital flight. Also, a real and financial crisis developed in the last year of the programs, and continued in the following years. The December 1990, on the other hand, showed some auspicious short and medium run results: high rates of GDP growth and considerable decline in the inflation rate. A final evaluation cannot be done since the program is still in place (successful stabilizations can only be judged ex post). Nevertheless, comparing both programs will allow us to address the questions of what causes such different outcomes (at least in the medium run), and especially, what was the role of expectations in stabilization policy.

The rest of this paper is organized as follows: Section 2 studies the main differences between the October 1978 and the December 1990 plans. Section 3 introduces our measures of credibility. In section 3.1 interest rate differentials are employed as a first approach to the credibility problem in the financial markets. In section 3.2, we investigate the presence of credibility effects in the money market. In particular, we exploit the informational role of the behavior of the demand for real cash balances. Finally, in section 3.3 we build a model in which inflationary inertia is explained not only by backward-looking indexation rules but also by lack of credibility in policy announcements. The model allows us to empirically study whether credibility problems affected the actual path of inflation during stabilization. Finally, section 4 summarizes the results and discusses some lessons and policy issues.

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3 Although inflation targets are easily monitored (in general, with one month lag), economic agents must evaluate in each period of time whether deviations of actual inflation from target inflation are due to central bank cheating (i.e., when the monetary authority issues more money that the amount implicit in the inflation target) or due to unexpected exogenous factors, such as an increase in the price of oil, natural disasters, etc.
2. A Brief Comparison Between the October 1978 Program and the December 1990 Program

In order to understand the environment in which policy outcomes and expectation were jointly determined we now briefly discuss the main differences between these two plans.

The initial situations that triggered the adoption of the disinflation plans were definitely different. The tablita was announced in an environment characterized by declining inflation and strong economic growth (see Table 1 and Figures 1 and 2). The annual inflation rate was around 40%. The main reason for the program was the government's concern about the slow convergence of inflation to international standards. The December 1990 plan, on the other hand, was launched after inflation reached 130%, and upward pressures on the inflation rate were apparent. As for the real sector, output had remained stagnant during the three years before the program (see Figure 2).

Table 2 to 5 summarize the main features of these plans. There are some remarkable differences. First, the programs differ in the way in which they managed the exchange rate. The tablita program consisted of preannounced values for the dollar, with a declining rate of devaluation below the inflation rate of the previous months. In the December 1990 program, a target zone was implanted. The exchange rate was also used as an antiinflationary device. The deceleration in the rate of devaluation was accompanied by a gradual broadening of the exchange rate band to a 7% width. According to Talvi (1994), "the reason behind the monetary authorities's decision to establish a band was to avoid the perception that the Central Bank was maintaining the exchange rate artificially low. This decision is yet another reflection of the lasting psychological impact of the failure of the tablita program."

Secondly, in the former program, the new exchange rate policy was known by the public from the onset of the program. In the later plan, the use of the exchange rate as an antiinflationary tool was not publicly admitted until June 1992. However, since the beginning of the program "it was well understood by economic observers that the primary goal of the authorities was to substantially reduce the rate of inflation, and that the nominal devaluation rate would cease to accommodate past inflation" Talvi (1994).

A third difference is the speed of the exchange rate deceleration. In the October plan, (in contrast to the December 1990 plan) in the first year of the program the rate of

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4 See Blejer and Gil Diaz (1986) or Hanson and De Melo (1985).
devaluation decelerated only slightly from a 4-quarter change of 32% through October 1978 to 26% through October 1979. Subsequently, it was gradually reduced to a 4-quarter change of 17% in the last year of the program. In the December 1990 program the rate of devaluation was halved to an annual rate of 60% in January of 1991 and gradually evolved to its final target of 27% a year as of May 1993.

Another difference between these programs is related to the fiscal measures that accompanied the exchange rate/inflation announcements. In the former plan, the fiscal deficit had already been reduced to less than 1% of GDP in 1977 and 1978 and no new fiscal measures were implemented when the program was launched. In late 1979, a major reform of the tax system was implemented, but the main objective was to improve the allocation of resources rather than enhancing revenues. In the December 1990 plan, an austere fiscal package had been adopted few months before. The Lacalle administration took office in March 1990 and rapidly sent to Parliament a tough fiscal package. It has been estimated that the adjustment was worth approximately 4% of GDP. It consisted mainly of tax increases. The package was approved in one month with the support of the Colorado Party which had just left office.

Finally, a major difference between these two program refers to income policies. In the tablita, public wages were linked to past inflation. Social security benefits were indexed to the General Wage Index and adjusted once a year. As for the private wages, they were regulated by decree and closely followed the public wage increases. In the new program, public sector quarterly wage adjustments were restricted to evolve in accordance with the nominal objectives of the program. The target inflation rate - instead of past inflation - was used to determine quarterly wage adjustments for the public sector employees. Backward indexation continued to be the rule for social security benefits, but now they adjusted once a quarter by constitutional mandate. Although quarterly backward-looking CPI based adjustments continued to be the norm in the private sector, as the program evolved, the contracts started to be gradually replaced by a wider variety of arrangements which were based on variables such as the nominal exchange rate and labor productivity.

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3. Measures of Credibility

The objective of this section is to devise some empirical measures of policy makers' credibility during the disinflationary programs. We measure credibility by evaluating the relationship between the announced policy targets and the public's expectations of the corresponding policy outcomes. Intuitively, a policy announcement will receive a heavier weight in private sector forecasts the greater is the policy-maker's credibility.

It is difficult to evaluate inflation and exchange rate expectations. In Uruguay, survey data on individuals' expectations is not available in the public domain. The absence of data forces the investigator to rely on proxies.

In the context of disinflationary programs in developing countries, the spread between the parallel market exchange rate and the official rate has often been used as an indicator of the degree of confidence in macroeconomic policies (see for example, Dornbusch, Sturzenegger and Wolf (1990)). Unfortunately, this variable cannot be used as a proxy for expectations in this study simply because there was no black market for the exchange rate in Uruguay during the periods under consideration. Since 1974 residents can buy or sell assets denominated in external currencies without any restrictions.

Another branch of the literature on empirical study of exchange rate expectations has tested whether the forward discount is an unbiased predictor of the future change in the spot exchange rate (see, for instance, Frankel and Froot, (1989)). These are tests of rational expectations if there are no transactions costs or risk premia. In Uruguay, as in many developing country, there is no forward exchange market. Thus, the forward discount can not be used as a measure of the expected change in the exchange rate.

Given the above problems to measure expectations, in this paper we will derive unobservable exchange rate and inflation expectations from three indirect indicators: interest rate differentials, the behavior of real balances, and the actual path of the inflation rate. After building proxies for unobserved expectations, we will be able to study whether expectations were affected by the announcements, how they evolved during the disinflation attempts, and to what extend they affected the inflationary inertia in the economy.

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3.1 Credibility Effects in the Financial Markets: The Interest Rate Differential Approach

The behavior of interest rate differentials is our first indicator of private expectations regarding future exchange rates. In an open economy, a widening of interest rate differentials would naturally be associated with an increase in expected devaluation and hence, a lack of credibility in the exchange rate target. On the other hand, confidence in the announcement should induce expectations of a lower depreciation of the domestic currency, and accordingly, the interest differential should shrink.

In order to isolate the informative effect of interest rate spreads it is necessary to employ financial instruments that are compatible one with the other. If we fail to control for differences in liquidity, maturity, and risk of default, the use of these indicator to measure exchange rate expectations will lead to misleading results. Interest rate differential may reflect not only the market's expectations of the future value of the currency but also other aspects in the domestic financial market, such as the effect of credit restrictions, imperfect competition among financial institutions, etc.

Keeping in mind such differences, for the subsequent analysis we use the interest rate on dollar deposit for 1 to 6 months as the foreign-currency denominated rate of return, and the interest rate on peso deposit for 1 to 6 months as the domestic-currency rate of return. Both rates are set by the Uruguayan banking system. Since peso and dollar deposits in the Uruguayan financial system are identical except for the currency of denomination, they should contain the same country-risk premium. Thus, as a first approximation, the interest rate differential between peso and dollar deposits may be seen as an appropriate proxy for unobservable expectations.

Figure 3 portrays the monthly domestic interest rate versus the rate of return on

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6 The liberalization of the Uruguayan economy began in 1974 when the military government took power. Uruguayan residents were allowed to buy or sell assets denominated in external currencies without any restrictions, leading to de facto convertibility of the peso. The considerable growth of dollar-denominated assets during 1975-78 reflects the end of the prohibition of holding them. The liberalization of the Uruguayan financial system was completed by 1978. Despite the massive external and internal shocks, Uruguay's capital market remained opened and regulation of the domestic banking system remained limited. Given this tradition of stability of the Uruguayan financial system, that sharply differs from others Latin American countries, it can be argued that the risk of default implicit in peso and dollar contracts was minimal and that peso and dollar deposits were seen by the public as equally enforceable.
foreign denominated assets. For the whole period 1974-94 the domestic interest rate is shown to be above the dollar returns. The greatest interest rate differential was reached in May 1990. At that time, the spread was 107.4%, while the inflation rate in the last 12 months was 103.8%.

Figures 4 and 5 show that the spread is positively correlated with the inflation and devaluation rates. Table 6 gives the statistic correlations of the interest rate spread with past and future inflation and devaluation during the period 1976-1994, and the sub-periods 1978-82 and 1990-94. It can be observed that the correlations are low during the tablita period and extremely high during the new stabilization program. Thus, the interest rate differential contains more information about future inflation and devaluation in the later period than in the former period.

Focusing attention in the two stabilization attempts, we observe a remarkable difference in the behavior of the interest rate differential. During the former period, the spread remained fairly constant despite the reduction in the devaluation rate and the decline of the inflation rate that began in 1980. In the latter period, on the other hand, a significant fall in the differential accompanied the disinflation process specially in the first two years of the program. The lack of response of the interest rate spread to the reduction of the devaluation rate in the tablita program may be taken as a preliminary evidence of credibility problems. The financial market's confidence in macroeconomic policies in the December 1990 program seems to have been greater.

In order to further study this phenomenon, let us define the exchange rate forecast error as:

\[ \varepsilon_{t+1} = \hat{S}_{t+1}^e - \hat{S}_{t+1}^r \]

where,

\[ \hat{S}_{t+1}^e = \frac{(1 + i_{t+1}^e)}{(1 + i_{t+1}^d)} \cdot 1 \]

is the expected devaluation for the following six months calculated under the assumption that the uncovered interest parity condition (U.I.P) holds, and \( \hat{S}_{t+1}^r \) is the realized devaluation in the same period.\(^7\) Since the magnitudes of exchange rate devaluation are different, in order

\(^7\) The use of the U.I.P. condition when estimating devaluation expectations is justified by the fact that, by 1978 the Uruguayan capital account was totally liberalized, and thus, there was no limitation to movements of capital. However, as we discuss below, using only the interest rate differential to proxy exchange rate expectations during
to compare the relative importance of the forecast error during the two stabilization periods the forecast exchange rate errors were expressed as a percent of the actual devaluation:

$$\sigma - \frac{100 \cdot \sigma}{\bar{g}}$$

Figure 6 depicts the path of \(\sigma\) in both stabilization attempts. Under rational expectations and "weakly" efficient foreign exchange markets, these errors should have zero mean, and they should be uncorrelated. It can be seen, however, that most of the forecast errors have been positive in the periods under consideration. In addition, the errors seem to be highly correlated.

In the *tablita* period, expectations of the future exchange rate overestimate the realized future spot price to a great extend. The highest overestimation is reached in 1979 where the forecast error is about 180% of the realized devaluation. Note also that the errors always remained high, varying between 50% and 110% of actual devaluation. Toward the end of the program, the interest rate differential widened. However, the increase of the spread was much less than the actual 100% devaluation in November. On six month deposits the November 1982 devaluation produced negative exchange rate forecast errors of about 85%.

In the December 1990 program the bias is much smaller. In fact, it has been greater than 100% only for a couple of months in 1994. The forecast errors for 6-month ahead period fell in the first semester of 1991. Then, the errors increased until April 1992 where they represented 65% of actual devaluation. An unexpected devaluation in July 1994 produced negative forecast errors for the first time since the beginning of the plan.

**Interpreting the Behavior of Interest Rate Differentials During the Tablita Program**

We first assess the credibility of the exchange rate policy pursued by the Uruguayan monetary authorities during the October 1978 program by comparing the expected devaluation for the following month implied by the interest rate differentials with the announced devaluation published in local newspapers (Figure 7A).

It can be seen that the distance between the government's exchange rate announcement and the private sector's expectations of the corresponding outcome - named premium over arbitrage - remained at a high level during most of the program. The premium during this period may lead to misleading results.
fluctuated between 1000 and 3000 basic points. Based in this fact it can be argued that, during the tablita period, the interest rates displayed what is known as a "peso problem", i.e., a significant component of the interest rate differential can be attributable to expectations of large exchange rate changes. Krasker (1980) and Lizondo (1983) have shown that in the presence of a small and positive probability of a devaluation, in an efficient exchange rate market the expected value of the future spot rate will reflect the probability of that event. However, as long as the devaluation does not take place, the expectation of the future spot rate will consistently overestimate the realized future spot rate. As a result, the forecast error in the exchange rate will show a positive bias up to the point in which the devaluation takes places. Also, in line with predictions from the model of the peso problem, a large and negative forecast error was observed toward the end of the tablita, just before the peso depreciation of 100%.

Although the comparison between the interest rate spread and the announced devaluation rate is a strong device to detect widespread credibility problems during the tablita plan, it may lead to misleading results when it is employed to study the evolution of the monetary authority’s credibility over time. Using the interest rate spreads as a measure of expected devaluation in the tablita period is troublesome for several reasons. First, this indicator relies on uncovered interest rate parity and thus, it assumes perfect substitutability between assets. However, some studies of the Southern Cone economies have suggested that domestic and foreign assets were imperfect substitutes in the inversors' portfolio (see Hanson and Melo (1986) for Uruguay, and Corbo (1985) for Chile). Deviations from U.I.P. condition may explain part of the interest rate differential.

During the first two years of the tablita (1979-80) residents transferred part of their financial wealth from dollar denominated deposits to peso denominated deposits (see Figure 8). As a consequence, the degree of dollarization in the economy fell considerably (see Figure 9). This phenomenon is contemporaneous to the widening of the peso-dollar spread. The change in the investors' preferences during 1979 is clearly inconsistent with the idea that agents' devaluation expectations were high in that year. Instead, this evidence seems to indicate the existence of large profits possible from uncovered arbitrage in these years.

The overestimation of exchange rate expectations when using interest rate differential during the first two years of the tablita may be due to the existence of some frictions in the Uruguayan banking system. The increased spread in 1979 might have reflected the entry of a new set of demanders into the market of loans. In particular, in these years a dramatic expansion of loans to consumers and firms took place. Since most of the new demanders had no alternative source of funding, banks were able to charge exorbitant interest rates on loans. These new opportunities for doing business let commercial bank to gathered a considerable amount of resources among both residents and nonresidents. The competence among banks may explain why most of the financial institutions were also willing to pay elevated interest rate on deposits. They transferred the cost of having "attractive" interest rates on deposits to
their borrowers, and they obtained large profits from intermediation.

Although financial liberalization was completed by 1978, the adjust of old institutions to the new environment and the development of new institutions required substantial time. Some authors interpreted this period as a transitional one. For instance, in summing up the experience with liberalization policies in the Southern Cone economies, Blejer (1983) concludes that:

"...many domestic markets, given their size and organization, reacted in an oligopolistic manner to the opening of the economy. In the financial market, this situation was particularly notorious. The domestic market displayed a high degree of segmentation since not all financial agents had the same access to international borrowing, especially before financial institutions specializing in international intermediation were developed. Given the fixed set-up costs and the structure of the domestic banking system, borrowers without direct access to international markets must obtain credit from domestic financial intermediaries that can borrow abroad and lend to domestic agents. In such a situation, the domestic interest rate is not determined solely by the foreign interest rate and the expected rate of change in the exchange rate, and any risk premium but is also strongly influenced by domestic market conditions, including the domestic demand and supply of credit, the structure of the domestic financial system, and the state of inflationary expectations." (Mario Blejer, 1993, page 441)

Another unpleasant result of using the premium over arbitrage as a measure of credibility arises when we study the evolution of this variable during the last year of the tablita. According to the Figure 7A, the credibility of the monetary authority announcements concerning the exchange rate in 1982 was larger than in 1979. Note also that this indicator of credibility remained relatively constant during the last two years of the program. The interest rate differential in September 1982 was 20% greater than the spread in July 1980. However, it is also true that toward the end of the tablita the monetary authority devaluated the currency at a higher rate than two years before. We would have expected a greater increase in the devaluation expectations as we get close to November 1982, date of the 100% devaluation. This view is based on both internal and external considerations. On the internal side, Uruguay entered into a deep recession in 1982. Unemployment reached 14% in the third quarter of that year and there were apparent signs of recession in the industrial and construction sector. In addition, as we mentioned above, the fiscal accounts deteriorated dramatically as a result of the fall in revenues and the increase in social security expenditures.

On the external side, the world recession and the series of massive devaluation in Argentina created a clear threat of a maxidevaluation. Also, uncertainty was raised by the
Mexican confiscation of dollar assets in August 1982. In Figure 10 we present the timing of the external negative shocks that affected Uruguay's economy during this period.

We can mention at least two additional indicators that lead us to claim that lack of credibility was a more serious problem toward the end of the *tablita*: (1) changes in portfolio composition of residents and nonresidents and, (2) short-run movements of capital. During these years there was a sharp increase in the degree of dollarization (see Figure 9). By 1981 banks start refusing to take open exchange positions, and an increasing share of loans were renewed in dollars. On the other hand, in 1982 there was an enormous private capital flight (see Table 1). The loss of international reserves was only partially avoided by increasing foreign debt at an unsustainable rate. Taken together these two indicators provide strong evidence to our hypothesis that interest rate differential do not reflect properly the state of expectations in 1982.

An explanation for the probable underestimation of devaluation expectations implicit in the interest rate differential in 1982 is that from January 1981 to October 1981 exchange guarantees were in place. During that period, the Banco de la Republica (BROU) offered inexpensive forward contracts for peso depositors. Also, in the first quarter of 1982, the ex ante spread was once again brought down by the sale of future guarantees, this time by the Central Bank. This option was withdrawn when the sharp growth in the fiscal deficit had become apparent and the economic team had been shaken up. Thus, it cannot explain the behavior of the differential in the second and third quarters of 1982.

Another possible explanation runs as follows: Towards the end of the *tablita*, commercial banks were unable to raise peso interest rates on loans as much as they have wished due to the fact that the economy was entering into a huge recession and their borrowers were suffering the burden of an already high level of indebtedness. The existence of a ceiling for the lending rate implied a corresponding ceiling for the deposit rate.

From the above analysis we conclude that using only the interest rate differential to proxy expectations of devaluation during the *tablita* program may lead to misleading results. The indicator tends to emphasize the existence of credibility problems during the beginning of the program. However, we have shown additional evidence supporting the hypothesis of lack of credibility toward the end of the program. We will thus need to make some adjustment to our indicator and to employ additional measures of credibility in order to get a better understanding of the formation of devaluation expectation during this period.
Interest Rate Differentials During the December 1990 Plan

Using interest rate differentials to evaluate expectations during the December 1990 program is somewhat more complicated since a target zone exchange rate regime was in place. As a first approximation, however, the exchange rate forecast errors analysis made in the last subsection have suggested that credibility problem in this period were not as serious as in the tablita program.

The simplest test of whether a target zone was completely credible is to check whether expected future exchange rates implied by the interest differential fell within the announced exchange rate band. Bergara and Licandro (1994) applied this methodology for Uruguay for the period 06.92 - 12.93, and they showed that only during a couple of months (June-July, 1993) the expected value of the foreign currency (6 months ahead) was outside the bounds announced by the government for the same period. They concluded that the exchange rate policy followed by the government was credible for most of the time.

However, there are two problems with this method. The first problem is that we cannot use it to evaluate the first 18 months of the program because the Central Bank made no formal commitments on a specific monthly rate of crawl for the target zone in this period. It only announced every day the rate at which it was prepared to buy or sell foreign currency (the lower and upper limits of the band, respectively). This is an important obstacle to the empirical study of credibility since, according to the forecast errors analysis made in the last section, the major credibility problems during this period were at the onset of the program.

The second problem is that the width of the target zone defined by the central bank is relatively large (7%). Hence, expected large devaluations may still lie inside the band. For instance, assuming that in period t the spot price is equal to the lower bound, then an expected devaluation of 9% for the following month still lies inside the band despite the fact that the devaluation of the center of the band (which is the government's announcement) is only of 2.5%. We argue, therefore, that these kind of tests offer little insight about people's credibility regarding the government's exchange rate policy when the width of the target zone is large and the central parity of the band is devaluated at a constant rate.

Because of the above problems, we decided not to follow this method. Instead, we directly analyzed the evolution of the spread and we studied whether it was affected by policy announcements.

According to Figure 11, in May 1990 there was a first fall in the interest rate spread. The timing of the fall indicate that this event to a large extent had its roots in the Parliament's adoption of the tough fiscal measures. Forecasting a fall in the inflation rate private agents seem to have adjusted downward their devaluation expectations. The 3-month ahead
expected devaluation fell from a 100% annualized rate in May 1990 to 75% in July 1990. The small decline in the spread after the fiscal adjustment is evidence that financial markets did not believe that the fiscal measures by themselves were going to kill inflation.

In spite of the approval of the fiscal package the Central Bank continued to devalue at a very rapid rate during 1990 (the annualized rate of devaluation of the last three months of that year was 120%). This fact may explain the widening in the spread starting in August 1990. By October 1990 expectations of a an acceleration in the rate of depreciation were apparent. It was not until the 26th of December, 1990 that the minister of finance announced the formal launching of the stabilization program. The declared exchange-rate policy was a fundamental change compared to the recent past, where the Sanguinetti administration had tried to maintain the external competitiveness of the economy in spite of the inflationary consequences of such a policy.

The December 1990 announcement had an immediate effect in the interest rate spread. Although initially there was no explicit declaration regarding the rate of crawl of the center of the target zone, "it was well understood the nominal devaluation rate would cease to accommodate past inflation." Talvi (1994). Forecasting a deceleration of the rate of devaluation financial markets set the domestic interest rate to a lower level. After having gone through an important decline between January 1991 and June 1991, the expected rate of devaluation stabilized itself at a 4% per month.

In the period May 1992 to October 1992, there is a further downward jump in the interest rates (see again Figure 11). The announcement of the rate of crawl of the target zone (2.5% a month), made in June 1992 can account for part of the fall in nominal interest rates. Also, the government's strong adherence to the exchange rate policy (in a situation where the former government might have devalued in order to improve the external competitiveness of the economy) is likely that have contributed to an increase in the credibility of the exchange-rate strategy and therefore also to the decline in the interest rates.

Between August 1994 and March 1995 there was a slight increase in the interest rate differential which was basically explained by the uncertainty originated in the November 1994 election and the posterior change of administrations. Once the new government took place in March 1995 and ratified the continuity of the stabilization program the spread returned the declining path. It is interesting to point out that, thought in December 1995 the interest rate spread for deposits of 1, 2 or 3 month was close to the announced devaluation rate, when considering the interest rates paid on 6 months or 1 year deposits the spread was still far from convergence. This indicates that, the government had achieved short-run exchange rate credibility, but long-run credibility had not been attained, even though considerable progress had been made in this regard.

In conclusion, as a result of the stabilization program the spread had been reduced
rather considerably, and it has slowly converged to the announced devaluation rate (2% a month since October 1992). This suggests that the anti-inflationary reputation of monetary authorities has improved, but only gradually as policy consistently remained tight. The slow convergence of the gap between peso and dollar interest rates to the announced devaluation target may be interpreted as a partial lack of credibility in the policy announcement. The finding is consistent with the interpretation put forward here that government credibility was built over time and that the main changes in expectations materialized when the announced policy gained credibility.

The Adjusted Interest Rate Differential: a Better Measure of Devaluation Expectations

In order to get a better assessment of the movements of devaluation expectations especially during the tablita period we now make two adjustments to our measure of credibility. First, we use a simple portfolio-balance model to test for the existence of a currency risk premium in the relative returns of peso and dollar deposits that depends on the investors' degree of risk aversion, the variance and covariance of the inflation and the devaluation rates and the currency composition of wealth. Once the perfect substitutability hypothesis is rejected, and the case for a risk premium is established, we proceed to use our estimates to subtract the effects of the changes in the portfolio composition of residents and nonresidents from the interest rate differential. Second, when estimating the reduce form of the model we control for the fall in the peso interest rate which was due to the official banks sales of exchange rate guarantees in 1981 and 1982. In other words, an attempt is made to estimate the level that peso interest rates would have reached in those years if those operations had not have taken place. By means of these adjustments we will be able to obtain a more satisfactory measure of exchange rate expectations.

As we pointed out in the previous section, during the tablita period the evolution of interest differentials did not conform with others credibility indicators such as short-run capital movements or changes in the public's preferences for domestic currency denominated deposits. One way of rationalizing these seemingly inconsistent facts is to postulate that the interest spread includes a significant currency risk premium which depends -among others - on the relative importance of peso assets on total wealth.

As depicted in Figure 9, the dollarization ratio changed dramatically in the tablita period. The share of peso denominated assets rose from less than 51 percent of total private sector assets in October 1978 to 66 percent in December 1980. During 1981 and 1982 this trend totally reversed. In October of 1982 the share of peso assets represented only 46 percent of total assets. If a risk premium associated with relative assets supplies were present, the interest differential would not be a reliable predictor of the state of expectations.
of devaluation in that period.

The Model

Following Frankel (1982) and Dornbusch (1983) we set up a simple portfolio selection model of a representative investor who maximizes an utility function that depends on the mean return and the portfolio variance. In this model there are two assets with random real returns: a peso denominated asset and a dollar denominated one. Let $W$ be the value of total nominal wealth. End of period real wealth is random and can be expressed as:

$$ w = xW(1 + i_p - \pi) + (1-x)W(1 + i_d - \pi) $$

(1)

where $x$ is the share of peso assets, $i_p$ and $i_d$ are the nominal returns of peso and dollar assets, $\pi$ is the expected devaluation rate and $\pi$ is the expected inflation rate. Nominal interest rates are known. Uncertainty comes from the inflation and the devaluation rates. An expression for the variance of real wealth is given by:

$$ \sigma_w^2 = W^2 \left[ x^2 \sigma_n^2 (1-x)^2 \left( \sigma_e^2 - \sigma_n^2 \right)^2 - 2 \left( (1-x)^2 \sigma_{en} - x (1-x) \left( \sigma_n^2 - \sigma_{en} \right) \right) \right] $$

(2)

The investor's utility is represented by a function which depends positively on total real wealth and negatively on the variance of real wealth:

$$ U = U(w, \sigma_w^2) $$

(3)

Maximizing (3) with respect to $x$ and subject to equations (1) and (2) yields:

$$ i_p - i_d - \pi = \theta \left[ \sigma_e^2 - 2 \sigma_e^2 \sigma_{en} - (2 \sigma_n^2 - \sigma_e^2) x \right] $$

(4)

where,

$$ \theta = \frac{-2 \sigma_n^2 w}{U_w} \quad \theta > 0 $$

8 We have used the following approximation: $(1+a)/(1+b) = 1 + a - b$
is the coefficient of risk aversion. The second term of the RHS of equation (4) represents the currency risk premium. The model leads to a reduced form where the peso-dollar interest rate differential is equal to the sum of expected devaluation and a currency risk premium. This is a standard portfolio-balance result: individuals must be rewarier with a premium in order to induce them to invest in the risky asset (in this case, the risky asset is the one denominated in domestic currency since investors may suffer capital losses from unexpected devaluation).

If purchasing power parity holds continuously, the covariance between the inflation rate and the devaluation rate will be equal to the variance of the devaluation rate, and equation (4) will become

\[ i_p - i_d = e + \Theta \sigma^2 \sigma \]  

(5)

From expression (5) it is apparent that for given devaluation expectations, the greater the share of peso denominated assets in total assets, the larger the risk premium and the wider the interest differential.

We have estimated equation (4) using monthly time series for the periods 1978.10-1982.10 and 1990.12 - 1995.12. In the former period, we also included a dummy variable which is equal to one when the official banks sold the exchange rate guarantees (January to September 1981 and January to March 1982) and zero otherwise.

Since the share of peso assets is an endogenous variable which depends among others on the interest spread, in order to obtain unbiased and consistent estimates equation (4) was estimated using 2SLS and LIML.\(^9\)

As for the measurement of the expectational variable, there are no adequate proxies for agents' expectations to rely on. Hence, we are forced to substitute the ex-post depreciation for the expected depreciation.\(^10\)

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\(^9\) As instrumental variables we have used: (i) the total amount of financial assets in the economy measured in real terms, (ii) the differential between the interest rate paid on Uruguayan dollar deposits and the interest paid on US Treasury bills and, (iii) a time trend. These variables should be uncorrelated with the \((i_p - i_d)\), but have some correlation with \(x\).

\(^10\) We are aware that this procedure is not totally correct specially in the tablita period due to the above commented existence of a "peso problem", but we were unable to find a better way to deal with this problem. Moreover, if a good proxy for expectations were available we would have not needed to make this adjustment.
The results of these estimations are presented in Table 6B. The coefficient associated to the share of peso assets is significant and has the correct sign. According to our estimates, in the period 1978.10 - 1982.10, for every 1 percentage point increase in the share of peso denominated assets, the interest rate differential rose approximately 87 basic points. In the latter period, the estimated increase in the spread is 84 basic points.

During the tablita program, the changes in the portfolio composition of the private sector had an important impact on the level of interest rates. On the one hand, a considerable portion of the rise of the spread that occurred during 1979-1980 can be explained by the increase in the relative importance of assets denominated in domestic currency. On the other hand, the strong dollarization occurred during 1981 and 1982 contributed significantly to keeping peso interest rates down.

The coefficient of the dummy variable associated to the sales of exchange rate guarantees by the official banks in the last two years of the tablita is also significant, though its dampening effect on the peso interest rate was relatively small: we estimated that, due to the monetary authority intervention the interest spread fell by 300 basic points.

In light of these results, and to recover a measure of the expected devaluation during the stabilization periods, we modified the observed interest rate differential to account for the change in the portfolio composition of the individuals and for the fall in the domestic interest rate due to the official banks' offering of forward contracts for peso depositors (this last adjustment applied only for the tablita period). The first adjustment was made by calculating the level that the interest rate differential would have reached if the composition of assets had remained constant at the level of October 1978. As for the latter adjustment, we subtracted the estimated coefficient of the dummy variable from the interest spread. The adjusted series are depicted in Figure 7B.

It can be seen that, in contrast to the behavior of the interest rate differential during the tablita program, the adjusted measured increased dramatically throughout 1982, signalling a declining level of confidence in the announced exchange rate policy. Although the new adjusted measure of credibility fits better the stylized fact than the original one, some problematic features still remain (for instance, the premium over arbitrage is still too high in 1979). In explaining these problems the existence of frictions in the Uruguayan financial system during the tablita period (which were discussed in last section) indeed play a major role.

As for the December 1990 program, the adjustment is irrelevant because there was no major change in the degree of dollarization of the economy (see Figure 7.C).
3.2. Credibility Effects in the Money Market: The Money Demand Approach

In this section we employ an alternative technique to draw inferences about unobserved expectations regarding the exchange rate and the inflation rate. The method exploits the informational role of the residuals that come from the estimation of a standard money demand equation. The idea is that, after fitting an adequate model for the demand of real balances, the behavior of the estimated errors may convey some useful information regarding unobserved expectations. In particular, controlling for other factors, systematic overprediction of realized real balances during disinflation can be interpreted primarily as caused by greater exchange rate and/or inflation expectations. Thus, the study of whether econometrically estimated money demand equations overpredict (or underpredict) cash balances holdings will allow us to provide a measure of public confidence in the stabilization program.

Figure 12 shows the evolution of money balances defined in a narrow sense as currency plus checkable deposits (M1). According to general economic theory, a successful disinflationary policy should induce an increase in the demand determined money stock. As the cost of holding money declines, people are more willing to hold cash balances. It can be observed that this was not the case in the tablita program, where money demand fell sharply since the beginning of 1981 despite the fact that the inflation rate was declining at the same time.\footnote{The fall in real cash balances cannot be attributed to a fall in output at least between the first quarter of 1981 and the third quarter of 1981. During that period, Uruguay’s real money balances decreased, despite the fact that Gross Domestic Product was growing and inflation was declining.} In the December 1990 program, on the other hand, the empirical evidence is more compatible with economic theory. The building of real balances was associated to the decline of the inflation rate. In order to study in detail this phenomenon we estimated a general money demand equation for each of the two stabilization periods under consideration of the following form:

\[ m_t = p_t^{\alpha_0} \alpha_1 y_t^{\alpha_2} \lambda_t^{\beta_2} E_{t-1} (C_t) + \varepsilon_t \]

where \( m_t \) and \( p_t \) are the logs of nominal money (defined as M1) and the price level, \( y_t \) is the log of real GDP and \( C_t \) stands for the opportunity cost of holding domestic money. \( E_{t-1} \) denotes the expectation conditional on the information available at the beginning of the period. The money demand semielasticity, \( \alpha_2 \) should be negative.
The Demand for Money During the *Tablita* Program.

The first estimation of the demand of money was done by using the actual inflation rate as the empirical proxy for \( C_t \). The results are displayed in Table 7, row 1. Although the fit of the model is acceptable, it turns out that the inflation variable has the wrong sign, suggesting that treating the realized inflation rate as a proxy for the opportunity cost of holding money during the *tablita* period results in misspecification.

The result, hence, confirms the positive relationship between inflation and money demand during this period. Conventional money demand regressions that include the inflation rate as a proxy for the opportunity cost of holding money are therefore unable to provide a consistent explanation for the behavior of real balances during the *tablita* period.

The explanation for this "rare" phenomenon is the fact that, under heavy currency substitution, the inflation rate is not the right proxy for the opportunity cost of holding money. During the last two years of the *tablita*, the expected rate of depreciation undoubtedly played a more important role in determining financial portfolio shifts. When expectations of exchange rate devaluation intensified, the expected return from holding assets denominated in foreign currency rose dramatically. This increased the opportunity cost of holding domestic money, and therefore, individuals tended to alter their portfolio of financial assets. In particular, they substituted foreign for domestic financial assets. Under those circumstances, a reduction in the demand for domestic cash balances was to be expected.

Our approach emphasizes the importance of foreign exchange risk among the diverse reasons for holding foreign currency money balances. The hypothesis to be tested is that the behavior of money demand in this period is basically determined by the expectations about future exchange-rate adjustments. In particular, an increase in expected devaluation should reduce the demand for the domestic money.

The main difficulty in testing the hypothesis is the lack of an observable variable which measures expectations about future exchange rates. We first tried the actual rate of devaluation. From Table 7, row 2 we observe that the ex post rate of devaluation is insignificant, and it also has the wrong sign. The poor result obtained with this variable is consistent with one of our conclusion in last section: The announced path for the future value of the exchange was not believed. The rate of devaluation as scheduled in the *tablita* was an inadequate descriptor of expectation of devaluation. This model is misspecified since it does not explicitly take into account uncertainly about the probability that the foreign exchange regime could be discontinued.

We then run a couple of regression that include the domestic interest rate and the
interest rate differential as arguments in the demand of money. If we assume that the domestic interest rate fully incorporates the expectations of depreciation of the domestic currency, then these variables should be correct proxies of exchange rate expectations. The results of the estimation are shown in row 3 and 4 of table 7. Although both variables are significant at a 1% level and have the right sign, the performance of the model as a whole is not good. The regression fails almost all of the diagnostic tests. Residuals are strongly positively correlated, and the coefficients are not stable.

As we mentioned above, studying the behavior of these residuals may be useful to infer some information regarding private expectation of future devaluation rates. In Figure 13A we present actual values, fitted values and residuals of this regression. During the last year of the tablita program the demand for real money was less than the one predicted by the model. The finding of negative and correlated residuals toward the end of the program may be interpreted as evidence supporting the idea that the domestic interest rate (or the interest rate differential between peso and dollar deposits) was an inadequate descriptor of the opportunity cost of holding domestic money.

Our hypothesis is that in the last year of the tablita program the domestic nominal interest rate was somewhat "controlled", and hence, it did not adequately reflect the expectations of devaluation of the domestic currency. To empirically prove this we introduce a dummy variable, D1, that takes a value of one in the last four quarters of the tablita program (1981:4-1982:3). It tries to capture the growing expectations of exchange rate realignment that took place in this period, expectation which, we believe, are not fully incorporated in the interest rate spread.

Row 5 and 6 of Table 7 present the results of the money demand estimation with the inclusion of a dummy variable that accounts for the lack of credibility in the exchange rate announces in the last quarter of 1991 and 1982. Several features of these regressions are noteworthy. First, it appears possible to improve significantly the fitness of the model along the lines discussed above. All the diagnostic tests are satisfied at a significance level of 5% (test failures at 5% are marked by asterisks). Second, the influence of expected devaluation indeed appears to be dominant during this period. The dummy variable has the correct sign, with an t coefficient three times as large as the t coefficient on the interest rate. Third, the introduction of the dummy variable corrected the problem of autocorrelations among residuals, and the model becomes stable according to CUSUMQ test.

We find that the results of the estimations are indicating a shift in expectations toward the end of 1981. This shift is not totally incorporated in the interest rate differential. As internal and external condition deteriorated private agents expected a real devaluation that

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12 Justification for this point is given in section 4.3.1.
restore equilibrium. The increasing opportunity cost of holding cash balances caused a
dramatic fall in the demand of domestic money in the latter period of the tablita.

The Demand for Money During the December 1990 Program

We now study the behavior of money demand during the second disinflation period.
As we mentioned above, in this period real balances behaved in a way much more close to
what theory predicts. The fact that real balances significantly rose during disinflation (see
Figure 12) seems to indicate that credibility problems were less important than those in the
tablita program. I shall argue, however, that the increase in money demand would have been
even greater had inflation expectation converged immediately to the announced target.

First, we have estimated a demand for money for the period 1985.01 - 1994.4. The
results of this regression are reported in row 1 of Table 8. Although the coefficient are all
significant and right signed, the regression fails almost all of the diagnostic test. First, the
model did not past the test of stability of coefficients (CUSUMQ). Second, the estimated
residuals are positively autocorrelated according to DW test. Finally, the coefficient of
determination is relatively low ($R^2=.66$).

The instability of the demand for money can not be attributed to changes in the
performance of financial markets since, during the period under consideration, there were
no major changes in financial markets. The capital account remained open, and there was no
significant change in banking regulation and financial intermediation.

Looking at actual and fitted values and the estimated residuals (see Figure 13B), it is
easily observed a period of consistent overprediction of real balances at the beginning of
the program. Inferences based on our conventional money demand model also suggest, that
this downward shift in real balances was only temporary and that it was reversed after mid

The overprediction of the actual real money balances is even more surprising if we
consider the empirical regularity between business cycle and the performance of
conventional money demands reported by Goldfeld (1976) for the U.S. economy: Given that
this period is clearly one of recovery for the Uruguayan economy (after growing at rates
inferior to 1% per year between 1988 and 1990, the GDP grew 3.2% in 1991 and 7.9% in
1992) we would have expected, according to this evidence, a systematic underprediction of
the effective real money balances by estimated money demand equations.

Uruguay's economy seems to have experienced a phenomenon similar to that
observed in the U.S. economy in the mid 70s, known as "the case of the missing money".

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Our conventional money demand equations systematically overpredict the actual real money balances at the beginning of the December 1990 program. However, differing from the "missing money" phenomenon this is a reversible phenomenon. This is another reason for claiming that this shift cannot be due to financial innovation, if we understand the process as an irreversible one.

In this study we postulate that the negative sign of the estimated residuals during the first two years of the December 1990 program was caused mainly by a measurement problem in the opportunity cost variable. Errors of measurement arise due to the fact that we are estimating a money demand model using observed proxy variables instead of the true theoretical ones. In particular, our hypothesis is that inflation expectations were biased upwards during the first state of the program. This account for the problem of systematic overprediction of the actual real money balances at the beginning of the program.

In order to prove the stated hypothesis we followed the same procedure used when analyzing the tablita program. We introduce a dummy variable, D2, that tries to capture the lack of credibility in the announced inflation rate. It takes the value of 1 between 1990.4 and 1992.2. This period was chosen following one the findings of last section. There, we saw that during this first sub-period interest rates did not converge to the announced devaluation rate, indicating partial lack of credibility in the financial market. Results of the introduction of the dummy variable are presented in Table 8, row 2. It can be seen that the regression improved significantly compared with the original case. First, the money demand equation is stable according to CUSUMQ test. Second, the coefficient of determination is much higher than the original equation ($R^2=0.85$). Finally, with the introduction of the dummy we are able to rejected the hypothesis of autocorrelation among residuals.

The evidence reported here is therefore consistent with the hypothesis of stickiness of inflation expectations. Expectations of inflation fell only very slowly, and they always remained higher than the values announced by the government. In spite of the government commitment, economic agents forecasted high inflation, and thus, they decided to demand less cash balances than otherwise in order to avoid the inflationary tax. Since actual inflation was higher that announced inflation (see the following section), we conclude that people did not believe in the government's inflation goal. The results therefore, brings support to our conclusion of partial lack of credibility in the policy announcement during the first 18 months of the program.
Robustness of the Results

The robustness of the estimation results was studied with respect to several alternatives specifications:

a) The demand of money equation was estimated for different periods. We always obtain negative residuals toward the end of the tablita program (using the domestic interest rate as the opportunity cost variable) and the beginning of the December 1990 program (using the inflation rate or the interest rate). Actual and estimated money demand and corresponding residuals for the periods 78.1-83.2 and 88.4-94.3 are shown in Figure 14A and 14B.

b) We then incorporated a partial adjustment mechanism into the model through the introduction of a lagged dependent variable as an additional regressor (see Table 7, row 7, and Table 8 row 3). This improved the general fit of the model. The main results of this section still hold. The dummies variables are still significant at 1% significance level, and they have the right sign. There seems to be evidence of a lagged adjustment in the money market with a speed of adjustment equal to one half in both periods.

c) The money demand equations were estimated with several versions of inflation expectation. In particular, we tried a weighted average of the last 4 periods with decreasing weights. Also, we estimated an autorregressive representation of order 4 for inflation, and then we used the predicted value coming from such a regression as a proxy for the opportunity cost of holding money. In the tablita period, the variable chosen for inflationary expectation always appeared with the wrong sign. In the December 1990 stabilization, for any price expectation variable, the money demand equation systematically overpredicts the actual real money balances at the onset of the program (the estimated residuals are always negative and highly correlated).

d) We added a time trend to the demand equations to capture possible effects of financial innovations. The estimated coefficient of the time trend turned out to be statistically insignificant and it did not improve the performance of the model (see row 8 of Table 7 and row 4 of Table 8).

e) To deal with the possibility that unaccounted changes in the scale variable had affected the demand of money during these periods, we substituted the current income variable for a measure of permanent income. Our proxy for permanent income, yₚ, was computed as the predicted value of current income in a two-period autoregressive model of GDP (we also included a time trend to improve the fitness of the model). The inclusion of

\[ \pi_{te} = 0.4\pi_{t-1} + 0.3\pi_{t-1} + 0.2\pi_{t-2} + 0.1\pi_{t-3}. \]

13 The specification used was \( \pi_{te} = 0.4\pi_{t-1} + 0.3\pi_{t-1} + 0.2\pi_{t-2} + 0.1\pi_{t-3}. \)
this proxy improves the general fitness of the model (see Table 7, row 9 and Table 8, row 5). The income elasticity of money demand increases to 0.72 (tablita) and 0.85 (Dec.90 program). The main result of this section remains unchanged: both dummies are significant at 1% significance level.

f) To test for the eventual jointly endogeneity of real money, real output and interest rates or inflation rate we have reestimated the demand for money equation using 2SLS. The instruments used were lagged values of the independent variables. We find no significant change in the coefficient estimates and in their significance level.

3.3 Credibility Effects in the Goods Market: The Kalman Filter-Principal Component Approach

Our first two indicators (interest rate differential and the behavior of real balances) provided evidence supporting the hypothesis of (partial) lack of credibility in financial and money market during the stabilization programs. This section goes on to provide some evidence of credibility effects in the product market.

If nothing else but expectations affected the inflation rate, then a straightforward way to measure credibility in this market is by evaluating the relationship between the announced inflation and the realized values of this variable. If fully credible, a new program would lead economic agents to set wages and prices in accordance with it. The transition to low inflation would be achieved without much delay. Conversely, if the private sector is unconvinced that the government will adhere to the announced policies for very long, current wages and product prices will include an expectation of higher future inflation, and therefore, a divergence between the announced path of inflation and the actual path will arise.

Figure 15 presents the evolution of the announced path for the inflation rate and the realized values during the December 1990 program (in the October 1978 plan, there is no inflation target to compare to). It can be seen that, though inflation declined significantly, convergence did not occur. Indeed, the government's goal of having a 30% annual inflation rate has not been accomplished up to now. The divergence may be attributable to the fact that the private sector harbored inflationary expectations which were higher than those announced by the Government. Unfortunately, it may also be attributable to other factors that plausibly have influenced the inflation dynamic in Uruguay, like external shocks, changes in wage policies, etc.

The comparison of announced and realized variables does not allow us to distinguish between the different factors that caused the divergence. Therefore, we cannot assess the extent to which inflation expectations have been affected by the government commitment
based only in this indicator. We know built a model where we can study credibility effects in the product market in a more systematic way.

3.1 A Model of Credibility and Inflationary Persistence

In this section, the implications of lack of credibility for the dynamic of the inflation rate are considered. We build on Edwards (1993) two sector model of inflationary inertia to demonstrate the link between the perceived degree of policy credibility and the degree of inflation persistence.

In Masoller (1995) we addressed the issue of designing optimal credible exchange rate-based disinflation programs in high indexed economies. Thus, we assumed that the announced exchange rate peg was believed to hold into the indefinite future by price setters, investors and currency speculators. We will now go a step further with the framework underling that model and introduce the fact that the public sometimes lacks confidence in the ability of politicians to carry out a newly announced stabilization program. The model is based on the following equations:

\[ \dot{P}_c = \alpha \dot{P}_r + (1-\alpha) \dot{P}_{nt} \]  

(1)

\[ N_D \left( \frac{P_{nt}}{P_r} ; Y_r \right) = N_S \left( \frac{\dot{W}_c}{P_{nt}} \right) \]  

(2)

\[ \dot{P}_r = \dot{S}_r^e \]  

(3)

\[ \dot{P}_r = \gamma \dot{P}_{t-1} + (1-\gamma) \dot{P}_c^e \]  

(4)

According to equation 1 the inflation rate is a weighted average of the rate of growth of tradable and nontradable prices. Equation 2 is the equilibrium condition for the nontradable market. Demand of nontradables depends on the relative price and real income.\(^{14}\) Nontradable supply depends on the relevant real wage. Equation 3 says that the rate of growth of tradable prices is given by the expected rate of devaluation (we have normalized world inflation to zero). Finally, equation 4 is a wage indexation rule where \( \gamma \) is the degree of indexation.

The introduction of exchange rate and price expectations in equation 3 and 4 will

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\(^{14}\) The real side of this model is the same as the one used in Masoller (1995).
allow credibility effects to affect the actual path of inflation. Note that a purely backward-looking setting would prevent lowered inflation expectation from affecting the actual path of inflation. The possibility of a downward shift in inflation expectations requires that expectations be at least somewhat forward-looking, as well as responsive to policy commitments that are viewed as credible.

Suppose that the government announces the following exchange rate rule at period 0:

$$S_t = \phi_F S_{t-1}$$  \hspace{1cm} (5)

where $\phi_F$ is the degree of exchange rate accommodation. This rule can be interpreted as a partial accommodation rule, where the exchange rate is adjusted a proportion $\phi_F$ of lagged inflation.\(^{15}\)

Under complete credibility in the exchange rate rule (i.e., when $S_t = \phi_F S_{t-1}$) the dynamic of the inflation rate is given by the following first order autoregressive process:

$$\hat{\pi}_t = \Gamma_F \pi_{t-1} + \xi_t$$ \hspace{1cm} (6)

where $\xi$ is an error term that combines demand and supply shocks, and,

$$\Gamma_F = b_1 \gamma + b_2 \phi_F$$ \hspace{1cm} (7)

$$b_1^* = \frac{(1-\alpha)(1-\delta) \varepsilon}{(n-\alpha\varepsilon) + (1-\alpha)(1-\delta) \gamma}$$

$$b_2^* = \frac{n-\alpha\varepsilon}{(n-\alpha\varepsilon) + (1-\alpha)(1-\delta) \gamma}$$

$\Gamma_F$ is a parameter that measures the degree of inflationary inertia in the economy. The degree of inertia if determined not only by the elasticities involved but also for the degree of

\(^{15}\) The rule is a partial representation of the way in which the government managed the exchange rate as the nominal anchor of the system during disinflation. In the 1978 plan the exchange rate policy consisted of a preannounced declining rate of devaluation of the domestic currency. The government deliberately set the declining rate of devaluation at a lower rate than the ongoing inflation. In terms of this model, this policy amounted to reducing the parameter $\phi_F$ in equation (4.5).
exchange rate accommodation, $\phi_F$, and the degree of wage indexation, $\gamma$.

We now allow for lack of credibility in the peg. Suppose that the private sector expects random realignments of the exchange rate. The public assigns a positive probability $(1-\sigma_t)$ to the event of a devaluation higher than the announced by the government in period $t+1$. Then,

$$\hat{S}_t^c = \sigma_t \phi_F \hat{P}_{t+1} (1-\sigma_{t+1}) \hat{S}_{t+1}^c$$  \hspace{1cm} (8)

where $\hat{S}_t^c$ stands for the expected rate of devaluation at period $t$ if the government discontinues the program. Notice that in the labor market, the expectation of realignments affects the wage contract (defined in equation 4) by modifying expected future prices. Expressing the rate of devaluation in the case of collapse, $\hat{S}_t^c$, as a coefficient of adjustment, $\phi_t^e$, times lagged inflation, $\hat{P}_{t+1}$, and reordering terms, we obtain:

$$\hat{S}_t^c = (\sigma_t \phi_F (1-\sigma_{t+1}) \phi_t^e) \hat{P}_{t+1}$$  \hspace{1cm} (9)

Finally, plugging 9 into 3, and solving for the dynamic of the inflation rate under the assumption of partial lack of credibility we obtain a dynamic equation for the inflation rate:

$$\hat{P}_{t+1} = \Gamma_L \hat{P}_{t+1} + \xi_t$$  \hspace{1cm} (10)

where,

$$\Gamma_L = b_1 \gamma + b_2 (\sigma_t \phi_F (1-\sigma_{t+1}) \phi_t^e)$$

The parameter $\Gamma_L$ now depends not only on $\gamma$ and $\phi_F$ but also on $\sigma_t$ and $\phi_t^e$. It is straightforward to verify that:

$$\frac{\partial \Gamma_L}{\partial \sigma_t} < 0 \hspace{1cm} \frac{\partial \Gamma_L}{\partial \phi_t^e} > 0$$

The degree of inflationary inertia in the economy will increase whenever the probability that economic agents assign to the event of collapse of the exchange rate regime in the following period, $1-\sigma$, or the expected size of devaluation in the case of crisis, $\phi^e$, grow. Inflation persistence is shown therefore to result not only from backward-looking elements per se, but also from lack of credibility in disinflation policies.

Note that the specification of the inflation rate that arises from this model (equation
10) allows us to distinguish between the announcement effect and the implementation effect of the new program which were mentioned in the introduction of this paper. In the former case, we study the immediate effect on the inflation rate occurring when the change in policy is announced. In the latter case, we studies the evolution of the inflation rate during the stabilization attempt. If the announced exchange rate policy is totally credible since the beginning, we would observe a structural break in the behavior of inflation. The break should take place at the moment the nominal anchor is implemented. From that point in time onward, the coefficient of lagged inflation in an expression of the type of equation 10 should be lower than the one in the pre-stabilization period, reflecting the reduction in the degree of exchange rate accommodation. If, however, the nominal anchor initially lacks credibility, and the public has doubts regarding the extent to which the government will stick to the new policy, the estimated degree of inertia in equation 10 will not be significantly affected by the adoption of the nominal exchange rate anchor. The announcement effect would be irrelevant. Similarly, if after some period an initial no credible plan starts gaining credibility, we would observe a slow decline in the degree of inflationary inertia in the economy. In this case, the implementation effect would be relevant.

The main implication derived from the model is that, other factors constant, the higher the credibility of the announced low-inflation policy, the less persistent inflation will be.

3.2 Empirical Implementation of the Model

In this section we employ the theoretical framework derived above to empirically investigate whether credibility effects have influenced the inflationary inertia in the economy during the stabilization periods.

Our empirical analysis rests on the study of the behavior of $\Gamma$, the coefficient of lagged inflation in an autoregressive process (equation 10). In terms of the model presented above, this coefficient can be interpreted as measuring the degree of inertia in the economy. The first step in the empirical investigation is therefore to prove that indeed there were significant changes in the degree of inflation persistence during the disinflation attempts.

A number of tests on the structural stability of the inflation equation were computed to assess the significance of the variability of the coefficient of lagged inflation. Figure 16A and 16B plot the CUSUM cumulative recursive residuals, with deviations outside the 5%

16 Of course, this assumes that there exist no source of exogenous money creation such as fiscal imbalance or exogenous expansion of credit to the private sector.
critical lines implying structural instability of this coefficient. The estimated inflation autorregressions are found to be unstable over the two disinflation program. The rejection of the hypothesis of stable parameters makes room to the possibility of credibility affecting inflationary inertia.

Studying price inertia in Chile, Edwards (1993) ran a regression of the inflation rate against lagged inflation rate and an index of demand pressures (proxied by the rate of growth of real domestic credit). He introduced a dummy variable, which takes the value of one during the fixed exchange rate period. The dummy variable interacts with the coefficient of the lagged inflation to allow for a reduction of inertia following the fixing of the exchange rate. The estimation results leads him to conclude that the Chilean economy displayed considerable inertia during this period. He also finds that the coefficient of lagged inflation did not decrease following the fixing of the exchange rate. According to Edwards, this indicates that the implementation of an exchange rate rule in 1978-79 did not alter the degree of inflationary inertia in Chile.

The main weakness that we find in Edward’s empirical way of evaluating the effect of a stabilization program (i.e., testing the significance of the dummy variable that interacts with the coefficient of lagged inflation) is the fact that his method does not allow for a gradual change in the dynamics of the system. In high inflation economies, we would not expect that the inflation equation captures a "change in regime" following the adoption of a new plan. This is particularly true for those countries that have seen a number of failed plans in the recent past. In those cases, people do not adjust inflation expectations immediately, and a high degree of inflationary sickness will remain.

For chronic inflation countries such as Uruguay, the use of a time-varying coefficient may be a more appropriate specification for the model during the stabilization process. We will use an alternative procedure to test for credibility effect based on the Kalman filter.\(^\text{17}\) The method allows the coefficient of lagged inflation (which is our measure of inertia) to change gradually, rather than moving instantaneously from the old to the new values as the stabilization program is launched. It thus takes into account the possibility of a gradual change in inflation expectations, a particularly useful case when credibility builds through time. We hypothesize that the time varying model tracks the behavior of the inflation rate

\(^{17}\) The Kalman filter follows a two-stage process for estimating a time-varying coefficient. At time t, an optimal predictor for the dependent variable is formed, using all information available up to and including time t. In the second-stage, the forecast error is used to modify the coefficient, and new information is used to generate new predictions at time t+1 for time t+2. Intuitively, the Kalman filter may be described as an "optimal discounting" of past data to find the best one-period forward predictor. Detailed descriptions of Kalman filtering appear in Pagan (1980), Harvey (1989) and Chow (1984).
better than the traditional constant coefficient regression.

A second weakness in Edward's method is the fact that it cannot distinguish between the different factors that plausibly influenced inflation persistence. For instance, if a change in the degree of wage indexation occurred during disinflation, then the fall in the degree of inertia in the economy will be due to the new wage policy. If we do not take this fact into account, we may conclude that a positive credibility effect took place. Thus, failing to control for other factors that affected inertia will lead to misleading results. We have developed a method that tries to resolve this problem, isolating the effect of credibility on the dynamics of inflation. Thus, we will be able to assess the role of expectations in stabilization programs.

Another paper that tries to measure credibility is the one of Agénor and Taylor (1992). They tested for credibility effects during the Cruzado stabilization plan in Brazil. They used the transitory component of the parallel market premium (TCPMP) as a proxy to measure the degree of credibility of the stabilization package. They calculated the TCPMP as the estimated residual, \( u_t \), that comes from the following regression:

\[
\rho = \pi_t + \delta + u_t
\]

where \( \rho \) is the parallel market premium (PMP), \( \pi_t \) is a vector of "fundamentals", and \( \delta \) is a vector of parameters. The variables considered as fundamentals were: the rate of growth of the money stock, changes in output, domestic and foreign inflation rates, and the rate of depreciation of the official exchange rate. Lack of monthly data prevented them from using other variables such as the budget deficit.

Then, they estimated a backward-looking process for inflation with parameters varying with the TCPMP. They found that the TCPMP, and no the PMP was significant in explaining credibility effects on inflation persistence.

The main critique of Agénor and Taylor's method is that their decomposition of an observable variable such as PMP into transitory and permanent component depends on the choice of fundamentals, \( z \). As they recognize, there is an inherent lack of uniqueness in using this decomposition. It may make more economic sense to use the whole PMP as a proxy for credibility.

We know present a two step procedure which is less vulnerable to some of the critics of the methods described above. Following Agénor and Taylor, we will estimate the changes in the degree of inertia in the economy; and then, we will try to relate these changes to some measure of the degree of public's confidence on the disinflation policies.
A time varying estimation was carried out by using quarterly data from 1974.1 to 1994.4. The equation to be estimated was:

\[ \hat{P}_t = \beta \hat{P}_{t-1} + \epsilon_t \]

The estimated coefficients of lagged inflation, our measure of inertia according to the model developed above, are depicted in Figure 17. In order to assess the significance of the variability of the coefficients, we show in each graph, in addition to the time-varying coefficient estimates, the OLS estimate and upper and lower bounds for the OLS estimate calculated at 5% confidence intervals, based on the estimated standard error and the critical t-statistics. If the Kalman-Filter estimate at any time is outside the upper or lower bounds, then the variation is significantly different from the variation one may tolerate under the constant coefficient assumption. Figure 17 confirms the results reached when using the CUSUMQ test: Again, we reject the hypothesis of constant parameters during the period under consideration.

The results of the estimation are quite interesting, suggesting that in the beginning of the tablita program, inflation behaved in an opposite way as the one we would have expected after the adoption of a stabilization plan. Inflationary inertia unambiguously increased at the beginning of the program, then declined (but remained high) during 1980-81 and finally it increased again in 1982. The peak reached in the fourth quarter of this year is due to the 100% devaluation in November 1982. In the December 1990 program, on the other hand, there was an important fall of inertia at the beginning of the program. After having gone through this fall, the coefficient of lagged inflation seems to have stabilized itself at a remarkably high level.

The first step of our procedure said nothing about the role of expectations in the dynamic of inflation. To determine if changes in the degree of persistence are related to credibility effects, we constructed an index of credibility from a variety of indicators, and then we tested whether this index was a significant explanatory variable in a linear regression explaining the degree of inertia in the economy.

To build the credibility index we used principal component analysis. The essential purpose of this technique is to describe the covariance relationships among many variables in terms of a few underlying, but unobservable random quantities called principal components. If a considerable amount of the total variance among p variables, can be attributed to the first principal component, then this component may "replace" the original p variables without much loss of information. The higher the degree of comovement that exists among the original p series, the fewer the number of principal components that will be needed to explain a large portion of the variance of the original series.
The use of this procedure is justified by the belief that economic agents do not look at an unique variable to make forecast of future events. In fact, they use several indicators. Introducing all of them as independent variables in the model may cause multicolinearity problems and a loss of degrees of freedom. This is a critical point since we are working with a small number of observations.

Following the recent theory on speculative attacks, three variables were chosen to serve as proxies of the "credibility" of the economic authority during the exchange rate-based stabilization program. The first variable, VINTRES, stands for changes in international reserves held by the monetary authority. Negative values of this variable mean that the government is loosing reserves, and thus, it is less able to defend a given objective of the exchange rate. The second variable, GOVDEF, is the quarterly government deficit, measures in real terms. This variable is intended to capture the degree of sustainability of the fiscal policy: high negative values should indicate less sustainable policies. The variable can also be interpreted as a measure of the severity of the government's financial needs. Finally, our third indicator of credibility, REALEXCH, is the actual level of the real exchange. Lower levels should indicate that the country has lost external competitiveness, and thus, the public will expect a realignment at some point in the future to restore the external equilibrium. The behavior of these three variables is shown in Figure 18.

We constructed the principal component indices for the periods 1978.I to 1982.III and 1990.I to 1994.IV. As Table 9 shows, the extent of comovement in VINTRES, GOVDEF, and REALEXCH is considerable. The first principal component, which is interpreted as a credibility index, explain 43% of the variation among the three variables, while the second principal component explains an additional 25% of the variation.

Figures 19A and 19B plot the behavior of the unobserved index, which by construction is correlated with the observed time series VINTRES, GOVDEF, AND REALEXCH. In the tabilta period, the index indicates relatively high credibility at the beginning of the program, explained by the adoption of fiscal measures in the previous years and by the relatively high level of the real exchange. It remains in a relatively stable range

---

18 In the principal component analysis VINTRES and DEFGOV were introduced with one lag. This choice is based on the fact that, in Uruguay, data regarding these variables becomes available with a delay of one quarter.

19 Although this number is relatively small owing to the low correlations among the variables in the system, we do not consider this a major limitation of the analysis, since we interpret the low percent of total variance explained by the first component as indicating that the chosen indicators evolved in opposite direction during some sub-periods.
during most of the program, and then fell dramatically toward the end of the program (second and third quarters of 1982). The fall is explained by the combined effect of an explosive fiscal deficit, a low level of real exchange, and considerable losses of international reserves. The path of this index in the December 1990 program is different. It starts from low levels, reflecting partial lack of credibility at the beginning of the program (caused especially by the fiscal situation), and then it increases over time, indicating a slow process of building credibility (due to an improvement of fiscal situation and continuous gaining of reserves).

To test for the existence of a credibility effect on the behavior of inflation, we examine the relationship between the coefficients driving the inflationary process, $\beta_0$, and the credibility index, CI, in a linear regression model. The following general equation was estimated for both periods:

$$\beta_t = \delta_0 \cdot \delta_1 \cdot \beta_{t-1} \cdot \delta_2 \cdot Z_t \cdot \delta_3 \cdot CI_t + e_t$$

where $Z$ stands for a set of additional variables that may have also influenced the inflationary inertia in the economy during the periods under consideration.

The theoretical model developed in last section suggests that the resulting estimate of $\delta_3$ should be negative: the higher credibility is, the lower is the inertial effect on inflation. Although the procedure does not allow for a precise interpretation of the size of $\delta_3$, its sign is what matters.

As we mentioned above, one of the advantage of this procedure is that it allows us to control for additional variables that might also influenced the degree of inflationary inertia in the economy. In this way the general environment is controlled for in assessing credibility. We now discuss briefly the rationality behind the inclusion of additional explanatory variables ($Z$) in the regressions during both stabilization periods.

NWA is the number of wage adjustments per years. It stands for the lengthening of wage indexation intervals during the tablita program. Figure 20 shows the increases in nominal wages in that period. It can be seen that at the beginning of the program nominal wages were adjusted once every two months. In 1979, there were quarterly adjustments. In 1980, increases occurred once every 4-months. The government decreed semiannual adjustments in 1981. Finally in 1982, yearly adjustment came into play (the only adjustment during that year was in January). It is well known that less frequent indexation makes inflation slow down. In terms of the above model, the impact of lengthening indexation intervals on the inflation rate is the same as the impact of decreasing the degree of wage indexation $\gamma$. A fall in $\gamma$ should lower the degree of inertia $\Gamma$. Therefore, the sign of the TNW variable in the estimated regression should be positive indicating that the as time went on, the degree of inertia decreased due to the changes in the wage policy.
The second variable included in the regression in the *tablita* period, the deviation of GDP from a linear trend (DGT), is a proxy for aggregate demand pressures. The pressures came from two different sources. On the one hand, the increasingly overvalued Argentinean peso caused a increased regional demand for Uruguay's goods during 1979 and especially 1980. On the other hand, there was a considerable amount of capital inflows during that period that was spent in both tradable and nontradable sector (especially in housing and the construction sector) adding to the increase in aggregate demand. As a result, expenditures increased rapidly in the first years of the *tablita*, putting upward pressure on prices, especially in the nontradable sectors. Difficulties began to arise in 1980, when Argentina embarked on a series of massive devaluations, and Uruguay continued its slow rate of crawl. The fall in Argentina's demand, the massive capital flight, and the beginning of the recession should have induced deflationary pressures in the last period of the *tablita*. Therefore, we should expect a positive sign for this estimated coefficient of this variables.

As for the December 1990 program, the above factors were not as important as in the *tablita* program, so we decided not to include them in the regression. We introduce a dummy variable, DF, to test for the incidence of the fiscal adjustment on the dynamic of the inflation rate. The major increase in the degree of inertia occurred in the fourth quarter of 1990 (look again at Figure 17) cannot be attributed to a downward shift in inflation expectations induced by the new plan because the announcement of the stabilization program was on the 26th of December, so any credibility effect due to the plan should have affected the actual path of inflation in 1991. In order to account for the effect of the fiscal adjustment we introduced a dummy variable that is equal to 1 during the third and fourth quarter of 1990 and zero otherwise. The expected sign of this variables is negative. Of course, inertia in the economy may be influenced by other economic variables, such as business cycles, external shocks, and so forth; however, it seems plausible that during the stabilization programs under study the variables considered above became the major determinants of the inflation rate.

Table 10 gives the results of simple regressions of the time-varying parameter estimates on their lagged value, the value of the index of credibility and an additional set of variables. The coefficient of CI is significant at 2% level in the *tablita* period and at 3% level in the December 1990 period, and it has the expected sign in both periods. The credibility index therefore does quite well in accounting for part of the fluctuations in inflationary inertia during both periods. As for the additional variables included in the regressions, all are significant and right signed.

There is therefore preliminary evidence supporting the hypothesis that inflation expectations have affected the actual path of inflation during both stabilization programs. During the *tablita*, a dramatic upward shift in inflation expectations (due to the credibility problems discussed in the previous sections) is the main responsible for the increase in the inflation rate in the last year of the program. The credibility effect was in part counterbalanced by two effects: On the one hand, nominal wages did not adjust during 1982,
so there were no cost pressures in the economy. On the other hand, a recession started in the fourth quarter of 1981 contributing to generate deflationary effects.

Regarding to the December 1990 program, the evolution of the index built in this section indicates that credibility was built over time. As the plan evolved satisfactorily, the low inflation reputation of the government increased, and people adjusted downward inflation expectations. The evolution of inflation expectations contributed to explain the behavior of the actual inflation rate. The empirical evidence seems clearly consistent with the view that disinflation was hampered by a partial lack of policy credibility at the beginning of the new plan. However, once the program appeared consolidated to the public's eyes, expectation seems to have played a supportive role in the stabilization effort.
4. Conclusions

The purpose of this paper was to empirically assess the extent to which inflation and exchange rate expectations have played a major role during two disinflation attempts in Uruguay: the tablita program (October 1978 to November 1982) and the new stabilization plan launched in December 1990. These periods are characterized by intensive exchange rate targeting and policy announcements aimed to break inflationary expectations. Thus, they seem especially suitable for testing credibility effects.

We measured credibility by comparing the announced policy targets with the public's expectations of the corresponding policy outcomes. Since data on people's expectations before and after the announcements is not available, we employed indirect indicators from the analysis of financial, money and product market.

The financial market's confidence in the program was measured by interest rate differentials. In the tablita, uncertainty regarding the continuation of the crawling peg system, and the induced "peso problem", seem to be relevant in understanding the level reached by domestic interest rates. The fact that the spread did not fall despite a declining inflation rate in the latter period of the tablita is indicating that the announced schedule of exchange rate devaluation was not believed. We have argued, however, that it is a mistake to interpret the interest differential uniquely in terms of risks of depreciation. Deviation from the uncovered interest parity condition may also have contributed to explain the behavior of the spread, especially at the beginning and at the end of the stabilization attempt.

Interest differentials also prevailed during the December 1990 program. However, the ex-post exchange rate forecast errors analysis indicated that credibility problems in this period were less important than those in the tablita period. The decline in nominal interest rates occurred during this period can be interpreted as a response to the stabilization program and to the fact of a major reduction in inflation. We concluded that the Uruguayan authorities made some progress in strengthening the credibility of its exchange rate policy over this period. A special role must go to the exchange rate policy. The monetary authorities were able to signified a shift from an accommodating exchange rate policy to a determined effort to squeeze inflation. Interest rate differential seems to have converged to the devaluation rate announced by the government. However, the convergence did not occur in the first couple of year of the program. We interpreted the slow reaction of the interest spread to policy announces as evidence of partial lack of credibility in the first stages of the plan.

We then tried to use the available financial information to build a better measure of credibility of the exchange rate regime. To accomplish this goal we first rejected the hypothesis of perfect substitutibility between assets and established a case for a currency risk premium. To recover a measure of devaluation expectations, we then made two adjustments
to the interest rate differential: (1) we controlled for the effect of changes in relative asset supplies on the currency risk premium and, (2) we estimated the fall in the domestic interest rate which was due to the official banks' sales of foreign exchange guarantees in 1981 and 1982. The distance between the adjusted interest differential and the exchange rate announcements began to increase in 1981. The adjusted measure allowed us to conclude that the government lost credibility during those years, though the indicator built using UIP condition shows quite a different story. For the December 1990 program, the adjustment is of less importance since, in that period, there was no major change in the public's portfolio composition and the degree of dollarization remained relatively constant.

We further consider the implications of lack of credibility for the behavior of real cash balances. We have demonstrated that ignoring the state of expectations or failing to adequately proxy them is not only an important source of instability in the conventional money demand functions, but is the main reason for the strong autocorrelation in the estimated residuals. We have presented evidence that toward the end of the tablita program and during the first 18 months of the December 1990 program the observed autocorrelation in the estimated residuals is the result of a "omitted variable" problem, an expectational component that has not been accounted for in the estimation. We conclude that partial lack of credibility in policy announcements accounted for the "missing money" phenomenon. Expecting greater devaluation and/or inflation than the ones announced by the government, the public substituted foreign money for domestic (narrow) money to avoid the cost associated with holding cash balances.

In order to study the linkages between credibility, inflation expectations and inflationary inertia, we built a two sector model where inflation persistence was shown to result not only from backward-looking elements per se, but also from lack of credibility in disinflation policies. We then proceeded to test the model for both disinflation periods. The empirical analysis followed a two-step procedure. First, we constructed an index of unobserved credibility based on three indicators: the government's deficit, the level of the real exchange rate, and variations in international reserves. Then, the credibility index was incorporated in a linear regression explaining the degree of inflationary inertia in the economy. This procedure has two advantages over more traditional ways to test for credibility effect in the product market. On the one hand, it allows for a gradual change of inflationary expectation. On the other hand, the general environment is controlled for in assessing credibility. The empirical results conform to the model predictions and are statistically significant. The findings are also consistent with those found when using others indicators of credibility.

During the tablita period, the evidence seems clearly consistent with the view that disinflation policy was hampered by a persistent lack of policy credibility, especially aggravated toward the end of the program. The fact that long-term interest rate differentials failed to converge to the announced schedule of exchange rate devaluation supports this
interpretation. So do the fall in real cash balances occurred in the latter period of the tablita and the dramatic increase in the degree of inflationary inertia in the last year of the program.

In the December 1990 program, the empirical evidence supports the idea that the anti-inflationary reputation of monetary authorities improved over time, but only gradually as policy consistently remained tight. This interpretation is supported by the evolution of interest rate differential, the behavior of real balances, and the dynamics of the inflation rates. The analysis highlights the importance of the fiscal consolidation as the main explanatory factor of the improvement in the public's confidence in the stabilization plan.

Though the evidence obtained is preliminary, it sheds light to the process of adjustment of expectations, and its effect in financial, money and product market. We conclude that credibility formation was an asymmetric process. During the last year of the tablita, exchange rate and inflation expectations increased rapidly as a consequence of the deterioration of internal and external conditions. In the recent experience of stabilization the reduction in long-term inflation expectations took a much longer period of time.

Finally, it is worth to point out that changes in expectations were registered first in the financial and money markets and only subsequently in the product markets. In fact, credibility effects seem to have been greater in the former than in the latter market. The explanation for this empirical fact is that financial and money markets are much more forward-looking than product markets. Moreover, the rigidities that characterized product and labor markets themselves prevented lowered inflation expectations from affecting the actual path of inflation. We conclude that market imperfections may reduce the extent to which credible policies can translate directly into lower inflation. In particular, we argue that backward-looking indexation mechanisms are a key factor for the understanding of the inflationary inertia in Uruguay. Credibility may be secondary to this factor in determining the speed of disinflation.

Lessons and Current Policy Issues

The tablita experience showed us that adherence to an intermediate target such as the exchange rate is not by itself sufficient to engender credibility, if other policies are not consistent with the low inflation outcome. For example, the presence of a large budget deficit will imply an ultimate monetization of government debt, and therefore, higher inflation in the future. Thus, adherence to a nominal intermediate target over the short-run may not provide credibility if there is doubt as to its long-run sustainability. Similarly, if the government allows the real exchange to appreciate to unsustainable level, the public may perceive a increasing risk that the authorities will ultimately back off their exchange rate commitments, especially, when external conditions turns out to be unfavorable.
Even though the December 1990 program can be regarded as partially successful in terms of inflation control, there remain some negative aspects of the economy that have recently become the subject of much concern. The pegging of the exchange rate that began in the first quarter of 1991, together with the decreasing but still relatively high inflation rate determined a significant real appreciation of the peso that has continued up to the present. It is clear that the downward trend in the real exchange rate, together with the continuation of the trade liberalization process has induced an equally impressive trade account imbalance. The presence of capital inflows made the situation sustainable all along the stabilization episode. Given this fragile situation, having the fiscal accounts under control seems to be of the most importance for the sustainabilaty of the program in the long run.
5 References


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## Table 4.1
THE OCTOBER 1978 PROGRAM

<table>
<thead>
<tr>
<th>Variables</th>
<th>1 Year Before</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Fourth Year</th>
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<td>18%</td>
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<td>Debt/GDP</td>
<td>26.8%</td>
<td>21.9%</td>
<td>22.0%</td>
<td>27.8%</td>
<td>52.6%</td>
<td>66.5%</td>
</tr>
<tr>
<td>CENTRAL BANK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int. Reserves</td>
<td>607.8</td>
<td>686.1</td>
<td>805.8</td>
<td>840.8</td>
<td>202.5</td>
<td>375.5</td>
</tr>
</tbody>
</table>

Note 1: The devaluation and inflation rates are expressed as annual changes for a year beginning in September. Interest rates are 6-months deposits rates in domestic currency. The reported rates correspond to September of each year. GDP growth is calculated from January to December. The real exchange rate (RER) and real wage indexes are calculated in September of each year. The RER index is calculated vis-a-vis the US. The real interest rate is defined as the 6-months deposit rate (September) minus the realized inflation in the following 6 months. External sector variables and central bank reserves are expressed in millions dollars. These variables are calculated for years starting in January. The public sector deficit is the consolidated deficit of the government, public enterprises and the central bank. Debt is the end of year debt of the public sector in foreign currency with residents and nonresidents.
Table 4.1 (cont.)

THE DECEMBER 1990 PROGRAM

<table>
<thead>
<tr>
<th>Variables</th>
<th>2 Years Before</th>
<th>1 Year Before</th>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Fourth Year</th>
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<tbody>
<tr>
<td>NOMINAL VAR</td>
<td></td>
<td></td>
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<tr>
<td>Deval. Rate</td>
<td>77%</td>
<td>97%</td>
<td>58%</td>
<td>41%</td>
<td>27%</td>
<td>27%</td>
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<tr>
<td>Infla. Rate</td>
<td>89%</td>
<td>129%</td>
<td>82%</td>
<td>59%</td>
<td>53%</td>
<td>44%</td>
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<tr>
<td>Inter. Rate</td>
<td>94%</td>
<td>99%</td>
<td>70%</td>
<td>40%</td>
<td>39%</td>
<td>40%</td>
</tr>
<tr>
<td>REAL SECTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output growth</td>
<td>1.3%</td>
<td>0.9%</td>
<td>3.2%</td>
<td>7.9%</td>
<td>2.5%</td>
<td>5.1%</td>
</tr>
<tr>
<td>RELAT. PRICES</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>RER</td>
<td>109.3</td>
<td>100</td>
<td>85.2</td>
<td>76.0</td>
<td>63.5</td>
<td>57.2</td>
</tr>
<tr>
<td>Real wage</td>
<td>110.2</td>
<td>100</td>
<td>105.9</td>
<td>105.4</td>
<td>111.8</td>
<td>110.7</td>
</tr>
<tr>
<td>Real interest rate</td>
<td>-15.3%</td>
<td>5.9%</td>
<td>2.8%</td>
<td>-12.5%</td>
<td>-0.3%</td>
<td>-0.5%</td>
</tr>
<tr>
<td>EXTERNAL SEC.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Trade acc.</td>
<td>462.8</td>
<td>425.9</td>
<td>61.0</td>
<td>-234.2</td>
<td>-473.0</td>
<td>-671.5</td>
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<tr>
<td>Current acc.</td>
<td>121.3</td>
<td>169.9</td>
<td>42.4</td>
<td>-115.7</td>
<td>-353.3</td>
<td>-396.3</td>
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<tr>
<td>Capital acc.</td>
<td>-15.3</td>
<td>-267.4</td>
<td>-768.0</td>
<td>118.1</td>
<td>402.1</td>
<td>705.1</td>
</tr>
<tr>
<td>Net Err. &amp; Oms.</td>
<td>-11.4</td>
<td>178.4</td>
<td>488.6</td>
<td>117.7</td>
<td>134.0</td>
<td>-70.8</td>
</tr>
<tr>
<td>PUBLIC SECTOR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deficit/GDP</td>
<td>-7.4%</td>
<td>-4.1%</td>
<td>-1.4%</td>
<td>-0.5%</td>
<td>-1.1%</td>
<td>-2.2%</td>
</tr>
<tr>
<td>Debt/GDP</td>
<td>83.5%</td>
<td>84.7%</td>
<td>82.5%</td>
<td>75.8%</td>
<td>76.5%</td>
<td>79.0%</td>
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<tr>
<td>CENTRAL BANK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Int. Reserves</td>
<td>997.2</td>
<td>1097.9</td>
<td>825.3</td>
<td>946.8</td>
<td>1201.8</td>
<td>1432.1</td>
</tr>
</tbody>
</table>

Note 2: In the case of the December 1990 program all values are calculated from January to December. For the definition of the variables, see note 1.
Source: Banco Central del Uruguay data base.
<table>
<thead>
<tr>
<th>EXCHANGE</th>
<th>OCTOBER 1978 PROGRAM</th>
<th>DECEMBER 1990 PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- The exchange rate was used as the nominal anchor of the system</td>
<td>Both plans are ER-BSP</td>
</tr>
<tr>
<td></td>
<td>- The exchange rate was used as a main disinflation device</td>
<td></td>
</tr>
<tr>
<td>RATE POLICY</td>
<td>- Schedule of monthly devaluations (active crawling peg regime, also known as the tablita)</td>
<td>- The exchange rate was allowed to fluctuate within a 2.5% band (target zone regime)</td>
</tr>
<tr>
<td>POLICY ANNOUNCEMENTS</td>
<td>- The value of the dollar was announced six to nine months in advance</td>
<td>- Inflation target: 1991-70%, 92-50%, 93-30%</td>
</tr>
<tr>
<td></td>
<td>- No inflation target</td>
<td>- No formal announcement of the rate of crawl of the band until June 92</td>
</tr>
<tr>
<td>FISCAL POLICY</td>
<td>- The fiscal deficit had already been reduced to less than 1% of GDP in 1977-78.</td>
<td>- An austere fiscal package had been adopted few months before (4% of GDP, consisted mainly in tax increases)</td>
</tr>
<tr>
<td></td>
<td>- No new fiscal measure was implemented.</td>
<td></td>
</tr>
<tr>
<td>INCOME POLICY</td>
<td>- Public wages: indexed to past inflation (the adjustment intervals lengthened)</td>
<td>- Public wages: adjusted according to the government's inflation target</td>
</tr>
<tr>
<td></td>
<td>- S.S.B.: indexed to past inflation (adjustments were made once a year)</td>
<td>- SSB: quarterly adjusted, indexed to past inflation by law.</td>
</tr>
<tr>
<td></td>
<td>- Private wages: adjusted by decree. They follow public wage increases.</td>
<td>- Private wages: backward-looking indexed, but also, some contracts based on productivity and the exchange rate</td>
</tr>
<tr>
<td>CREDIT POLICY</td>
<td>OCTOBER 1978 PROGRAM</td>
<td>DECEMBER 1990 PROGRAM</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>- Credit to domestic residents by the private banking was encouraged.</td>
<td>- No attempt to control credit to domestic residents by the private banking system</td>
<td></td>
</tr>
<tr>
<td>- Lack of control of credit granted by the official banks.</td>
<td>- Bank supervision was substantially tightened</td>
<td></td>
</tr>
<tr>
<td>- Credit granted by official banks was limited</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STRUCTURAL POLICIES</th>
<th>OCTOBER 1978 PROGRAM</th>
<th>DECEMBER 1990 PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Trade liberalization started in 1974 and continued during the disinflation period.</td>
<td>- Trade reforms: maximum tariff was reduced to 20%, and non-tariff barriers were curtailed.</td>
<td></td>
</tr>
<tr>
<td>- Financial liberalization was completed by 1979.</td>
<td>- Free trade agreement was signed with Argentina, Brazil and Paraguay</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXTERNAL ENVIRONMENT</th>
<th>OCTOBER 1978 PROGRAM</th>
<th>DECEMBER 1990 PROGRAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Although initially favorable, the external conditions deteriorated significantly during the course of the program: (i) International interest rate rose dramatically in 79-81</td>
<td>- Particularly favorable external environment: (i) Argentina and Brazil started stabilization plans in 1990; this caused a dramatic improvement in Uruguay's terms of trade vis-à-vis those countries. (ii) Argentina's Tablita collapsed in 1981, leading to a loss of competitiveness of Uruguayan's goods and services vis-à-vis Argentinean's.</td>
<td>(ii) Plan Brady agreement reduced the burden of the external debt. (iii) International interest rates fell significantly.</td>
</tr>
</tbody>
</table>
### Table 4.3
The Stylized Facts of the October 78 and December 90 Stabilization Programs

<table>
<thead>
<tr>
<th></th>
<th>INITIAL SITUATION (2 Years Before)</th>
<th>MEDIUM RUN RESULT (First 3 Years)</th>
<th>FINAL OUTCOMES 4th &amp; 5th Years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OCT.78</td>
<td>DEC.90</td>
<td>OCT.78</td>
</tr>
<tr>
<td>Inflation</td>
<td>Below average (40%) &amp; falling</td>
<td>High (130%) &amp; raising</td>
<td>First rose, then declined</td>
</tr>
<tr>
<td>Output</td>
<td>Strong growth</td>
<td>Stagnant</td>
<td>Considerable expansion</td>
</tr>
<tr>
<td>Curr. Acc.</td>
<td>Deficit</td>
<td>Surplus</td>
<td>Deteriorated</td>
</tr>
<tr>
<td>Real Exch. Rate</td>
<td>Average period</td>
<td>Average period</td>
<td>Significant appreciation</td>
</tr>
<tr>
<td>Fiscal Situation</td>
<td>Balanced</td>
<td>Large deficit</td>
<td>Under control</td>
</tr>
<tr>
<td>Private Capital Movements</td>
<td>Capital inflows</td>
<td>Normal capital inflows</td>
<td>Huge capital inflows</td>
</tr>
</tbody>
</table>

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### Table 4.4

**THE PUBLIC SECTOR DURING THE OCTOBER 78 AND DECEMBER 1990 PROGRAM (I)**

(as a percent of GDP)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Revenues</td>
<td>16.2</td>
<td>19.7</td>
<td>20.5</td>
<td>20.1</td>
<td>19.3</td>
<td>20.3</td>
<td>23.2</td>
<td>20.8</td>
</tr>
<tr>
<td>2. Expenditures</td>
<td>20.0</td>
<td>20.8</td>
<td>20.5</td>
<td>20.3</td>
<td>18.0</td>
<td>19.4</td>
<td>23.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Social Security</td>
<td>7.0</td>
<td>7.6</td>
<td>7.3</td>
<td>7.1</td>
<td>6.2</td>
<td>7.5</td>
<td>11.0</td>
<td>13.7</td>
</tr>
<tr>
<td>Other</td>
<td>13.0</td>
<td>13.2</td>
<td>13.2</td>
<td>13.2</td>
<td>11.8</td>
<td>11.8</td>
<td>12.6</td>
<td>14.9</td>
</tr>
<tr>
<td>3. Primary Balance</td>
<td>-3.7</td>
<td>-1.1</td>
<td>-0.0</td>
<td>-0.3</td>
<td>1.3</td>
<td>0.9</td>
<td>-0.5</td>
<td>-7.7</td>
</tr>
<tr>
<td>4. Interest Payments</td>
<td>0.9</td>
<td>1.2</td>
<td>1.0</td>
<td>0.8</td>
<td>0.6</td>
<td>0.4</td>
<td>0.3</td>
<td>0.9</td>
</tr>
<tr>
<td>5. Other Revenues</td>
<td>0.5</td>
<td>0.1</td>
<td>0.3</td>
<td>0.4</td>
<td>0.2</td>
<td>1.1</td>
<td>0.3</td>
<td>-0.5</td>
</tr>
<tr>
<td>6. Overall Balance (3-4+5)</td>
<td>-4.2</td>
<td>-2.2</td>
<td>-0.7</td>
<td>-0.7</td>
<td>0.9</td>
<td>1.6</td>
<td>-0.5</td>
<td>-9.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Revenues</td>
<td>16.3</td>
<td>16.8</td>
<td>15.6</td>
<td>17.8</td>
<td>18.8</td>
<td>19.6</td>
<td>18.7</td>
<td>19.0</td>
</tr>
<tr>
<td>2. Expenditures</td>
<td>16.1</td>
<td>17.4</td>
<td>17.1</td>
<td>16.0</td>
<td>16.6</td>
<td>17.8</td>
<td>17.9</td>
<td>19.4</td>
</tr>
<tr>
<td>Social Security</td>
<td>0.2</td>
<td>-0.6</td>
<td>-1.5</td>
<td>1.8</td>
<td>2.2</td>
<td>1.8</td>
<td>0.8</td>
<td>-0.4</td>
</tr>
<tr>
<td>Other</td>
<td>4.2</td>
<td>4.4</td>
<td>5.1</td>
<td>5.3</td>
<td>4.0</td>
<td>3.0</td>
<td>2.5</td>
<td>2.3</td>
</tr>
<tr>
<td>3. Primary Balance</td>
<td>-0.6</td>
<td>0.1</td>
<td>-0.8</td>
<td>-0.6</td>
<td>0.4</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td>4. Interest Payments</td>
<td>-4.6</td>
<td>-4.9</td>
<td>-7.4</td>
<td>-4.1</td>
<td>-1.4</td>
<td>-0.5</td>
<td>-1.1</td>
<td>-2.2</td>
</tr>
</tbody>
</table>

Notes: Revenues and expenditures refer to the central government and the social security system. Interest payments include payments on net central bank debt. Other net revenues include the surplus of public enterprises and other government agencies. Sources: Talvi (1994), Dominioni (1995) and Banco Central del Uruguay, data base.
### Table 4.5

**URUGUAY: FISCAL DEFICIT AND CREDIT EXPANSION**

<table>
<thead>
<tr>
<th>Year</th>
<th>Fiscal Deficit (% GDP)</th>
<th>Change in High-Powered Money (% GDP)</th>
<th>Change in Net Public Sector Credit (% GDP)</th>
<th>Within-Year Change in Net Public Sector Credit (% GDP)</th>
<th>Banking System</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>-5.3%</td>
<td>2.92%</td>
<td>2.06%</td>
<td>2.34%</td>
<td></td>
</tr>
<tr>
<td>1975</td>
<td>-4.2%</td>
<td>3.41%</td>
<td>1.38%</td>
<td>2.99%</td>
<td></td>
</tr>
<tr>
<td>1976</td>
<td>-2.2%</td>
<td>4.56%</td>
<td>1.95%</td>
<td>1.92%</td>
<td></td>
</tr>
<tr>
<td>1977</td>
<td>-0.7%</td>
<td>2.66%</td>
<td>0.72%</td>
<td>0.84%</td>
<td></td>
</tr>
<tr>
<td>1978</td>
<td>-0.7%</td>
<td>4.46%</td>
<td>0.38%</td>
<td>0.66%</td>
<td></td>
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<tr>
<td>1979</td>
<td>0.9%</td>
<td>3.92%</td>
<td>-0.23%</td>
<td>-1.15%</td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>1.6%</td>
<td>2.61%</td>
<td>-0.29%</td>
<td>0.05%</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td>-0.5%</td>
<td>0.28%</td>
<td>0.21%</td>
<td>1.30%</td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>-9.1%</td>
<td>1.92%</td>
<td>5.85%</td>
<td>11.12%</td>
<td></td>
</tr>
<tr>
<td>1983</td>
<td>-7.1%</td>
<td>2.84%</td>
<td>11.80%</td>
<td>13.36%</td>
<td></td>
</tr>
<tr>
<td>1984</td>
<td>-9.0%</td>
<td>3.81%</td>
<td>5.22%</td>
<td>11.67%</td>
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<tr>
<td>1985</td>
<td>-6.6%</td>
<td>5.90%</td>
<td>5.48%</td>
<td>5.33%</td>
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</tr>
<tr>
<td>1986</td>
<td>-4.8%</td>
<td>4.18%</td>
<td>4.24%</td>
<td>6.81%</td>
<td></td>
</tr>
<tr>
<td>1987</td>
<td>-4.6%</td>
<td>4.85%</td>
<td>3.82%</td>
<td>3.28%</td>
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<tr>
<td>1988</td>
<td>-4.9%</td>
<td>4.42%</td>
<td>6.88%</td>
<td>8.30%</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>-7.4%</td>
<td>1.01%</td>
<td>4.93%</td>
<td>7.01%</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>-4.1%</td>
<td>3.17%</td>
<td>4.32%</td>
<td>6.76%</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>-1.4%</td>
<td>2.58%</td>
<td>0.24%</td>
<td>1.25%</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>-0.5%</td>
<td>2.45%</td>
<td>2.86%</td>
<td>2.84%</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>-1.1%</td>
<td>1.58%</td>
<td>0.74%</td>
<td>1.60%</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>-2.2%</td>
<td>2.17%</td>
<td>0.20%</td>
<td>2.11%</td>
<td></td>
</tr>
</tbody>
</table>

Source: Banco Central del Uruguay, data base.
<table>
<thead>
<tr>
<th></th>
<th>76-94</th>
<th>78-82</th>
<th>90-94</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPREAD, PDR</td>
<td>.57</td>
<td>.13</td>
<td>.92</td>
</tr>
<tr>
<td>SPREAD, PIR</td>
<td>.62</td>
<td>.35</td>
<td>.85</td>
</tr>
<tr>
<td>SPREAD, RDR</td>
<td>.56</td>
<td>.33</td>
<td>.86</td>
</tr>
<tr>
<td>SPREAD, RIR</td>
<td>.60</td>
<td>.22</td>
<td>.78</td>
</tr>
</tbody>
</table>

**Note**: SPREAD is the contemporaneous interest rate differential between peso and dollar deposits (1-6 months). PDR and PIR are the rate of devaluation and the rate of inflation in the last 3 months. RDR and RIR are the realized devaluation and inflation rates in the following three months. All rates have been annualized.

**Source**: Author's own calculations using data from Boletín Trimestral, Banco Central del Uruguay.
Table 4.6B

TESTING FOR THE EXISTENCE OF A CURRENCY RISK PREMIUM
ECONOMETRIC RESULTS

Sample 1978.10 - 1982.10

<table>
<thead>
<tr>
<th>Method</th>
<th>Constant</th>
<th>Share $ assets</th>
<th>Dummy</th>
<th>R2 Adj.</th>
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Sample 1985.03 - 1996.03

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Note: t-statistic in parenthesis.
The dependent variable is the difference between the interest spread on deposits and the realized devaluation rate for the following three months (annualized).
### Table 4.7

**URUGUAY: OLS ESTIMATES OF THE DEMAND OF MONEY EQUATION**

**OCTOBER 1978 PROGRAM**

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**NOTES:**
1) Statistic t in parenthesis.
2) All regressions include non-reported seasonal dummies
3) Period: 1976.4-1982.3, quarterly data
## Table 4.8

**URUGUAY: OLS ESTIMATES OF THE DEMAND OF MONEY EQUATION**  
**DECEMBER 1990 PROGRAM**

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**NOTES:**  
1) Statistic t in parenthesis.  
2) All regressions include non-reported seasonal dummies.  
Table 4.9
PRINCIPAL COMPONENT ANALYSIS


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Period: 1990.1 - 1994.4

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Note: Cumulative R-squared gives the percentage of the variance of the original series explained by the first principal component, the first two principal components, and so on.

Variables used in the analysis: VINTRES, GOVDEF, REALEXCH
### Table 4.10

**OLS Estimates of the Time-Varying Coefficient Beta**

Dependent Variable: BETA

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R-squared 0.888 0.858 0.812 0.741
Adjusted R-squared 0.856 0.829 0.776 0.711
S.E. of regression 0.019 0.021 0.022 0.025
Durbin-Watson statistics 2.348 2.220 2.102 1.809
Log likelihood 51.287 49.039 50.087 46.921
Mean of dependent variable 0.878 0.878 0.961 0.961
S.D. of dependent variable 0.050 0.050 0.047 0.047
Sum of squares residual 0.005 0.008 0.008 0.011
F-statistic 27.709 30.190 22.971 24.370

Statistic *t* in parenthesis.

Columns (1) and (2): Sample range 1978.1 - 1982.3, Number of observations: 19

Columns (3) and (4): Sample range 1990.1 - 1994.4, Number of observations: 20
Figure 4.1
URUGUAY: QUARTERLY INFLATION RATE
(1974.1 - 1995.2)

Source: Banco Central del Uruguay, data base.
Figure 4.2
URUGUAY: REAL GDP, 1974.1 - 1995.2

Note: FQMOAV is the 4-quarter moving average of the GDP index.

Source: BCU, data base.
Figure 4.3
URUGUAY: INTEREST RATE ON PESO AND DOLLAR DEPOSITS (1-6 months)

Source: BCU, data base.
Figure 4.4
URUGUAY: INTEREST RATE DIFFERENTIAL VERSUS ACTUAL DEVALUATION

Note: ACTDEVA is the realized devaluation in the following three months.
Source: BCU, data base.

--- SPREAD ----- ACTDEVA
Figure 4.5
URUGUAY: INTEREST RATE DIFFERENTIAL VERSUS ACTUAL INFLATION

Note: ACTINFLA is the realized inflation in the following three months.
Source: BCU, data base.

---

SPREAD  ACTINFLA
Figure 4.6

URUGUAY: ERRORES DE PROYECCIÓN DEL TIPO DE CAMBIO, 1978-82 Y 1991-95
EL DIFERENCIAL DE TASAS DE INTERESES COMO INDICADOR DE CREDIBILIDAD

FIGURE 4.1
SERIES ORIGINALES

FIGURE 4.7 B
SERIES AJUSTADAS
FIGURE 4.7c

URUGUAY: EL DIFERENCIAL DE TASAS COMO INDICADOR DE CREDIBILIDAD, 1991-95

PORCENTAJES

90.12 91.06 91.12 92.06 92.12 93.06 93.12 94.06 94.12 95.06 95.12

DEVALUACIÓN ESPERADA DIFERENCIAL DE TASAS
Figure 4.8
URUGUAY: NONRESIDENT AND RESIDENT DEPOSITS IN
COMMERCIAL BANKS, 1974-1995

Source: Banco Central
del Uruguay, data base.

RES&DOL    NOR&DOL    RES&PESO
Figure 4.9
URUGUAY: DOLLARIZATION RATIO, 1974–94

Note: Dollarization ratio defined as total resident dollar deposits over M3
Source: Banco Central del Uruguay, data base
Figure 4.10
EXTERNAL FACTORS THAT CONTRIBUTED TO THE UNDERMINING OF THE TABLITA STABILIZATION ATTEMPT IN URUGUAY

Uruguayan tablita collapsed (October, 82)

Recession in Argentina and Brazil

World recession

1980 1981 1982

time

Argentinean tablita collapsed (April, 81)

Series of massive devaluations in Argentina (April, 81 to July, 82)

Mexican confiscation of dollar assets Beginning of the international debt crisis (August, 82)

World interest rate (Libor) reached 18%

Chilean program collapsed (June 82)
A. Diciembre 1990. 30% la tasa de inflación para 1991
C. Junio 1992. 2.5% tasa de deslizamiento de los límites de la banda de flotación
D. Octubre 1992. 2% tasa de deslizamiento de los límites de la banda de flotación
Figure 4.12

Note: Seasonally adjusted data.
Source: Banco Central del Uruguay data base.
Figure 4.13A
URUGUAY: ACTUAL AND ESTIMATED DEMAND FOR MONEY AND ESTIMATED ERRORS, 1976.4 -- 1982.3

Note: the regression includes: constant term, seasonal dummies, the log of GDP and the domestic interest rate (peso deposit, 1-6 M.)

Source: BCU data base. RESIDUAL --- ACTUAL --- FITTED
Figure 4.13B

Note: the regression includes: constant term, seasonal dummies, the log of GDP and the actual inflation rate.

Source: BCU database RESIDUAL ACTUAL FITTED
Figure 4.14A
URUGUAY: ACTUAL AND ESTIMATED DEMAND FOR MONEY AND ESTIMATED ERRORS, 1978.4 - 1983.2

Note: the variables included in the regression are the same as in Figure 4.13A.
Source: BCU data base.
--- RESIDUAL --- ACTUAL --- FITTED ---
Figure 4.14B
URUGUAY: ACTUAL AND ESTIMATED DEMAND FOR MONEY AND ESTIMATED ERRORS, 1988.4 - 1994.3

Note: the variables included in the regression are the same as in Figure 4.13B
Source: BCU data base — RESIDUAL — ACTUAL — FITTED
Figure 4.15
URUGUAY: DECEMBER 1990 PROGRAM ANNOUNCED AND ACTUAL INFLATION

Note: The announced schedule in March, 1991 was: 70% by the end of 1991, 50% by the end of 1992 and 30% by the end of 1993.
Source: BCU and official announcements

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ACTUAL
--- ANNOUNCE
Figure 4.16A

URUGUAY: OCTOBER 1978 PROGRAM
CUSUMQ TEST OF COEFFICIENT STABILITY

Note: The test was applied to an AR(1) process for the inflation rate.
Level of Significance: 5%

CUSUMQ INF SUP
Figure 4.16B
URUGUAY: DECEMBER 1990 PROGRAM
CUSUMQ TEST OF COEFFICIENT STABILITY

Note: The test was applied to an AR(1) process for the inflation rate. Level of significance: 5%.

CUSUMQ — INF — SUP
Figure 4.17
URUGUAY: OLS AND TIME-VARYING COEFFICIENT OF LAGGED INFLATION (BETA), 1975.1 - 1994.4

Source: Author's own calculations using data from BCU.
Figure 4.18
URUGUAY: VARIABLES USED TO BUILD THE CREDIBILITY INDEX

Source: Banco Central del Uruguay data base and IFS, IMF.

--- RESERVES --- RER --- DEFICIT ---
Figure 5.19A

Source: Author's own calculation using data from Banco Central del Uruguay data base.
Figure 5.19B


Source: Author's own calculation using data from Banco Central del Uruguay data base.
Figure 4.20
URUGUAY: WAGE INCREASES DURING THE TABLITA STABILIZATION PROGRAM

Source: BCU data base.