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The cruzado plan: theoretical foundations and practical limitations

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TEXTO PARA DISCUSSÃO

Nº 154

THE CRUZADO PLAN: THEORETICAL FOUNDATIONS
AND PRACTICAL LIMITATIONS

Eduardo Marco Modiano

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PRACTICAL LIMITATIONS

Eduardo Marco Modiano*
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1. Introduction

During the first half of the eighties economic policy in Brazil was mainly geared towards fighting rampant inflation. The first doubling of the rate of inflation occurred by the end of 1979, as it jumped from 50 to 100% per year. The conjunction of the second oil shock with a domestic policy of setting "realistic prices" and simultaneously increasing the frequency of wage adjustments from twelve to six months certainly contributed to increase inflation. The second doubling of the rate of inflation is dated of 1983, as the mark of 200% per year was reached. The acceleration of inflation in this case can be primarily attached to the cruzeiro maxidevaluation of February 1983. By early 1986 another doubling of the rate of inflation was signaled as agricultural prices reflected the drought that affected Brazilian harvests. At this moment the Cruzado Plan was launched .

The orthodox stabilization policies adopted from 1981 to 1984 had little effect upon the trajectory of inflation. Inflation seemed to resist to the deflationary forces of recession and unemployment. During this period several theoretical and empirical studies attempted to show that the Brazilian inflation had special properties and followed its own dynamics. The predominance of inflation inertia, feedback by widespread indexation,

over aggregate demand and supply conditions was demonstrated by Lopes and Lara-Resende (1980), Lopes (1982) and Modiano (1983 , 1985a) among others. Research efforts were then concentrated upon alternative ways to eliminate inertial inflation.

Along these lines Lara-Resende and Arida (1984) presented by the second-half of 1984 the "indexed money" proposal. It suggested the introduction of a new currency that would circulate simultaneously with the cruzeiro. The new currency would have a fixed parity with the Obrigações Reajustáveis do Tesouro Nacional (ORTN), whose nominal value in cruzeiros was monetarily corrected monthly on the basis of past inflation. Conversion to the new currency would be voluntary, but according to the authors, public acceptance would be guaranteed by its stability and credibility. The proposal was criticized by Modiano and Carneiro (1984) on the basis that stability was not guaranteed. If inflation in cruzeiros accelerated during the conversion process, the new currency would devalue, what would affect its credibility. Also the risks of reindexation under the new currency were shown to be present.

Approximately at the same time Lopes (1984b) proposed the so-called "heterodox shock" to curb the Brazilian inflation. In its original form, it suggested a wage-and-price freeze at levels consistent with the status-quo of the distribution of income and a widespread deindexation of the economy. Later it incorporated the idea of a simultaneous monetary reform, introducing the "cruzado". The rules for conversion from

cruzeiros into cruzados were further explored by Modiano (1985b).

Following this introduction, in section 2, the economic policy pursued by the Brazilian "New Republic" during the interval between the theoretical presentation of "heterodox shock" and the announcement of the Cruzado Plan, is described. In section 3, the basic diagnosis of the Brazilian inflationary process, that inspired the Cruzado Plan, is discussed. A simple analytical model is used to illustrate its theoretical foundations and technical difficulties. Section 4 describes in greater detail the conversion rules for wages, prices, rents and future payments. It also points out some of the risk factors contained in the Plan, such as the magnitude of the wage bonus, the wage sliding scale, the neglected price readjustments and so forth. Finally, section 5 concludes this paper.

2. Preliminaries: The "New Republic" Economic Policy*

The Brazilian "New Republic" took office in March 1985, after twenty-one years of military rule. While the necessity of a "social pact" to conciliate real wage claims with disinflation had been very much emphasized during the electoral campaign, an orthodox economic policy was announced at the onset of the new government. Besides facilitating negotiations with the International Monetary Fund, the cut in public expenditures and the slow-down of monetary expansion were presented as the government initial contribution to the "social pact". Since restrictive fiscal and monetary policies could take some time to produce a decline in inflation rates, that by that time reached 12% per month, a price freeze was determined for the month of April. Also, in order to dampen the acceleration of inflation, the formulas for computing monetary correction and exchange rate devaluation were modified, extending the "memory" of past inflation from one to three months. A scheme of daily minidevaluations, preset every month, was introduced. Table 1 presents monthly data for the main indicators of performance of the Brazilian economy from March 1985 to February 1986.

Immediately after the announcement of the new economic policy, inflation dropped significantly, from 12.7% in March to 7.2% in April 1985. However, this result could be almost entirely explained by the suspension of price adjustments for two

* This section draws heavily on Modiano (1986a).

TABLE 1
BRAZIL: MAIN ECONOMIC INDICATORS
(JAN. 85 TO FEB. 86)

YEAR-MONTH	MONTHLY VARIATIONS (%)										ANNUAL VARIATIONS	
	GENERAL PRICE INDEX (ICP-DI)	CONSUMER PRICE INDEX (IPC)	CONSUMER PRICE INDEX-FOODSTUFFS (IPC-A)	WHOLESALE PRICES FOODSTUFFS (IPA-DI)	EXCHANGE RATE (AVERAGE)	NOMINAL WAGES (FIREF)	INTEREST RATE (OVERNIGHT)	INDUSTRIAL OUTPUT	TRADE SUPPLIES (US\$ MILLIONS)			
85 JAN	12.5	14.6	13.5	10.6	11.3	7.2	12.6	7.9	13,136			
FEB	10.2	8.9	9.4	10.7	11.9	7.0	10.8	7.1	12,838			
MAR	12.7	12.8	11.5	10.4	10.5	6.3	11.8	8.3	12,703			
APR	7.2	8.8	8.7	6.5	13.5	14.5	11.9	8.1	12,693			
MAY	7.9	6.8	5.2	9.2	11.0	24.1	11.1	7.6	12,693			
JUN	7.8	7.7	6.5	8.5	9.7	9.5	9.7	7.1	12,589			
JUL	8.9	9.3	10.9	8.7	8.4	12.4	8.8	6.9	12,701			
AUG	14.0	12.1	16.0	19.0	7.9	8.4	8.3	7.0	12,371			
SEP	9.1	12.0	12.2	6.9	11.0	3.6	9.2	7.6	12,594			
OCT	9.0	9.6	9.3	5.5	9.7	19.4	9.4	7.8	12,428			
NOV	14.9	11.1	11.5	20.1	9.0	21.0	9.2	8.0	12,395			
DEC	13.2	13.4	17.3	12.6	11.0	7.0	12.3	8.5	12,442			
86 JAN	17.8	16.2	17.2	26.2	14.1	19.8	15.0	8.3	12,603			
FEB	15.0	14.4	17.6	19.8	15.3	12.9	13.1	9.2	12,775			

SOURCE: FGV, FIDET, ANDEMA, CAGEX.

groups of products: steel and fuel. Private prices, that were not under strict control, did not seem to follow the freeze. Anyhow, the government decided to extend the duration of the price freeze. As prime costs increased in real terms during these months, since the existing lags on the formulas for wage, exchange rate and monetary correction passed along past higher inflation rates, the price freeze was put under high pressure. And in June 1985 the government announced the first increases for a few of public and a lot of private-controlled prices. In order to avoid an inflationary rebound, minor adjustments were conceded in the first round. An increase in the frequency of later adjustments was to compensate for the losses in profit margins. Inflation increased from 7.8% in June to 8.9% in July 1985.

The adjustment of prices had only begun when the economy suffered a major agricultural supply shock. As wholesale food prices augmented 19.0% in August 1985, the general price index increased 14.0% in the same month, signaling the failure of the "orthodox-cum-freeze" anti-inflation package of March 1985 and the end of the first phase of the "New Republic" economic policy. The new Finance Minister announced a modest inflation target to be pursued: stabilization at the rate of 10% per month. The indexation rules were once more altered in order to avoid the propagation of the August inflation rate. The "memory" of past inflation in the formulas for monetary and exchange rate correction was reduced from three to one month. Important public and private-controlled prices were to be monetarily corrected on a monthly basis, and hence at smaller percentages, to minimize the impact upon the general price index, what suggested that the stabilization of the inflation

rate would be obtained at the expense of an increase in the degree of indexation of the economy. Interest rates, that skyrocketed during April/July 1985, would decline as a result of a less restrictive monetary policy.

The new indexation rules suggested that the economy was on the route of the "indexed money" proposal, as price, exchange rate and financial assets monetary adjustments became increasingly linked to the monthly variations of the ORTN. However, there was not a clear, and widely acceptable, rule for the indexation of nominal wages, that remained, at least officially, guided by the six-month adjustment established in 1979. The perspective of returning to 1984 monthly inflation rates, after the failure of the price freeze, gave a new impulse to the demand for more frequent nominal wage adjustments. The proposals for a new wage policy included: adjustments every three months; adjustments every month according to the variation of the ORTN; and, a sliding scale of 30%. While the public discussions proceeded, the government allowed free negotiation of bonuses, advancements, and alternative indexation schemes as long as these were not passed along to prices. The price control agencies should not consider for the purpose of cost computation any wage increase that was not in strict accordance with the official rule of six-month cost-of-living adjustments. Real wages increased substantially during this period.

If in one hand the "fine-tuning" of price adjustments maintained inflation at 9% per month during September/October 1985,

on the other hand it did not allow any space for major corrections to compensate for the losses incurred mainly by public prices during the freeze of April/July 1985. Repressed inflation combined with a major supply shock originating from the drought that harassed the food harvests, raised the general price index by 15% in November 1985. Deindexation then proceeded along an alternative line: the price index that officially measured inflation was changed from the General Price Index (IGP-DI) to the Consumer Price Index (IPCA). The latter showed an inflation rate of only 11.12% in November.

The IPCA became also the official universal indexer for capital and labor incomes, that used to be monetarily corrected by the IGP-DI and the INPC respectively. While this move was announced as one step toward social justice, the frequency of nominal wage adjustments was maintained at six months. Only the lag between the announcement of the IPCA and the correction of wages was reduced from two to one month. The appointed advantages of the IPCA over the other indices were its slower response to supply shocks, which would help dampening an increase in inflation rates, and the smaller weight attributed to foodstuffs prices, which had increased 20.1% at the wholesale level in November. These gains had to be balanced against the fact that consumer prices were less suitable to controls than wholesale prices, that comprised 60% of IGP-DI. At this point, as an acceleration of inflation seemed inevitable, the application of a "heterodox shock" or the negotiation of a "social pact" were already in the order of the day. The main discussion concerned the eventual contractionary effects upon

economic activity , as recession was usually associated with orthodox stabilization plans to be repelled. In fact, the fear of a recession based upon the experiences of Argentina and Israel, seemed to be the major obstacle to be overcome.

Inflation, as measured by the new index, reached 13.36% in December 1985 and 16.23% in January 1986. The agricultural supply shock finally showed up at the consumer level, as the price of foodstuffs increased approximately 17% per month during December/January. At the wholesale level it increased 26% only in January. There were no doubts that , with the widespread indexation of the Brazilian economy, the annual inflation rate would move quickly to a new plateau of 400 to 500% per year. The government would not be able to keep wage adjustments at the frequency of six months, what could result in another cost push that would drive the economy into a hyperinflation. Also the jump in monthly rates frustrated the exchange rate policy , as the preset daily minidevaluations could not keep pace with the increase in inflation. A program of gradual recover of the real price of public services had to be abandoned as the nominal adjustments in December and January fell behind the monthly rates of inflation.

The failure of gradualism in producing the stability of monthly inflation rates ended the second phase of the "New Republic" economic policy . Rampant inflation threatened not only the economic ministries but also the political coalition

that supported the government. The legitimacy of the indirect voting process that elected Tancredo Neves and of the presidential succession after his death were once again at stake. Even the President's political party seemed on the verge of a major rupture. Not many options were left, and on February 28th President Jose Sarney decreed a new stabilization program: the Cruzado Plan. The preconditions were considered most appropriate: industrial output had grown 9.15% during the twelve months before February 1986; the trade balance had accumulated US\$12.8 billion from March 1985 to February 1986; the public sector deficit was believed to be roughly balanced for 1986 as a result of the "fiscal package" of December 1985; the price of oil, that accounted for 45% of Brazilian imports, was declining in the world markets; and the dollar was being devalued against European currencies and the Japanese yen.

3. Basic Diagnosis: The Inertial Inflation Model*

The Cruzado Plan favored the interpretation that the Brazilian inflation was mainly inertial. The indexation mechanisms for monetary correction of prices, wages, exchange rates and financial assets tended to perpetuate past inflation into the present and the future. In the absence of shocks the inflation rate tended to remain as it was. This perception of the inflationary process is perfectly compatible with the distributive conflict model that characterizes structuralist macroeconomics, recently formalized by Bacha (1982) and Taylor (1983). Movements of the inflation rate, as opposed to movements of the price level, would result from an ex-ante inconsistency in the distribution of income**.

The distributive conflict interpretation of the inflationary process can be explained with a simple model of an economy with an aggregate production function with only two inputs (labor and imported intermediary products). The price frontier of the economy establishes, then, an inverse relation between the real wage w and the real exchange rate e , given by:

$$\phi(w,e) = 0, \phi_1' > 0 \text{ and } \phi_2' > 0 \quad (1)$$

The income distribution equilibrium implied by (1) is represented graphically by curve DE in Figure 1. Notice in (1) that a real devaluation of the exchange rate (an increase in e) would result

* This section draws heavily on Modiano (1985b, 1985c).

** For a non-analytical exposition of the relation between conflict and inertia see Bacha (1986).

in a loss for real wages (a decrease in w). In Figure 1 a real devaluation would be represented by a downward movement of DE to DE'.

An inverse relation between the real wage and the rate of inflation completes the model. Denoting by ξ the rule for adjustment of the nominal wage, one can show that:

$$w = \psi(\xi, \hat{p}) \quad , \quad \psi_2' < 0 \quad (2)$$

The inflationary equilibrium determined by (2) is represented in Figure 1 by curve IE. The intercept on the vertical axis w^* indicates the desired or peak real wage. This is the real wage that would prevail in the short-run if inflation stopped abruptly after a nominal adjustment. In Figure 1 a decline in the peak real wage would displace IE downwards to IE'. A decrease in the frequency of nominal wage adjustments would rotate IE clockwise to IE''.

Equations (1) and (2) determine simultaneously the equilibrium real wage and the rate of inflation of the economy. This general equilibrium is represented in Figure 1 by E_1 , at intersection of curves DE and IE. According to this stylized interpretation of the Brazilian inflationary process, the economy real wage would depend solely upon the pattern of income distribution, that might be rigid in the short-run. Changes in indexation rules or in peak real wages would affect only the rate of inflation, without altering the real wage.

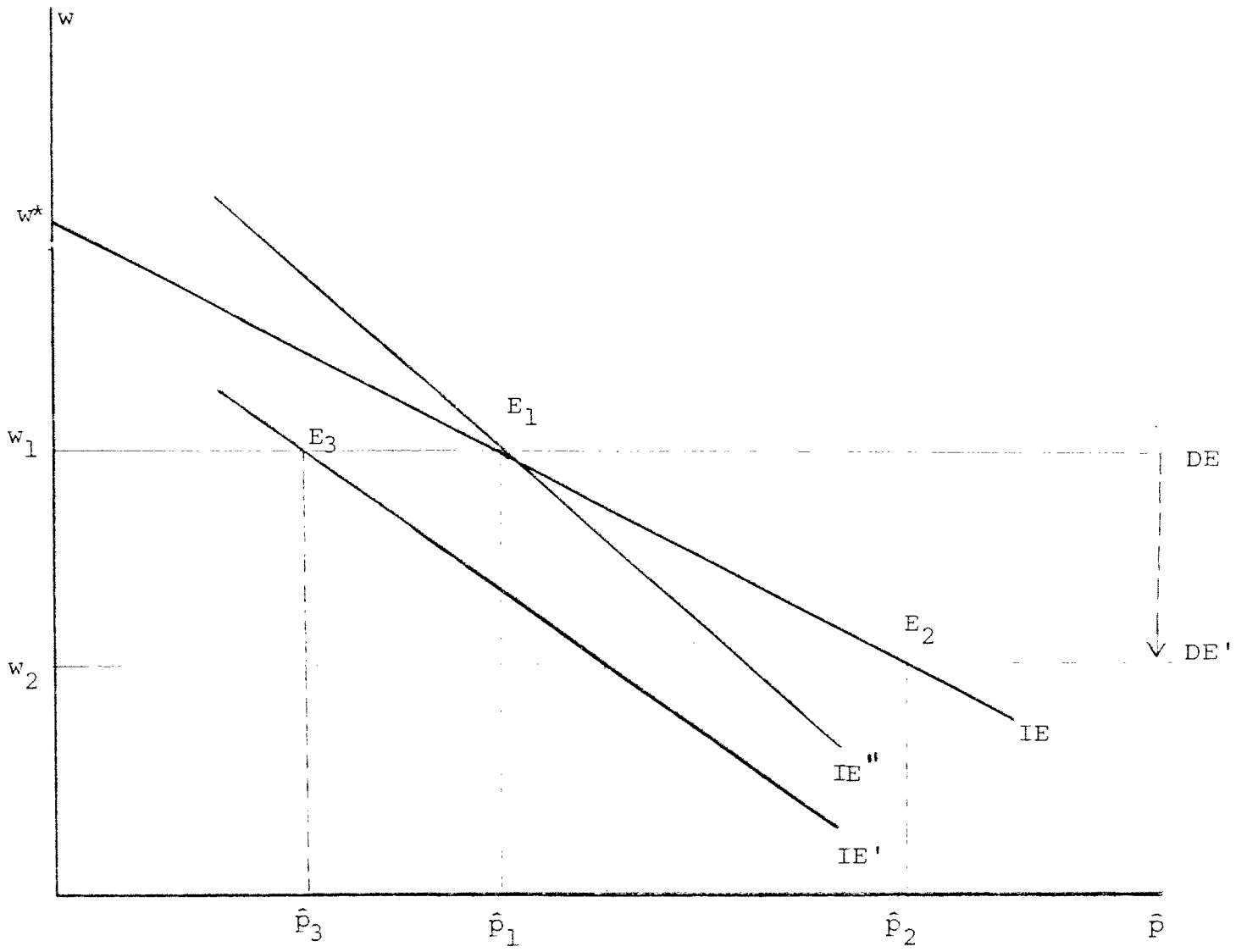


Figure 1

In the absence of shocks, the rate of inflation remains constant due to the indexation mechanism, characterizing an inertial process. A supply shock, such as a real devaluation of the exchange rate would cause, as DE move downwards to DE' in Figure 1, both a permanent decline in real wages and a permanent rise in the inflation rate.

The inverse relation between the real wage and the rate of inflation in (2) can be easily derived in the case of fixed-periodicity adjustments, that dominated the Brazilian economy until the Cruzado Plan was launched. Figure 2 illustrates the dynamics of real wages, and to a certain extent of any relative price, for which nominal values are corrected by past inflation at fixed intervals of time. The peak real wage is restored at the moment the nominal wage is readjusted. While the nominal wage is kept constant, the real wage declines due to the continuous inflationary process, and a trough is reached exactly before another readjustment is due. Since the real wage oscillates, a more stable measure of purchasing power is given by the average real wage. Hence, equations (1) and (2) should be reinterpreted in terms of the real wage averaged over an interval of time equal (or a multiple) to the fixed interval between successive adjustments.

Denoting the peak real wage by w^* , the fixed interval between nominal wage adjustments in months by M and the monthly rate of inflation by \hat{p} , we obtain for the average real wage w that:

$$w = \frac{(1+\hat{p})^{M+1} - 1}{(M+1)\hat{p}(1+\hat{p})^M} w^* \quad (3)$$

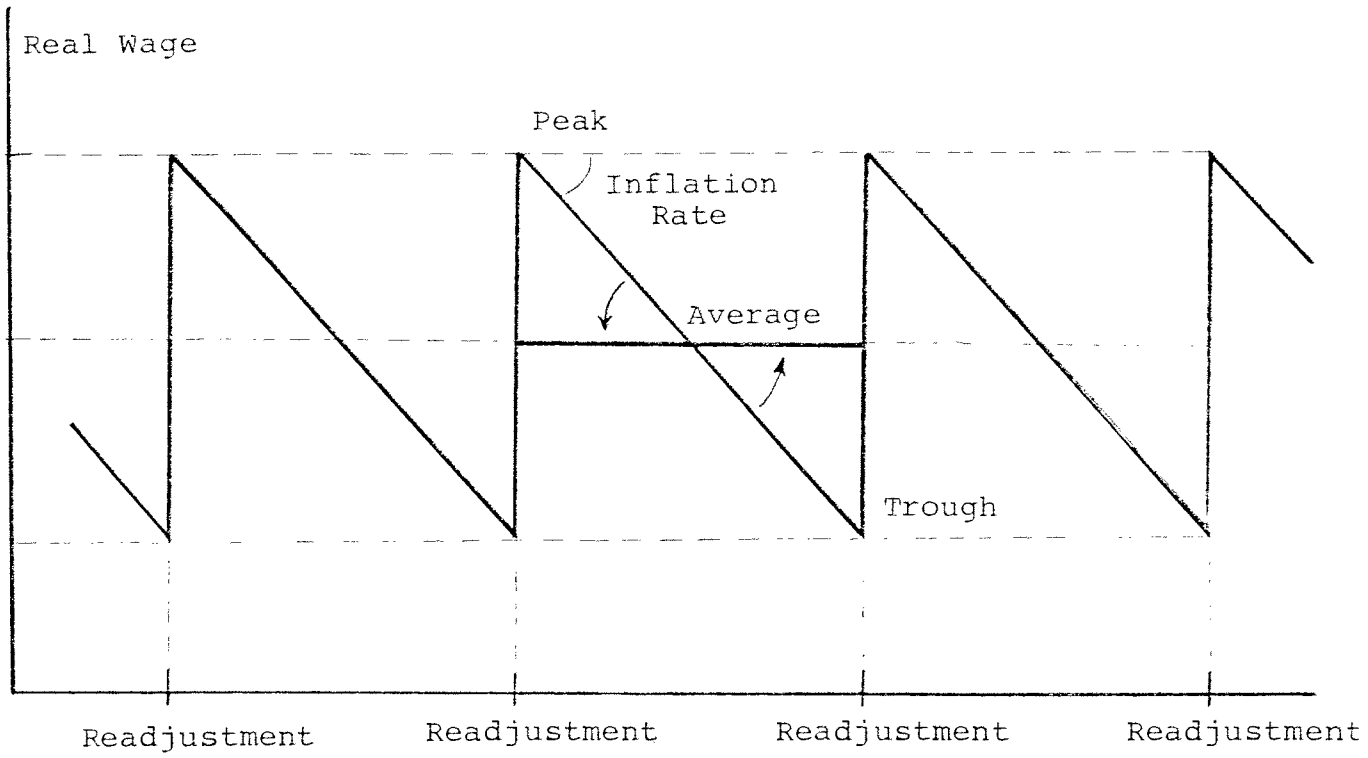


Figure 2

For the specific case of wage adjustments every six months, as it prevailed in the Brazilian economy until the February 28th, 1986, it suffices to make $M = 6$ in (3)*. With expression (3) the inverse relation between w and \hat{p} , postulated in the inflationary equilibrium represented by equation (2), can be easily proved.

Figure 2 illustrates one major technical difficulty involved in the design of a stabilization plan for the Brazilian economy: the lack of synchronism in wage adjustments. If the inflationary process were terminated abruptly, workers with the same average real wage could be left with different real wages, as they were caught at different stages of the same "inflationary slide". Major redistributions of income could result. The same observation applied to all other sources of income that were monetarily corrected with fixed periodicities but lacked synchronism, such as rents, profits, and exchange rates.

The Cruzado Plan was designed to overcome these difficulties. Its technical foundations can also be explained with the aid of Figures 1 and 2. Notice in Figure 2 that a decline in the peak real wage, that leaves the average real wage unchanged, corresponds to a counterclockwise rotation of the "slide" around the mean. As the angle of the "slide" is equivalent to

* Equation (3) is a discrete-time version of the expression for the average real wage earlier derived by Simonsen (1984) and Modiano (1985c). The discrete-time version is adopted here for consistency with the conversion rules of the Cruzado Plan.

the rate of inflation, to a reduction of the peak real wage there corresponds a decline in the rate of inflation. In the limit the "slide" turns horizontal and the inertial component of inflation would vanish , without affecting the income distribution equilibrium determined in Figure 1. In the latter figure , this process of disinflation would correspond to a downward movement of IE, until the peak real wage w^* coincides with the equilibrium (average) real wage w_1 . Hence, it becomes clear that the main ingredient for price stabilization would be the conversion to average relative prices and the suppression of the indexation mechanisms that linked current to past inflation. The institution of a new currency and a wage-and-price freeze would only reinforce such a stability.

4. Basic Ingredients: The Rules for Conversion

The Brazilian stabilization plan of February 28th, 1986 promoted a monetary reform, that established the cruzado (Cz\$) as the basic unit of national currency. The rate of conversion was fixed at 1,000 cruzeiros per cruzado. As explained in section 2, the lack of synchronism in wage and price adjustments under the cruzeiro required the design of specific rules for conversion, if major redistributions of income and wealth were to be avoided. These rules aimed at producing a "neutral shock", which would restore under the cruzado the same patterns of income and wealth distribution verified more recently under the cruzeiro. As noted in section 2, these were not directly observable under the Brazilian inflationary process, as wages and prices were monetarily corrected at different fixed periodicities.

Several reasons concurred for the shock to be not as neutral as it purported in its original form. Among these, one can cite the fact that the stabilization plan was launched when inflation was in fact accelerating and, hence, before a new inertial inflation and a new income and wealth distribution were settled. Also, as can be ascertained from the description below, the neutrality of the plan was impaired by political commitments and technical difficulties.

4.1. The Conversion of Wages

Wages have been converted into cruzados on the basis of the average purchasing power of the last six months. Even

though quarterly readjustments have become widespread during the second half of 1985, the official wage policy, dated of 1979, still determined adjustments every six months. The wage conversion formula corresponds to expression (3), for the computation of the mean real wage, valued at prices of end-February 1986. Actual, as opposed to uniform, monthly inflation rates were used.

The rule for wage conversion, established by the Decree-Law 2283 of February 28th, 1986, can be expressed analytically as:

$$W(\text{Cz}\$) = \frac{1}{6} \sum_{t=0}^5 W_{T-t}(\text{Cr}\$) \prod_{j=0}^t (1 + \hat{q}_{T+1-j}) \quad (4)$$

where $W(\text{Cz}\$)$ stands for the wage in cruzados, $W(\text{Cr}\$)$ for the monthly wage in thousands of cruzeiros and \hat{q} for the monthly rate of inflation. Time period T refers to February 1986, $T-1$ to January 1986, $T-2$ to December 1985 and so forth. The right-hand side products in (4) are the "present-value factors" to end-February 1986. The rate of inflation for March 1986, time period $T+1$ in (4), was set to zero.

An underlying hypothesis for (4) was that wages were normally paid at the last day of the month, even if they were set at the beginning of the month. The erosion of the real wage that occurred along these thirty days of the month was not compensated for*. Purchasing power was assumed to be exercised in full at wage receipt in the last day of the month. Weekly or fortnightly

* The full compensation for the monthly loss in real wages would be equivalent to substituting \hat{q}_{T-j} for \hat{q}_{T+1-j} in (4).

advances , as well as alternative paydays, were disregarded.

Table 2 displays the application of conversion formula given by (4) for wage-earners that followed strictly the official rule for adjustments during the six months prior to the Plan. The initial wage was set at 1,000 thousand cruzeiros in August 1985 for all the six classes, among which workers that had cost-of-living adjustments every six months could be divided. The third row from the bottom of table shows that in this case the procedure adopted would be equivalent to multiplying the nominal wage that prevailed in February 1986 by alternative conversion factors. Wages readjusted in cruzeiros immediately before the Plan, for example in January or February 1986, had conversion factors lower than unity. Wages readjusted in cruzeiros long before the Plan, which means from September to December 1985, had conversion factors higher than unity.

One advantage of the conversion procedure adopted by the Cruzado Plan over the utilization of preset conversion factors that applied to February nominal wages according to the month of the last readjustment, as earlier suggested by Modiano (1985b), stemmed from encompassing bonuses, advances, quarterly readjustments and other benefits freely negotiated for September 1985 through February 1986. However, not all wage gains have been perpetuated as benefits contracted for the months following February 1986 have not been taken into account. These were left for future negotiations.

TABLE 2
WAGE CONVERSION PROCEDURE
 C L A S S E S

Months	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC	JUL/JAN	AUG/FEB
AUG	1000.0	1000.0	1000.0	1000.0	1000.0	1000.0
SEP	1683.3	1000.0	1000.0	1000.0	1000.0	1000.0
OCT	1683.3	1719.8	1000.0	1000.0	1000.0	1000.0
NOV	1683.3	1719.8	1702.5	1000.0	1000.0	1000.0
DEC	1683.3	1719.8	1702.5	1692.8	1000.0	1000.0
JAN	1683.3	1719.8	1702.5	1692.8	1893.5	1000.0
FEB	1683.3	1719.8	1702.5	1692.8	1893.5	2014.1
MAR	3458.8	1719.8	1702.5	1692.8	1893.5	2014.1
Average	2381.6	2213.1	1997.9	1815.8	1734.1	1583.9
Average with respect to February	1.4148	1.2868	1.1735	1.0727	0.9158	0.7864
Average plus bonus of 8%	2572.1	2390.1	2157.7	1961.1	1872.8	1710.6
Average plus bonus with respect to February	1.5280	1.3898	1.2674	1.1585	0.9891	0.8493

PRESENT VALUE FACTORS	
1985 SEP	1.8351
OCT	1.6743
NOV	1.5068
DEC	1.3292
1986 JAN	1.1436
FEB	1.0000

Another advantage for wage-earners of the adopted conversion procedure resulted from its "backward-looking" direction. Wages have been converted into cruzados on the basis of the average purchasing power of the past six months. The rise in monthly inflation rates from 12.8%, which corresponds to the average between September 1985 and February 1986, to 14.6%, which corresponds to the average between December 1985 to February 1986, would result, according to (3), in a decline of 3.9% in the six-month average real wage. Had inflation rates remained at 14.6% per month with wage readjustments occurring every six months after March 1986, the average purchasing power for the future six months would fall by 3.9%. Hence a "forward-looking" conversion procedure would set wages in cruzados at levels 3.9% lower than "backward-looking".

4.2. Wage Bonus and Cost-of-Living Adjustment

A bonus of 8.0% was conceded to all wage-earners, irrespective of prior gains obtained through labor negotiations from September 1985 to February 1986, when inflation accelerated. The last two rows in Table 2 show the application of the wage bonus to the average purchasing power of the last six months. The minimum-wage, which used to be readjusted in November and May, was raised to 804 cruzados from 600 thousand cruzeiros in February 1986. With respect to the average purchasing power of the past six months, the new minimum-wage implied a bonus of 16.1%. If the average purchasing power of the future six months is taken as a reference, the bonuses amounted to 12.2% for all wage-earners and 20.6% for the minimum wage.

There was no economic rationale for the magnitude of the wage bonus. It resulted from a political decision to promote a redistribution of income towards wage-earners, favoring still further the lower-classes. The "New Republic", installed in March 1985, was committed to restore real wages to pre-1983 levels. The recession and the wage deindexation of 1983, in the aftermath of the foreign debt crisis, reduced the real wage by approximately 20%.

Several economic motives were supposed to explain the wage bonus. The first motive stemmed from the data collection interval for the Consumer Price Index (IPCA). February inflation was measured from January 15 to February 15 and, hence, the wage bonus should have accounted for the missing fifteen days in February. The argument is false because the fifteen-day time lag was carried-on ever six-month wage readjustments were installed. Wage readjustments for March 1986, for instance, were based on cumulative inflation measured from August 15, 1985 to February 15, 1986. A compensation for inflation in the last days of February would amount to a six-month-and-a-half cost-of-living adjustment. Bacha (1986) showed that a more rigorous computation of the average real wage, that involved measuring inflation from the first to the last day of the month, would result in lower wages in cruzados, as inflation declined during the second-half of February 1986.

The wage bonus was also supposed to compensate for the acceleration of inflation from November 1985 to February 1986, due to the rise in foodstuffs prices. This motive had no sound

theoretical foundations as the increase in agricultural prices reflected a supply shock, namely the drought that affected the Brazilian harvests in 1985. Besides, as shown by Modiano (1985b), the real wage losses entailed by the food supply shock were at most 3.2% for wage-earners which had their last six-month readjustment in December 1985.

In contrast to the Argentinian Austral Plan of June 1985 or the Israeli Stabilization Plan of July 1985, wages were not frozen with the Cruzado Plan. Instead, the annual wage negotiation dates that had prevailed until November 1979 were restored. The asynchronous wage readjustments that complicated the launching of any stabilization plan for the Brazilian economy, were not eliminated. The interval between successive wage negotiations has only been extended from six to twelve months. At first wages were supposed to be freely negotiated on an yearly basis, with no automatic compensation for past inflation. However, a second-version of the decree-law established an automatic cost-of-living adjustment at the negotiation dates, equivalent to 60% of the variation of consumer prices accumulated either from March 1st, 1986 or the previous negotiation date, whichever comes last. The remaining 40% of CPI were to be part of the wage negotiation process. While the wage deindexation was not complete, the partial compensation for past inflation was considered sufficient to accomodate eventual supply shocks.

4.3. The Sliding Scale

A sliding scale for wage adjustments has been a constant demand in labor negotiations during 1985. While in the opposition, the political party that came into power in March 1985 had endorsed such a claim. It was then felt that acceptance by the working class of the wage conversion scheme would be enhanced if a sliding scale for protection of real wages was introduced with the stabilization program. Hence, the Cruzado Plan established, over and above the annual automatic partial compensations, that wages should be automatically adjusted whenever the inflation rate, as measured by consumer prices, accumulated the trigger of 20%. The inflation counter was set initially at zero in March 1st 1986 and would be reset either at the annual negotiation dates or at the moment the trigger was reached. No limits were imposed on the number of times wage adjustments could be triggered within twelve months.

Given the instability associated with wage readjustments without a fixed periodicity, it was thought that the trigger of 20% would indicate an annual inflation rate that was tolerable without further monetary or fiscal restraint. For the sliding scale to remain inoperative and wage adjustments to be limited to the annual negotiation dates, inflation rates had to be kept below 1.67% per month, which is equivalent to 20.0% in eleven months and 22.0% in one year. It can be shown through equation (3) that with an inflation rate of 1.67% per month, the equality between the real wage after the Plan (averaged over twelve months) and the real wage before the Plan (averaged over six months) would only be obtained if the cruzado wages were set 9.4% above the average

purchasing power of the cruzeiro wages from September 1985 through February 1986*. This theoretical wage bonus, that could guarantee no losses in real wages in the "worst case", was of the same magnitude of the politically determined bonus of 8%.

An expression for the average real wage w , in terms of the peak real wage w^* , with a sliding scale coupled to annual wage negotiations can be obtained as an extension of (3). Denoting by \hat{p} the uniform monthly inflation rate, we have:

$$w = \left\{ \frac{MN}{12} \left[\frac{(1+\hat{p})^{M+1} - 1}{(M+1)\hat{p}(1+\hat{p})^M} \right] + \frac{12 - MN}{12} \left[\frac{(1+\hat{p})^{13-MN} - 1}{(13-MN)\hat{p}(1+\hat{p})^{12-MN}} \right] \right\} w^* \quad (5)$$

where M is the number of months between two successive wage readjustments and N the number of times automatic wage readjustments are triggered within a year. Clearly, N must be the integer that results from the division of 12 by M , or:

$$N = \text{int} \left[\frac{12}{M} \right] \quad (6)$$

Consistency with the trigger mechanism further requires that:

$$M = \text{int} \left[\frac{\log(1.20)}{\log(1+\hat{p})} + 1 \right] \quad (7)$$

Figure 3 shows the dynamics of the real wage and the average real wage with: a) $M=12$ and $N=1$; b) $M=5$ and $N=2$ and c) $M=2$ and $N=6$.

The instability of the rate of inflation with the sliding scale is illustrated in Table 3. It uses equations (5) to (7) to show different combinations of \hat{p} and M (and hence, N)

* Substituting 0.0167 for \hat{p} and 12 for M in (3), one obtains for the real wage a peak-to-average ratio of 1.094.

Real Wage

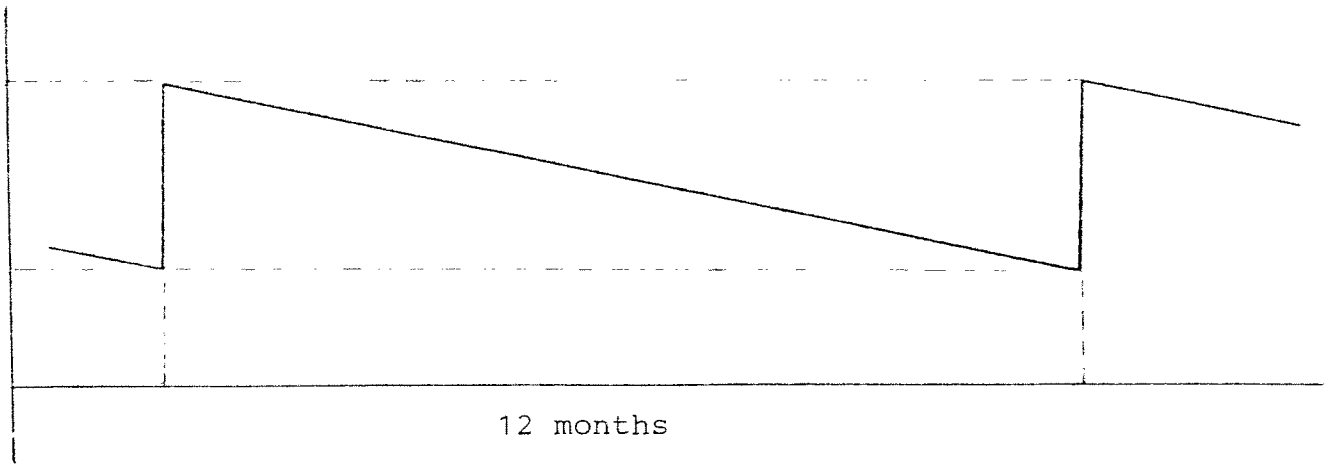


Figure 3(a)

Real Wage

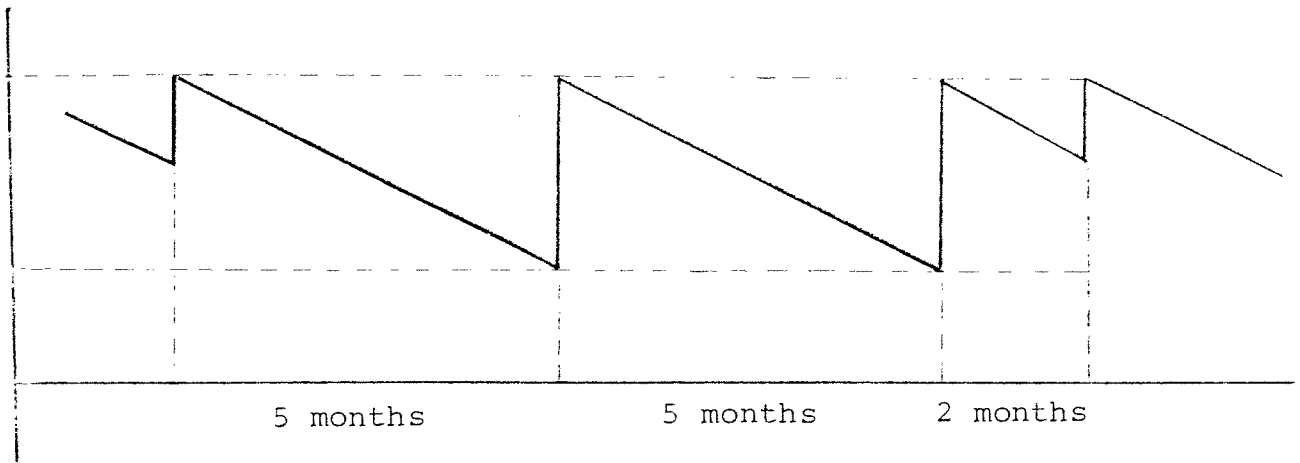


Figure 3(b)

Real Wage

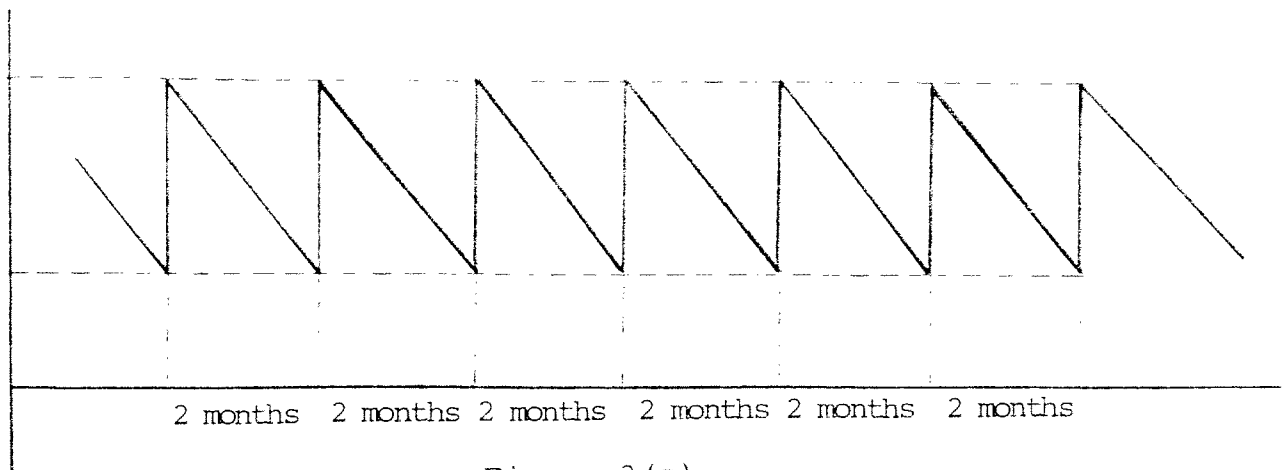


Figure 3(c)

TABLE 3

ALTERNATIVE INFLATION RATES CONSISTENT WITH AN 8% DECLINE IN REAL WAGES

Monthly Inflation Rate (%)	Annual Inflation Rate (%)	Number of Months Until Next Wage Readjustment	Number of Times Sliding Scale is Triggered	Number of Months Until Next Negotiation Date
1.4	18.4	12	0	12
1.7	22.3	11	1	1
2.0	26.7	10	1	2
2.3	31.4	9	1	3
2.6	35.9	8	1	4
2.8	39.3	7	1	5
3.9	57.7	5	2	2

that result in the same decline in the average real wage with respect to the peak, that would prevail under the "zero-inflation" hypothesis*. The average real wage would decline by the same percentage of the official wage bonus under alternative inflation rates that run from 1.4% to 3.9% per month. In the best case the sliding scale would not be triggered and wage readjustments would be limited to annual negotiations. In the worst case, automatic wage readjustments would be triggered twice within the year, at the end of the fifth and tenth months.

Table 4 determines the inflation rates that are consistent with the same adjustment of the average real wage under alternative indexation schemes. Besides the sliding scale introduced by the Cruzado Plan, two fixed-periodicity regimes for wage readjustments are considered: every twelve months, which coincide with the annual negotiation dates; and every six months, which were followed before the Cruzado Plan. For the sliding scale, the smallest rate of inflation was selected.

Notice that up to an 8% decline in average real wages, the sliding scale would not be triggered and the rate of inflation is the same as under the policy of readjustments every twelve months: 1.4% per month or 18.4% per year. Six-month wage readjustments would imply a higher rate of inflation: 2.9% per month or 40.4% per year. If real wages have to decline by more than 10%, the rates of inflation under the three regimes become markedly different. A rate of inflation of 1.8% per month or 24%

* In the limit when \hat{p} approaches zero in (5), one can show that $w = w^*$.

TABLE 4

CONSISTENT INFLATION RATES

(%)

Real Wage Adjustments (%)	12-Months Readjustment		6-Months Readjustment		20% Sliding Scale*	
	Monthly	Annual	Monthly	Annual	Monthly	Annual
0	0.0	0.0	0.0	0.0	0.0	0.0 (12)
-2	0.3	4.2	0.7	8.5	0.3	4.2 (12)
-4	0.7	8.6	1.4	17.9	0.7	8.6 (12)
-6	1.1	13.4	2.1	28.5	1.1	13.4 (12)
-8	1.4	18.4	2.9	40.4	1.4	18.4 (12)
-10	1.8	24.0	3.7	53.9	5.6	91.4 (4)
-12	2.2	30.0	4.5	69.4	9.3	189.1 (3)
-14	2.6	36.6	5.3	86.9	17.3	575.8 (2)
-16	3.1	43.6	6.2	106.8	47.1	10130.4 (1)

* The values in parentheses indicate number of months between successive wage readjustments.

per year under annual readjustments is consistent with 5.6% per month or 91.4% per year under the sliding scale. In the latter case wage readjustments would be triggered every four months. The distance between inflation rates under the alternative regimes becomes larger, the larger is the required decline in real wages. Real wages would fall by 16% with inflation rate of either 3.1% per month under the fixed periodicity of twelve months or 47.1% per month under the 20% sliding scale.

The importance of setting prices "right" at the onset of a stabilization plan, that at the same time introduced a sliding scale for protection of real wages, becomes clear. Should large price corrections be needed afterwards, the inflation rate may grow exponentially as wage readjustments become frequently triggered. The numerical example in Table 4 has shown that, in the presence of a 20% sliding scale, the need to raise prices by as much as 16% above wages could move the economy from stabilization on the route of hyperinflation.

4.4. The Conversion of Prices and the Exchange Rate

Prices should have been converted into cruzados following basically the same rule that applied to wages. Relative prices under the cruzeiro, with respect to either a composite cost index or the wholesale price index, should have been averaged out over a predetermined period of time. In the example carried out by Modiano (1985b), where the inflationary process was purely inertial, average relative prices were computed

considering a time interval equal to the fixed periodicity of readjustments. In practice, however, major technical difficulties were involved.

As discussed in section 2, from April to July 1985 a partial price freeze was adopted by the Brazilian authorities. During this period key-prices, mainly public, were maintained at the levels observed by the end of March 1985. The freeze was abandoned when agricultural prices provoked a substantial inflationary shock in August 1985. However, key industrial prices were left lagging behind costs. In order to avoid a major inflationary rebound, the new economic administration, installed in September 1985, did not promote major price realignments. Instead, the frequency of price readjustments was increased. By the end of 1985, most private prices were corrected on a monthly basis. Past losses, for both private and public prices, were to be compensated gradually. For public prices, the situation was even more critical as these had constantly been used during the eighties as part of the anti-inflationary policy.

Under the prevailing conditions it seemed clear that some "right" prices could be well above the averages computed for one, two or even six months. As pointed by Modiano (1985b) disregarding such lags could create a "potential inflation" for the new currency. The technical difficulties involved were not easily overcome and prices, except for industrial electricity which were raised by 20%, were frozen at the consumer levels prevailing on February 27th, 1986. Inter-industry prices were

left to private negotiations. A technically fragile price freeze was to become the "fundamental piece" of the stabilization plan.

Rough estimates of the maxima price lags, and also of the price leads, with respect to the averages disregarding the above mentioned generalized pressures on the price index due to past repressed inflation, can be obtained with the help of expression (3). Using in (3) the actual average inflation rates for interval between successive readjustments, one obtains that prices lags could run from at most 6,7% in the case of monthly readjustments to as much as 45.1% in the case of six-month adjustments, that were limited by February 1986 to some public tariffs. It was thought that, in the absence of generalized pressures on the price index, relative price distortions could be corrected along the lifespan of the Plan by matching some price increases with other price decreases.

The Cruzado Plan also modified the Consumer Price Index (IPCA) that had been adopted in November 1985 as the official measure of inflation. The structure of the index, which measured the prices of a consumption basket for workers with income up to 30 minimum-wages, was not altered. Only the price basis was displaced to February 28th, 1986. The rationale for such a move was to avoid what has been called the "Alfonsin effect". Lopes (1986) has shown that with prices measured by daily or weekly averages, the IPCA would register an increase in the first month after the Plan even if prices remained stable all along. Roughly, approximately half of the February 1986 inflation, which amounted to 14.36%, would show up in the

index for March. This effect was first observed one month after the Argentinian Austral Plan was launched, in July 1985. For the Cruzado Plan such a statistical effect was thought unbearable as it would inappropriately fuel the trigger for the wage sliding scale. A second advantage of the displacement of the price basis of the CPI was that it opened space for major price adjustments prior to the freeze, with no harm to the "zero-inflation" target set for March 1986. Due to the technical difficulties discussed above and the political costs involved in backdating price increases in early March to February 28th, this opportunity was bypassed.

As mentioned in section 2, since March 1985 the exchange rate was being adjusted on a daily basis. After September 1985 the daily minidevaluations were preset to equalize the inflation rate of the past month. Under an inflation rate that ran at less 0.5% per day, it was reasonable to assume that peak and average real exchange rates coincided. Hence, the exchange rate was converted to cruzados at the level prevailing on February 27th, 1986 at the rate of 1,000 cruzeiros per cruzado. The comfortable external position of the Brazilian economy and the devaluation of the U.S. dollar, to which the cruzeiro was pegged, against European currencies and the Japanese yen in late 1985 and early 1986 seemed to eliminate the need for a maxidevaluation prior to the Plan. However, as flexibility was desired, the exchange rate was not frozen, but fixed for unlimited time. It was thought that this "semantic difference" would not associate an eventual devaluation with a rupture with the price freeze.

4.5. The Conversion of Rents

Before the Cruzado Plan, residential rents were readjusted based on 80% of past inflation every six or twelve months. The conversion to cruzados could use the same procedure adopted for wages. However, as with partial indexation, real rents tended to decline, a "forward-looking" rule was enforced. Peak-to-average ratios were computed for both six and twelve months readjustments based upon an inflation rate of 14.6% per month, which corresponds to 0.45% per day for 30.4 days. The general formula for computation of the peak-to-average ratios was:

$$r = \frac{1.146^M - 1}{M \times 0.146 \times 1.146^{M-1}}, \quad M = 6 \text{ or } 12$$

which results in 0.7307 for $M = 6$ and 0.5266 for $M = 12$. Before applying the peak-to-average ratios, residential rents were monetarily updated to February 28th, 1986 using the "present value factors" in Table 1, corresponding to the month of the last readjustment. This procedure assumed that all residential rents were paid at the last day of the month.

Commercial rents did not have such well defined periodicities for readjustments. Corrections were based on the variation of the ORTN, which was monetarily updated every first day of the month based on the rate of inflation of the previous month. Most commercial rent contracts were updated every three months by February 1986. However, monthly as well as yearly adjustment contracts also existed.

The procedure for converting commercial rents into cruzados followed exactly the same scheme adopted for wages. The average real ORTN for the duration of the contract, which could vary from one month to one year, was calculated and valued at February prices according to:

$$\overline{\text{ORTN}}(J,K) = \frac{1}{J} \left\{ \sum_{t=T-J+1}^{T-K-1} \text{ORTN}_{T-K-J} \prod_{i=t}^T (1+\hat{q}_{i+1}) + \sum_{t=T-K}^T \text{ORTN}_{T-K} \prod_{i=t}^T (1+\hat{q}_{i+1}) \right\}$$

$$J = 1,2,3,4,6 \text{ or } 12$$

$$K = 0,1,\dots, J-1$$

where J denotes the number of months between successive readjustments, K the number of months since the last readjustment as of February 1986 and T the month of February 1986. The symbol ORTN_t is the value of the ORTN in month t. As before \hat{q}_t denotes the monthly rate of inflation, which is zero, by definition, for March 1986. Dividing $\overline{\text{ORTN}}$ by ORTN_{T-K} one obtains the multiplicative coefficients that, when applied to the nominal values of February 1986, reproduced the average real commercial rents over an interval equal to the interval between readjustments. These are displayed in Table 5.

4.6. The Conversion of Future Contracts

Basically two types of contracts for future payments in cruzeiros existed in the Brazilian economy before the Cruzado Plan. The difference resided on whether interest rates were pre-or post set. Contracts with postset rates did not impose major problems for conversion into cruzados. With the suppression of monetary correction, the percentages contracted over and above

Table 5

CONVERSION COEFFICIENTS FOR COMMERCIAL RENTS

Month of Last Readjustment	Periodicity of Readjustments									
	12 Months	6 Months	4 Months	3 Months	2 Months	1 Month				
MAR/85	2.0099	-	-	-	-	-				
APR/85	1.8261	-	-	-	-	-				
MAY/85	1.6532	-	-	-	-	-				
JUN/85	1.4911	-	-	-	-	-				
JUL/85	1.3419	-	-	-	-	-				
AUG/85	1.2135	-	-	-	-	-				
SEP/85	1.1016	1.4148	-	-	-	-				
OCT/85	1.0006	1.2882	-	-	-	-				
NOV/85	0.9199	1.1816	1.2449	-	-	-				
DEC/85	0.8847	1.0764	1.1317	1.1576	-	-				
JAN/86	0.7376	0.9637	1.0092	1.0372	1.0718	-				
FEB/86	0.6530	0.8293	0.8734	0.8963	0.9340	1.0000				

monetary correction would become the nominal interest rates in cruzados. This has been the case for all contracts that lasted less than one year, as with the Cruzado Plan indexation was forbidden within such a time span. The only exception occurred savings-deposits, that remained indexed. An "insurance against inflation", to be credited quarterly, substituted the monthly monetary correction that prevailed before the Plan.

Preset contracts imposed a major difficulty as inflation accelerated from December 1985 to February 1986. In contrast to the Argentinian case, there existed in the Brazilian economy preset contracts that had been signed up to one year before the Plan. Clearly, contracts signed in the near past had already taken into account the rise in inflation rates, while older contracts still projected inflation rates of 10% per month. Hence, the elimination of the "inflationary expectation" imbedded in such contracts, in the style of the "Austral tablita", involved a greater degree of arbitrariness.

The Cruzado Plan preset the future devaluation of the cruzeiro at 0.45% per day, which corresponds to the daily average of the inflation rate between December 1985 and February 1986. Based on this devaluation rate, a table for daily conversion of future cruzeiros into cruzados was established for the following twelve months. Certainly the conversion table would promote a major redistribution of income between debtors and creditors. However, this would be no different from the redistribution of income that would result if the cruzeiro inflation rate had stabilized at 0.45% per day . The problem was that the new inertial

level was not yet deeply rooted . As pointed out in the beginning of this section, while the Cruzado Plan was technically designed for a stable inflation rate, it had from its birth to compromise with reality: it would only be politically desired when inflation accelerated.

4.7. Monetary and Fiscal Policies

The Cruzado Plan did not indicate any rules or targets for monetary and fiscal policy to complement the stabilization program. This did not mean, however, that demand policies were considered unimportant for a successful stabilization. On the contrary , the general belief was that contractionary policies, while impotent to deal with inflation rates of 200-400% per year feedback by widespread indexation, would regain vitality under one or two-digit annual inflation rates. Only the impact upon inflation expectations at the onset of the Plan was minimized. The flexibility to control aggregate demand by means of either expansionary or contractionary monetary and fiscal policies was desired, but left to the discernment of the economic authorities. As a matter of fact, as mentioned in section 4.3, the 20% sliding scale imposed an annual inflation limit that could be tolerated without further monetary or fiscal restraint. The triggering of the wage sliding scale would increase the risk of a widespread reindexation of the economy. The major difficulty would stem from the proper assessment of potential inflation, once the price freeze was lifted.

The decline in inflation rates would provoke an increase in the demand for real money balances. The implicit objective of monetary policy during the first months of the Plan was to accommodate such a spurt in money demand as this movement was viewed as non-inflationary. It would be the consequence of a portfolio shift towards the stable new money. The difficulty here was to evaluate when the process of natural remonetization had ended, and further monetary expansion would be deemed inflationary. Interest rates would signal excessive or insufficient monetization. Monitoring interest rates during the first months of the Plan would prove, however, a difficult task as several restrictions applied. Higher interest rates could negatively affect investment programs that were badly needed, as the rate of investment in the Brazilian economy had declined from 22.5% of GDP in 1980 to 16.3% of GDP in 1985. Also higher interest rates would increase the burden of the domestic public debt, that amounted to approximately 21.3% of GDP in December 1985. Lower interest rates, on the other hand, could stimulate speculation with inventories and foreign currency, what would work against the Plan.

In December 1985 the government announced a "fiscal package" that aimed at eliminating the operational public deficit projected for 1986. Withholding taxes on labor incomes were reduced for 1986, increasing net wages, in order to decrease the volume of tax refunds in 1987. The income tax refunds due in 1986 were divided in four annual instalments to reduce current cash pressures. The tax structure on capital incomes was changed to include taxes on nominal gains, that would be considerably

reduced with abrupt disinflation. As of that moment the Cruzado Plan was under discussion, but there was no clear sign that it would in fact be launched. Six-month income statements, which would only increase government revenue during the second half of 1986, were required from large enterprises. Measures were taken to reduce the "fiscal lag", or the inflationary erosion of government revenues. It was clear that some of the benefits of this "fiscal package", such as the taxation of capital nominal gains, would not survive the Cruzado Plan. Others, such as the shorter fiscal lags, would reduce the benefits normally associated with the process of disinflation. Also the "fiscal package" of December 1985 could not take into account the loss of the "inflation-tax" that would result from price stabilization after February 28th, 1986.

5. Conclusions

The purpose of this paper was to review the conceptual and the conjunctural framework of the Brazilian Cruzado Plan of February 28th, 1986. Success or failure of a stabilization program depends not only on a technically sound basis, but on the proper evaluation of the economy conditions prior to the Plan, on the compromise between theory and practice in its formulation, and on the "fine-tuning" scope and ability of economic policy during its implementation. The latter issue is analyzed by Dias-Carneiro (1987) in a companion paper in this same volume. Only the first two issues have been addressed here. The analysis of the results of the Cruzado Plan on its first months shows that proper and mistaken assessments and decisions have occurred on all three instances. As shown in section 2, part of the demand pressure that the Cruzado Plan has faced after a few months has been built up prior to its announcement. The "heterodox shock", that inspired the Cruzado Plan, theoretically described in section 3, was designed to deal with inertial inflation, but it was launched when inflation was moving to a new plateau and the inherent distributive conflicts were being resolved.

On its formulation the Cruzado Plan compromised with a fair and due income redistribution program that could however, put at risk, the stabilization target. Relative prices were frozen at levels that were not consistent with a longer-term equilibrium. Indexation was not fully abolished. On the contrary, the introduction of the sliding scale for wage adjustments represented a high-risk factor, as reindexation would not be

be avoided once wage adjustments started to be triggered without a fixed periodicity. It was thought, however, that deviations in assessment, formulation, and execution could be corrected during the time span of the Plan. But the same political constraints that helped launching the Cruzado Plan in February 28th, 1986 remained active, restricting the action of economic policy. The political fears of a recession and of the wage sliding scale, that were very present in the discussions that preceded the Plan in the second-half of 1985, dominated during the first ten months after the Plan.

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