ESSAYS ON BRAZILIAN STABILIZATION PROGRAMS

by

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I dedicate the thesis to Suzi.
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Abstract

Five heterodox stabilization programs were launched in Brazil in the short period 1986 to 1991. All of them failed in eliminating the chronic inflation that has characterized Brazilian economy since the late sixties. Although the persistence of public sector deficits stands for the major explanation for the recurrent failures, the presence of widespread indexing in labor and assets' markets poses policy problems whose solution affects the performance of the stabilization program.

The essays are preceded by an Introduction mapping out the policy issues that form the subject of the thesis. Financial indexation is discussed first. In reviewing the debate on the
monetary correction equal to inflation rule, the Introduction
draws attention to the positive effect of inflation on the
demand for indexed bonds. The rapid reduction of inflation
provoked by heterodox stabilization programs is accompanied by
wealth portfolio shifts that increase aggregate demand. The
existing domestic debt stock would only be held by the public
at reasonable real interest rates under high inflation. A
brief description of the policies adopted to deal with the
"debt overhang" problem over the several stabilization
programs is provided.

Wage indexation is discussed next. In chronic inflation,
there is no synchronization of contracts, which leads to the
problem of adequately on-going contracts adopted by Brazilian
stabilization programs. Although neutrality was held to be
exact only for purely inertial inflation, it worked in
Brazilian stabilization programs as the default solution for
indexed contracts' conversion. The Introduction also describes
after-program wage indexation in Brazilian stabilization
programs. None of stabilization programs succeeded in
eliminating legal indexation at the flexibilization stage. It
is argued that although indexation in a broad sense is
endogenous, the framing of indexing laws matters to the
nominal dynamics of prices and wages.

The first essay, "Heterodox Programs and Inflation Rate
Uncertainty" interprets the effect of inflation on the demand
for indexed bonds based on inflation rate uncertainty. It
addresses the purely inertial inflation case in which the neutrality criterion to base wage realignment was supposed to be exact. The major result is that heterodox programs are expansionary but violate the external constraint if not accompanied by a reduction in the domestic debt stock. The inertial paradigm overstates the wage problem and understates the fiscal problem. The increase in steady state real wages caused by stabilization makes the neutrality criterion unnecessary but budget balance suffices only at the right domestic debt stock. The design of Brazilian heterodox programs does not pass the test of consistency in that they combined a neutrality handling of real wages with the attempt to eliminate the domestic debt overhang.

The second essay, "The Analytics of the Collor 1 Monetary Reform" discusses the compulsory lengthening of the maturity of financial assets carried out by the Collor 1 program. It was the most radical attempt to deal with the domestic debt overhang problem in Brazilian stabilization experience. The Monetary Reform was construed to confine the capital levy to net financial wealth, the latter being defined as the stock of financial wealth minus contractual liabilities incurred before the launching of the stabilization program. The Monetary Reform established a double currency standard by allowing blocked funds (cruzados) to settle these contractual obligations. The essay shows how the double standard worked. It addresses many issues on the Monetary Reform such as the
predictability of aggregate blockage targets, the Central Bank cruzado discount window, the effect of secondary markets for cruzados and the difference between the Treasury deficit and borrowing requirements in the new currency.

The third essay, "Fixed Length and Trigger Wage Indexation in Disinflation" compares different forms of wage indexation. It shows that the identification of wage indexation to inflation inertia is not correct in general. Inertia derives from fixed length indexation. Trigger schemes in which the timing of nominal wage increases is inflation contingent work like perfect indexing because in both schemes contractionary monetary policy does not cause output losses. For myopic policy making, fixed length indexing gives the wrong incentive on how to alter existing indexing laws. The comparison between indexing schemes is then extended to the flexibilization stage of heterodox stabilization programs. The problem is to find out the indexing scheme that minimizes short run inflation. The answer is shown to depend on the discrepancy between initial and steady state wages. The result suggests that the indexing choices of Brazilian stabilization programs were not always appropriate.
Thesis Introduction.

Restoring political liberties made Brazilian society less tolerant to inflation. Democratization came in 1985. Five stabilization programs took place since then: the Cruzado Plan of February 1986, the Bresser Plan of July 1987, the Summer Plan of January 1989, the Collor 1 Plan of March 1990 and the Collor 2 Plan of January 1991. None of the stabilization programs was successful. In all cases, inflation resumed after the lifting of price controls.

All the stabilization programs shared the same view of Brazilian inflation. Besides budget imbalance and the lack of non-inflationary sources of finance, Brazilian inflation reflected to a substantial extent the inertia caused by the economy-wide compulsory, backward looking indexation in staggered contracts. The inertial component differentiated Brazilian inflation from both the low, one digit inflation rate driven by excess demand or supply shocks and the extreme rates of open hyperinflation in which the adjustment intervals of contracts are but a span while a foreign currency becomes the standard of value and a current mean of payments. Because the equilibrium inflation rate imposed by seigniorage was
lower than the inflation rate dictated by inertia, incomes policy was called forth to complement tight fiscal policy in rapid disinflation.

Heterodox and orthodox programs are not opposite. Tight fiscal and monetary policies characterize both. The difference lies in incomes policy that coordinates price settling decision making. In heterodox stabilization, price and wage controls are complementary to the adjustment in fundamentals. Apart from relative prices realignment, controls work as a mechanism to buy time while authorities take appropriate measures to equilibrate the budget. By granting popular support to the stabilization package, price freezes strengthen the legitimacy of authorities in overcoming resistance to budget cuts and taxation.¹

The rationing of external finance imposed by the debt crisis of 1982 molded the design of heterodox stabilization programs in Brazil. Large external transfers to foreign creditors took place through the large trade surpluses that followed exchange rate devaluations. External debt became largely government debt as a large variety of fiscal incentives allowed private debtors to transfer to government the exchange risk. The persistence of budget deficits imposed a shift from external to domestic finance. Because of the debt crisis, inflation accelerated substantially side by side with

¹ See Dornbusch and Simonsen, 1991.
the growth of domestic debt.²

The external constraint imposed an additional strain on stabilization programs. Fixed exchange rate regimes could not rely on a sound external position. The Cruzado and Summer programs did not suspend external transfers. In both cases a moratorium was later declared with reserves depleted and the fixed exchange rate regime abandoned. The Bresser and the two Collor Plans took place under the shelter of the moratoriums of precedent stabilization programs.

The explanation for the recursive failure of Brazilian stabilization programs is complex. The three essays of the dissertation focus, at a high level of abstraction, on some aspects of the design of Brazilian programs. They fall short of an evaluation of recent experience. Major problems of implementation of stabilization programs are left aside and the coverage of design issues is selective.

The thesis introduction is organized as follows. Section I points briefly to some aspects of stabilization programs not discussed in the essays. Sections II and III focus on design issues that form the subject of the essays.

I. Fiscal and monetary policy and the setting of the nominal anchor.

Among the several aspects of Brazilian programs not discussed in this thesis, three deserve special attention. The first is the effect of fiscal stabilization. The second is the setting of monetary policy. The third is the role of nominal anchors.

After a hyperinflation, there is no alternative but to stabilize. It matters little whether the attainment of fiscal targets provokes a recession or not. The trauma of hyperinflation creates the willingness to adjust; the political power of interest groups yields to common interest. The situation is different for chronic inflation processes. COLA provisions and sophisticated financial markets impede inflation from disrupting the web of contracts that form the basis of economic life. Going back to the inflation status quo is a feasible fall back position if the attainment of fiscal targets is too costly. In chronic inflation, the design of stabilization programs has to address the issue of how to create the political consensus on fiscal reforms.

All Brazilian programs held fiscal equilibrium to be vital.\(^3\) They differed, however, on the expected effect of

\(^3\) The concept of fiscal equilibrium varied considerably among the several stabilization programs. The Cruzado Plan defined fiscal equilibrium as a situation in which the rate of
stabilization. The Cruzado program was conceived under the assumption that the replacement of inflation tax by ordinary sources of taxation would not change aggregate demand. Stabilization was expected to be neutral. Subsequent programs in contrast held that tight fiscal policy would of necessity entail a recession.

The way fiscal targets were presented to society also differed. The Cruzado Plan did not lay stress on fiscal imbalances because authorities took for granted that the popular support for the stabilization program was sufficient to implement a tough fiscal stance over time. In contrast, subsequent programs openly emphasized the need to bring budget under control. High sacrifice ratios were said to be unavoidable. The after-Cruzado prevalent view was that stabilization ought to be costly to last. The alleged reason was that policy makers seeking for votes tend to favor public expenditure and tax cuts. If disinflation is not costly, policy makers would quickly inflate again.

Both strategies failed. In the midst of the democratic political opening that elicited strong pressures toward

growth of domestic debt net of seigniorage was equal to the rate of growth of GDP. Statistical series of government total and domestic indebtedness in real terms were constructed to meet the definition requirements. The Bresser Plan defined fiscal equilibrium as zero operational deficit net of external transfers. The operational deficit in turn was defined by the nominal Treasury deficit minus monetary correction on the stock of domestic debt. The Summer Plan used the zero operational deficit including external transfers. The Collor 1 Plan emphasized the Treasury cash flow. The aim was to have zero nominal cash deficit.
reactivating and improving income distribution, the lack of open emphasis on fiscal imbalances was a good excuse for putting fiscal austerity aside in the Cruzado program. For subsequent programs, the costs entailed by tight fiscal policy were apparent but the benefits seemed distant. The persistence of fiscal imbalances was the decisive factor explaining the failure of the several programs. ⁴

On reflection, Brazilian programs may have been wrong on the effect of stabilization and the way to present tight fiscal policy to society. On the one hand, replacing the inflation tax by ordinary taxation and/or budget cuts and reducing external transfers tends to stimulate economic activity. ⁵ Stabilization is also likely to be expansionary because investment decisions are inhibited by the high relative price volatility of chronic inflation processes. We derive in the first essay another result on the expansionary effect of stabilization.

On the other hand, the expansionary effect of stabilization makes inflation a negative sum game. The rhetoric of high sacrifice ratios adopted by after-Cruzado programs inhibited the formation of a stable political coalition supporting

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⁴ Budget deficits were never eliminated in Brazilian experience. Equilibrium was obtained only by excluding external transfers. Even though external debt was largely government debt, the unilateral moratoria of late 1980s were of little help to fiscal adjustment in intertemporal perspective because they were not lasting solutions to the external constraint.

⁵ See Dornbusch, Sturzenegger and Wolf, 1990.
stabilization. In chronic inflation settings, the creation of political consensus on fiscal reform can hardly be obtained by an ill-balanced emphasis on the costs of fiscal adjustment. The appropriate political argument is that the policy makers supporting tough fiscal stance would politically benefit from stabilization instead of suffering from it.

Another major aspect of the design of stabilization programs not discussed in the essays is the accomplishment of tight monetary policy. With the exceptions of the Cruzado and Collor I programs, the design of stabilization programs paid little attention to channels of money and private credit creation. The identification of tight monetary policy to high interest rates was frequent. Yet monetary accommodation in many cases took place notwithstanding the high real interest rates. In the Summer program, for instance, abnormally high ex-ante and ex-post real rates applied to passbook savings deposits by government fiat. Similar rates applied to bank reserves, though. Since banks transferred passbook savings deposits to the Central Bank at a small profit, monetary accommodation took place by the return of seigniorage to the public. Monochromatic focus on the Treasury deficit impeded policy makers to include into the picture the quasi-fiscal deficit that arises from credit and exchange operations of the Central Bank as well as seigniorage sharing by the banking system.

The Brazilian stabilization programs failed in setting an
appropriate institutional framework for monetary policy. Banco do Brazil, the largest individual commercial bank, is state owned. The Cruzado Plan cut the link between Banco do Brazil and the Central Bank that had allowed Banco do Brazil to borrow freely (i.e., without monetary correction) Central Bank reserves in unlimited amounts. Since Banco do Brazil responded alone for more than 40% of overall banking credit and was traditionally controlled by politicians, the conta movimento link posed a major obstacle to stabilization. A second crucial link of monetary expansion, however, remained. By law, Treasury accounts are held at Banco do Brazil. Since the Central Bank cannot intervene in Banco do Brazil, any Treasury deficit has automatic finance by Banco do Brazil borrowing from the public. This second link persists to this day.\(^6\)

A third aspect of the design of stabilization programs not dealt with in the essays is the setting of the nominal anchor. The basic scheme of heterodox programs encompasses two stages.

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\(^6\) Three other major issues of monetary control deserve mention. First, Central Bank repurchasing government bonds on demand by financial institutions at face value leads to accommodating money demand changes. Second, the presence of multiple compulsory requirements makes velocity multipliers unstable when the demand composition among different financial assets changes. For reasons apparent below, unstable multipliers were the rule during stabilization programs because of the large drawings on passbook savings. Third, state banks and savings and loans institutions have been a factor of forced money expansion in election years. The dependence of Federal government on representatives loyal to their origin states posed a political difficulty in stopping over borrowing from Central Bank discount window.
To the initial price freeze it should follow a second stage with the gradual lifting of controls. During the so-called flexibilization stage, holding constant the nominal anchor is crucial to the success of the program.\textsuperscript{7}

In all stabilization programs, the commitment to stand behind the nominal anchor was at best weak. Both the Cruzado and the Summer programs had the fixed exchange rate as the nominal anchor. The capacity of Central Bank to resist speculative waves, however, was made doubtful by not suspending external transfers. The Bresser and Collor 2 programs in turn had no nominal anchors because they gave priority to the realignment of relative prices. Holding constant the nominal exchange rate was thought to entail a real appreciation authorities could not afford. The Collor 1 program stands alone in choosing a monetary anchor and allowing the exchange rate to float. Yet monetary targets were constantly revised through changes in the monitored monetary aggregate. In all cases all possible nominal anchors were released abruptly when the program entered into the flexibilization stage. Poor understanding of the role of nominal anchors in flexibilization has characterized the design of all stabilization programs in Brazil.

\textsuperscript{7} Kigel and Liviatan, 1991, argue that the repeated use of price controls undermined the credibility in conventional anchors and hence that the initial phase of controls must be deleted. In the political economy cycles, the high inflation status quo is also hardly sustainable as agents realize the distortions provoked by inflation and urge policy makers to launch stabilization programs.
The accomplishment of tight fiscal and monetary policies and the setting of nominal anchors do not exhaust the common core of issues faced by stabilization programs in Brazil. The next two sections focus on two other design issues that form the subject of the thesis. The first is the offsetting measures required by the decline in the demand of indexed bonds induced by lower inflation rates. The second is the wage indexation scheme more conducive to stabilization. To put these issues in proper perspective, some comments on financial and wage indexation seem appropriate.
II. Financial indexation.

Indexation was introduced in Brazil in the mid-sixties stabilization program to maintain the real value of tax collection. By early 1970s, escalator clauses were already in place for taxes, wages, domestic debt and private bonds, time deposits, compulsory savings deposits, rents and controlled prices such as utilities and the exchange rate. In financial markets the presence of indexed bonds increased over time. As inflation accelerated along the 1970s and 1980s, financial adaptation enhanced the role of indexed bonds. In the high and volatile inflation rate environment of late 1980s, the non-indexed share of wealth was residual. The maturity of indexed bonds shortened and overnight deposits reflected daily estimates of inflation. Holding of zero-interest money became almost unnecessary as interest-bearing deposits were available even to small investors.

An important aspect of Brazilian institutional set-up is the passbook savings-housing system. The nominal yield of passbook savings is fixed by law at monetary correction plus 0.5% per month or approximately 6.17% per year. The yield is invariant to scale and tax exempted. Deposits are insured by government. There are no minimum deposit requirements. Cashing is possible anytime. The accrual of monetary correction plus interest, however, occurs only at maturity. As inflation increased, the maturity of passbook savings shortened from six
to one month. The passbook savings yield established the floor yield for all financial assets of comparable maturity.

Passbook savings deposits provide the funding for long term housing and mortgage loans. The bulk of housing and mortgage loans have 12 years maturity. The loan rate is also set by law as monetary correction plus a maximum interest rate of 12% per year. The fraction of passbook savings deposits that financial intermediaries may allocate to other uses is small. Banking regulation imposed the opening of passbook savings accounts at the will of wealth holders but savings deposits exceeding the compulsory long term lending may be transferred to Central Bank at a small profit. As a consequence, the supply curve of passbook savings as an indexed bond was unlimited at the regulated yield.

Another important aspect of financial indexation in Brazil is that the monetary correction index was discretionary until

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8 The assets-liabilities management in the housing system set-up was nonetheless a thorny problem for financial intermediaries. When market real rates increased financial intermediaries could hardly find elsewhere the low cost funding required to sustain long term housing and mortgage loans. With few exceptions, among which the Collor 1 program described in the second essay, the discount window facility in which financial intermediaries could borrow at pass book saving rate was discretionary. Without this institutional set-up, however, it may be conjectured that long term lending would have disappeared over the high inflation period of the 1980s.

9 Passbook savings' deposits are not indexed bonds in that they are not transferable and do not qualify as collateral to financial transactions. We treat them alike in the thesis because we do not need to describe Brazilian financial system in detail.
the Cruzado Plan. In Brazilian policy circles there was no shortage of arguments against financial indexation.\textsuperscript{10} They motivated several policy episodes when the monetary correction index lagged behind inflation.\textsuperscript{11} Over time, however, a policy consensus on abiding to the monetary correction equal to inflation rule emerged. The rule was adopted during most of the non-freeze period in the 1980s. Financial adaptations rendered the rule reasonably effective even in sharp inflation rate acceleration of late 1980s.\textsuperscript{12}

\textsuperscript{10} The presence of indexed bonds was held to be inflationary by (i) undermining the seigniorage base by creating very close money substitutes, (ii) depriving aggregate demand from a stabilization mechanism as an increase in the price level would not reduce the value of private financial wealth and (iii) stimulating wage indexation as workers would not consent in leaving indexation confined to financial wealth.

\textsuperscript{11} The most important were: (i) the Delfim Netto "political" calculation of inflation in 1972 that limited monetary correction below real inflation; (ii) Simonsen's coupling to indexation of clauses allowing substantial discounts for supply shocks in late seventies known as "clausulas de acidentalidade"; (iii) Delfim Netto's preannounced monetary correction and exchange rate policy to induce disinflation in 1980 and (iv) Funaro's surprise change in the reference price index to impose a capital levy on holders of government domestic debt in 1985.

\textsuperscript{12} With inflation rate acceleration, official inflation lags behind on-going inflation because of data processing time and the use of arithmetic averages in calculating price indexes. The list of financial innovations was vast. Central Bank offered early redemption of government bonds on demand at face value. Effective maturity was shortened to daily Central Bank trading operations. Changes in banking regulation ensured the maturity shortening of other financial assets as well. The frequency of nominal adjustments of indexed bonds was not allowed to remain, at any time, second to that of alternative stores of value. More frequent price data collection also took place. During the inflation rate acceleration of 1989, Central Bank adjusted overnight interest rates to daily official
The policy consensus on the monetary correction equal inflation rule derived from three factors. The first is the rigidity created by the passbook savings institutional set-up. In principle, it is possible to offset the expected difference between monetary correction and inflation through larger coupon rates for passbook savings. The upward revision of the coupon rate, however, creates a major imbalance for financial intermediary. For although passbook savings deposits provide the funding for housing and mortgage loans, the rate of interest that applies to the latter is not legally tied to the former. Raising the legal interest rate on passbook savings deposits does not alter the rate on housing loans.\footnote{13} Because of the upward rigidity of the legal rate, monetary correction ceilings depressed the real rate of return on passbook savings.\footnote{14} The problem is aggravated by the fact that passbook savings yield is the lowest indexed bond yield. The inflation plus a daily estimate of inflation rate acceleration.

\footnote{13} Suppose inflation is 10% per month. By the equality rule, passbook savings yield would be 10,55% while the nominal interest charged on housing loans at the maximum rate of 12% per year would be 11,044%. With monetary correction set at 9%, the cost of housing loans falls to 10,034%. To keep unaltered the real rate of return on passbook savings deposits government has to increase the legal interest rate from 0,5% to 1,422%. With a capital leverage ratio of 10, say, losses amount to 4,22% of own capital without taking into account the costs of running the passbook savings/housing system and credit risks.

\footnote{14} A side effect contributing to the expansionary impact of ceilings on monetary correction was the positive wealth effect on mortgage and housing debts.
substitution of certificates of deposits for passbook savings also creates an imbalance for financial intermediaries because the former has a higher cost.

The rigidity created by the passbook savings-housing institutional set-up posed unsurpassable obstacles to policies setting monetary correction below inflation. To impede large portfolio shifts towards real assets, the coupon rate of interest on other indexed bonds had to increase to attract holders of passbook savings deposits. The risk was the bankruptcy of financial intermediaries. To avoid bankruptcies, Central Bank had in turn to guarantee financial intermediaries the access to a discount window at a cost comparable to passbook savings yield, thus accommodating the demand shift. In practice, the outcome of all policy episodes in which monetary correction lagged behind inflation was the same. The official rationale given to the monetary correction ceiling varied but wealth holders responded invariably by shifting portfolios towards real goods and assets.\textsuperscript{15} The result was an increase in inflation rates and the subsequent abandonment of the discretionary handling of monetary correction.

The second factor that weighted in favor of the equality rule was the cost of debt. Because of some characteristics of Brazilian monetary set-up, the effect of monetary correction

\textsuperscript{15} The destabilizing effects of portfolio shifts were larger after the debt crisis. The reason is that the replacement of external finance by internal finance mentioned above magnified the size of domestic debt stock.
ceilings on the existing stock of indexed debt was small.\textsuperscript{16} The cost of new debt, however, increased as investors demanded high risk premiums to hold partially indexed debt under volatile inflation rates.

The third factor came from the observation of markets. The demand for indexed bonds increased with inflation for the same real rate of interest. The dependence came out clearly for passbook savings deposits. With the monetary correction equal to inflation rule, the real yield of passbook savings was fixed. Demand, however, increased with inflation. The impact of inflation was stronger in the eighties when inflation was higher and more volatile than in the seventies. It worked like a stabilizing or absorption effect because the rise in the demand for financial indexed assets that followed a higher inflation rate depressed the demand for real assets.

The absorption effect provides an important element to explain the almost complete absence of open hyperinflation episodes in almost three decades long inflation process.

\textsuperscript{16} In the Brazilian monetary set up that prevailed until the Cruzado program, financial institutions borrowed from the public overnight funds and bought long term indexed government bonds that worked as collateral to overnight loans. Compounded overnight rates were expected to follow official monthly inflation. Imposing a ceiling on monetary correction created major imbalances for financial intermediaries as leverage ratios for government debt were very high. Central Bank perception of the social cost of financial bankruptcies frequently led to accommodative policies repurchasing indexed bonds when financial intermediaries were to face major losses. The Cruzado program altered this monetary set-up. Government bonds that serve as collateral to overnight operations are indexed to overnight rates which in turn reflects inflation.
Before the Cruzado Plan, inflationary jumps took place in several occasions caused by supply shocks such as increases in oil prices, real exchange rate devaluations or compulsory shortening of wage indexing lags. In an environment characterized by accommodative monetary policy, endogenous public sector deficits, distributive conflicts and indexed contracts, the inflation rate jump could precipitate a hyperinflation through the flight from financial assets. Yet in every case the absorption effect diminished aggregate demand and the sharp inflation rate increase following the supply shock failed to ignite explosive price behavior.

The absorption effect was not the only mechanism to depress aggregate demand. Inflation was also moderated by the real wage decline caused by higher inflation rates under fixed length, backward looking COLA provisions. Indexation worked differently therefore in assets and labor markets. The shorter the indexing lags, the stronger the absorption effect in assets markets becomes but the real wage decline for a given jump in inflation rate is smaller.

The absorption effect was also present in the aftermath of stabilization programs. Poor planning on how to unfreeze and deal with political pressures to overextend price controls were the rule. With the exception of the Bresser program, more concerned with relative price alignment than with price stability, the lifting of price controls was accompanied by the fear of hyperinflation. On top of the relative price
disequilibria dammed up during the freeze period, the abrupt release of all controls and the absence of nominal anchors prepared the ground for sharp inflation rate increases. Monetary accommodation was inevitable as the failure of the stabilization program weakened the political support for tight money policies. Inflation rate acceleration was aggravated by defensive price behavior as every individual price settler became uncertain about the extent of others price increases.

In this circumstance, the absorption effect was vital in avoiding hyperinflation. In all stabilization programs, financial indexation was restored as soon as inflation resumed and the monetary correction equal to inflation rule followed strictly. The way in which reinstatement occurred, however, varied. For the Cruzado and Bresser programs reinstatement was automatic because they included indexing provisions effective if after-program inflation was positive. The equality between monetary correction and inflation was ensured by the set of laws that accompanied the stabilization programs. The Summer Plan in turn was the only program to prohibit financial indexation. For the first time in Brazilian almost three decades long inflation process monetary correction was suppressed. The failure of the program, however, left no alternative to authorities but to create a new index and resume indexation as before. The Collor 1 program did not eliminate financial indexation but kept the index of monetary correction at zero for a few months following the price
freeze. The objective was to impose a capital levy on blocked funds that were indexed by law. The discretionary handling of monetary correction ended at the flexibilization stage.

The aftermath of the Collor 2 program provides a seemingly distinct case. First, a fixed nominal interest rate given by the average cost of inter-bank loans replaced the monetary correction index. The so-called TRD is announced in the beginning of the month and holds constant for the entire month. Second, the lifting of price controls did not pose as in previous cases a hyperinflation risk because the compliance with the price freeze, announced with euphemism as a truce was only partial. The hyperinflation risk came from the beginning of the gradual restitution of funds blocked by the Collor 1 program. Hyperinflation could be ignited by if traumatized holders of blocked currency hastened to buy real goods and assets.

The solution found by authorities, however, conformed to the previous analysis. By open market operations, Central Bank ensured that the TRD would always exceed inflation rate expectations by a large safety margin. It established in practice a super monetary correction as the TRD proved on

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17 Indexation to TRD is pro-rated daily. The basis for calculation is the monthly equivalent of the daily interest rate on inter-bank loans. At first, the TRD was calculated by an average of six daily interest rates -- the last three days of the preceding month and the first three days of the current month. To minimize the risk of underestimating current inflation, however, the collection period shifted later to the first six days of the current month.
average to be larger than inflation ex-ante and ex-post.18 Together with real wage compression, the absorption effect reinforced by setting the TRD substantially above inflation sufficed to prevent hyperinflation.

The reinstatement of financial indexation at the aftermath of stabilization programs did not impede capital losses. As a rule, the real value of domestic debt stock declined with every stabilization program.19 Yet in all cases, the absorption effect worked in the aftermath of stabilization

18 The inflation rate that served for the calculation of COLA provisions was the reference floor for the TRD. In case ex-post inflation is larger than the TRD established at the beginning of the month, the gap is compensated over the next month. Another example of super monetary correction happened in the short Dornelles administration right after the democratic opening. Monetary correction was referred to inflation in period t-1. When a temporary price control was enforced on public tariffs, inflation declined and monetary correction exceeded by a large margin current inflation. The Dornelles rule was abandoned when the public sector price control was lifted.

19 Because of the methodology for calculating the inflation rate, after program recorded inflation rates overestimates the inflation that obtains under the price freeze. The carry over or residual inflation effect derives from inflation rate acceleration before the launching of the stabilization program. Immediate adjustment of monetary correction to on-going inflation is a disguised capital levy. Another form of capital levy comes from the practice of avoiding monetary correction overshooting. When the equality between monetary correction and inflation is restored, monetary correction follows current inflation without allowing for inflation that took place while monetary correction was suppressed. A third form of capital levy hitting blocked funds took place with the Collor 1 program discussed in the second essay. The net effect of stabilization programs on domestic debt stock depends of course on the interest rate that applies after the launching of the program. With the possible exception of the Summer program, the net effect of stabilization programs was to reduce domestic debt.
programs as it had worked in face of supply shocks. Coupled with the real wage decline, the absorption effect imposed a temporary ceiling to the inflation rate acceleration that took place at the collapse of price controls.\(^{20}\)

The absorption effect was never given a satisfactory rationale in Brazilian policy circles. Drawings on passbook savings when monetary correction lagged behind inflation offered no reason for surprise as the real yield decreased. In contrast, the inflow of deposits for the same real yield when inflation rose was of difficult understanding. Monetary correction was viewed as a "veil" that could not possibly interfere with real equilibrium values. Rational behavior was thought to rule out demand sensitivity to nominal variables. Monetary illusion was the default explanation.

Evidence of the inflation effect on the demand for indexed bonds preoccupied authorities in charge of the design of stabilization programs. The decision to reinstate financial indexation in case the program failed was easy because the absorption effect would then work to hold inflation. The problem was the reverse situation. The rapid disinflation

\(^{20}\) The existence of a temporarily stable inflation plateau after price decontrol gave frequently political momentum to gradualist anti-inflation policies dispensing with price controls and relying on loosely defined tight fiscal and monetary policies enjoy popular appeal. Gradualist thinking in Brazil views the fixing of nominal anchors as artificial and describes stabilization programs as against free markets. Support for benevolent anti-inflation policies ceases when inflation resumes its acceleration pattern. Gradualist policies were the rule before the series of stabilization programs and between any given two programs.
following the imposition of price controls depresses the demand for indexed bonds. Aggregate demand expands by portfolio shifts and poses a pressure towards raising the price level.

The several stabilization programs addressed in different ways the problem created by the reverse absorption effect. It is useful to review briefly the different strategies adopted.

The Cruzado Plan opted to keep passbook savings indexed. All the other financial assets had indexation clauses suspended for one year. Passbook savings deposits, however, were exempted from the monetary correction temporary halt. Because the coupon rate was fixed by law, the reverse absorption effect could not be compensated through higher interest rates. The risk averse profile of holders of passbook savings deposits also persuaded authorities to give a special indexation status to passbook savings.

Adverse portfolio shifts and in particular large drawings on passbook savings, however, took place at the very outset of the Cruzado program. Adverse portfolio shifts were one of the main factors provoking excess demand in goods and assets markets at frozen prices. The debate on the reasons accounting for the decline in the demand for financial assets molded subsequent stabilization programs.

On the one hand, the Cruzado strategy to deal with the reverse absorption effect did not work because it was ill-implemented. A political ceiling on nominal interest rates
impeded the Central Bank from offsetting the decline in the demand for non-indexed bonds. In addition, official price indexes underestimated on-going inflation because they reflected just frozen prices. On the other hand, the magnitude of the change in desired portfolios was such that authorities in charge of subsequent programs shared a view that the adverse portfolio shifts would have taken place even if political interferences had not existed. The nominal interest rates required to offset the reverse absorption effect had to be much higher than the figures targeted during the Cruzado program.

The next two programs, the Bresser and the Summer, adopted a different strategy. They both altered the legal yield formula of passbook savings to discretionary nominal rates set by government fiat. Of the two programs, the Summer Plan stands for the boldest attempt to counteract the reverse absorption effect through high interest rates. The Bresser Plan was essentially concerned with relative price alignment. It did not enforce price controls severely and maintained the crawling peg regime for exchange rate and public sector tariffs. In contrast, the Summer Plan was designed as the "right" Cruzado program, that is, a full scale stabilization program to be carried out without political interference.

The Summer Plan kept initial interest rates at massive real levels. Inflation rate before the program was around 25% per month; the interest rate that applied to passbook savings
after the launching of a strictly enforced price freeze was set at 20% per month. Banks transferred idle passbook savings deposits to the Central Bank and the Treasury borne the cost given by the difference between the yield on passbook savings and long run housing loans. Rates of interest on other private debt instruments such as banking certificates of deposits were higher than those that applied to passbook savings.

The massive interest rate policy of the Summer Plan was effective in preventing portfolio shifts during the first two months of the program. The impact of the high ex-post rates on the budget, however, was devastating. Since the price freeze was enforced fiercely, the nominal rates of interest paid on government debt were also real. After the initial two months, the anticipation of a decline in nominal rates coupled with the very short maturity of debt instruments triggered again the same portfolio shifts observed during the Cruzado experience. As before, the generalized excess demand state undermined the price freeze.

In Brazilian policy circles, two interpretations were offered for the portfolio shifts in the Cruzado and Summer programs. The first relies on fiscal adjustment credibility.

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21 Because monetary correction was extinguished, monetary correction clauses were zeroed. The nominal cost of housing contracts was thus 12% per year or 0.949% per month. The resulting gap between passbook savings and housing loans in the first month of the program was 19.51%. It applied over the entire stock of housing loans.
It is not possible to move instantly to zero deficit. The credibility on the commitment to fiscal adjustment demands time to build up. As mentioned above, in all stabilization programs fiscal adjustment proved to be more difficult than had been anticipated by authorities. Without confidence on the sustenance of fiscal adjustment, inflationary expectations set in. Only very high ex-ante real interest rates could deter the flight to real goods and assets and even so if the debt burden they entail was deemed reasonable.

The other explanation lay stress on the absorption effect. The existing domestic debt would only be willingly held at reasonable real interest rates under high inflation. From the stabilization viewpoint, there was a domestic debt "overhang" problem.\textsuperscript{22}

The explanations are not contradictory. Lack of credibility on fundamentals may exacerbate the impact of low inflation on the demand for indexed bonds. As presented in Brazilian policy circles, neither explanation was fully satisfactory. On the

\textsuperscript{22} It is worth noting in this connection that the domestic debt overhang was frequently referred to in Brazilian policy debates in two different senses. The first describes a situation in which the real interest burden exceeds the maximum primary surplus that is feasible politically. Keynes, 1971, defended a capital levy to remedy debt overhang in this first sense. The second sense refers to a situation in which the domestic debt stock may only be held at reasonable interest rates under high inflation. This second sense can only emerge in indexed economies -- Keynes' analysis was restricted to non-indexed government debt. We use the concept of debt overhang in the essays below solely in this second sense. It may be argued that in Brazilian experience debt overhang was present in both senses.
one hand, there was no sound economic rationale for the observed dependence of indexed bonds on inflation rates. On the other hand, credibility seemed elusive. Taken as a broad measure of the public support and probability success as estimated by opinion-makers, credibility varied considerably across programs and at different moments of any given stabilization program. Lack of credibility on fiscal adjustment was certainly important in explaining portfolio shifts for the Bresser and Summer programs. In contrast, the Cruzado Plan in its initial phases provides a clear cut case of program with high credibility. Adverse portfolio shifts took nonetheless place since the very beginning of the Cruzado Plan.

It will be argued in the second essay that conditions for basic fiscal reform were favorable in the Collor 1 program. The evidence of the effect of inflation on indexed bonds demand, however, was decisive in convincing authorities that drastic measures were necessary. Instead of keeping indexation as the Cruzado or simulating the effect of inflation through nominal interest rates as the Summer Plan, the Collor 1 Plan enforced a compulsory lengthening of the maturity of financial assets coupled with a capital levy on domestic debt. To accomplish the compulsory lengthening discussed in the second essay a Monetary Reform blocked a substantial fraction of financial wealth in the old currency. Conversions into the new currency took place according to a restitution calendar with
an average period of two years. Since monetary correction was set below inflation, a disguised capital levy took place. The stock of domestic debt at the end of the restitution calendar was substantially smaller than before the launching of the stabilization program.
III. Wage indexation.

Fixed periodicity indexation with 100% plus COLA provisions characterized the setting of nominal wages in Brazil since late sixties. In contrast to the zigzags regarding financial indexation, a consensus on the so-called sawtooth model of wage indexation emerged in Brazilian policy circles well before the series of stabilization programs. In the sawtooth model, average real wages depend on (i) exogenous beginning of period or base wages, (ii) the length of the interval between wage adjustments and (iii) the rate of inflation over the indexing interval. Base period wages were interpreted as workers desired real wage. Interval adjustments were given by indexing laws. Equilibrium real wages could not possibly depend on the length of the interval or base wages. As a consequence, the shorter the indexing length or the higher base wages, the larger the equilibrium inflation rate associated with given real wages.  

The sawtooth model simplifies considerably the dynamics of nominal wages. Both base wages and indexing intervals reflect to some extent existing economic conditions. Base wages may exceed previous period peak wage by the effect of collective bargaining or courts rulings. Downward real wage flexibility is also possible through unemployment as firms dismiss workers hired under the previous wage contract and hire workers with

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smaller entry wages.

In Brazilian experience, the sensitivity of base wages to unemployment was asymmetric. Indexation resets base wages as the starting point of collective bargaining at the end of wage contracts. Labor turnover costs inhibited downward flexibility of base wages. Specialized labor courts usually settled wage conflicts under a biased judgment of the productivity gains that ought to be transferred to labor. Legal provisions for more than 100% plus increases to minimum wages reinforced the upward asymmetry.\textsuperscript{24}

Indexing intervals were to some extent endogenous. The indexing laws imposed a minimum frequency of adjustments but did not impede larger frequencies. Upward asymmetry also occurred as more frequent adjustments were a matter of private negotiation while less frequent adjustments run against the law.

In spite of leaving aside endogenous influences on base wages and indexing intervals, the sawtooth model was widely accepted as a good approximation to wage setting in Brazilian policy circles. It posed two problems to the design of stabilization programs. The first was the wage problem. Since the real wage fluctuates along the wage contract, what should

\textsuperscript{24} Such provisions were effective during extended time periods in the 1980s. The so-called recovery of purchase power of minimum wages was a major flag of policy groups concerned with the fairness of income distribution. Special provisions were already effective during the military regime and continued with some interruptions into the democratic period.
be the only wage adequate to stabilization? The second was the indexation problem. If indexation is exogenous, what is the indexing scheme that suits best stabilization?

In principle, stabilization requires a mandatory freeze of nominal wages at levels existing at the launching of the stabilization program. Because of staggered contracts, however, a straight freeze would distort relative wage structure. With staggered wage contracts, equilibrium of relative wages occurs over time but not at a given moment of time. Apart from staggering issues, the average real wage that existed over the contract life time may provide no indication on the right entry level of real wages. Replacing the inflation tax by other sources of budget finance and/or budget cuts alters relative price structure. The average real wage that prevailed in the inflationary equilibrium may bear no relation to the real wage adequate to stabilization.²⁵

In Brazilian policy circles, no theoretical guidance was available to set stabilization program wages and similar contractual incomes. Neutrality was the default solution: the entry real value of any given contract should equal the average real value observed in the inflationary status quo. For non-indexed contracts, neutrality was defined by a

²⁵ Similar problems appear for other contractual incomes such as rental or mortgage loans. In chronic inflation, there is no synchronization of the frequency of adjustments. The real value of contracts fluctuates over the contract life period. As to wages, there is guarantee that equilibrium relative prices in inflation and price stability are the same.
counterfactual exercise: the entry value is the real value that would have happened had inflation persisted. Wage realignment under the neutrality criterion handled separately every wage contract as different wage contracts have distinct average real values and evolve differently over time.\(^{26}\)

The neutrality criterion was admittedly resorted to in Brazilian stabilization programs as a first approximation to the complex restructuring of the economy that would follow from stabilization. It was held in Brazilian policy circles to give the exact solution solely for purely inertial inflation. With zero budget deficits, inflation is driven entirely by monetary correction clauses and the same relative price structure observed in inflation equilibrium was expected to hold for price stability as well.\(^{27}\)

Although Brazilian inflation was not purely inertial, reference to this ideal stabilization setting motivated a heuristic rule for adjusting on-going contracts to price stability: relative prices whose formation did not hinge

\(^{26}\) Neutrality conversions for every individual wage contract do not guarantee aggregate wage neutrality. The general level of real wages at the launching of stabilization may differ from the average real value prevailing before depending on the relative weights of wage contracts standing above or below their respective average the day before the program. The aggregate problem is an example of the unsurmountable difficulties in implementing exact neutrality mentioned below.

\(^{27}\) The pure inertial inflation case way thought to provide an exception to the arguments of Kessel and Alchian, 1962. For a double standard proposal based on the neutrality assumption see Arida and Lara-Resende, 1985 and the comments by Dornbusch, 1985.
directly upon the inflation tax or expenditures to be cut in fiscal stabilization were handled as if they would remain constant under price stability. Wages offered a case in point. No stabilization program contemplated replacing the inflation tax by higher taxation on wage incomes. Dismissing public sector employees was not viewed as exerting a first order magnitude effect on labor market equilibrium. The heuristic rule was therefore to keep real wages constant.

Additional arguments in favor of neutrality came from practical reasons. First, fairness regarding income distribution facilitated the acceptance of the stabilization program. Second, the downward rigidity of nominal wages induced authorities to search for the smallest nominal wage possible. The nominal wage that yields at frozen prices the same average real wage prevailing before was regarded as the minimum acceptable to workers. Third, the identification of cases in which departures from neutrality were justifiable by the direct effect of fiscal adjustment was difficult.

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28 That fairness measured by the inflation status quo was important in giving legitimacy to stabilization programs reveals the above mentioned difficulties of stabilizing when living with inflation is bearable.

29 A clear case was the settling of banking tariffs. Because of sharing inflation seigniorage, banks charged zero tariffs for current account and checking services in inflationary times. The removal of inflation tax required then an increase in the price of banking services. Apart from pricing visibility, the real price changed as monetization affected the demand for banking services. Authorities in charge of stabilization programs allowed for increases in banking tariffs in spite of the price freeze.
The legal implementation of neutral wage realignment was only possible through Monetary Reforms. Brazilian legislation impedes interference in private valid legal contracts except when the contract reference currency changes. The solution devised was to issue a Monetary Reform. The objective was not cut zeroes but to specify procedures settling suitably extant contracts in the new currency. Neutrality required nominal wages in the new currency to be such that after program real wages equal before program average real wages. While the Collor 1 program issued a Monetary Reform to block financial assets, the role of the Monetary Reforms that accompanied the Cruzado and Summer Plans was to realign relative prices.\footnote{The Bresser program dispensed with the Monetary Reform at the cost of running later into a series of adverse courts' rulings. In neutral Monetary Reforms, the criterion for conversion of non-wage indexed contracts was formally identical to wage contracts: entry values should be equal to average real values observed in the inflation equilibrium. Deflation by the "tabilta" applied to contracts foreseeing fixed nominal values.}

Exact neutrality criteria never applied thoroughly. Even the Cruzado program that followed neutrality rules closer than subsequent programs departed ostensibly from neutrality in a few key conversions. The reasons ranged from policy choice to political pressures.\footnote{Taxes to be paid in the future were not subject to deflation by the "tabilta". Real tax collection increased therefore. An example of political pressure is the wage bonus discussed below.}

Departures from neutrality depended to some extent on the legal framing of the Monetary Reform. The straight suppression
of monetary correction by the Summer program is a case in point. The value of contracts in the monetary correction plus interest format becomes distorted unless inflation is zero. In contrast, if monetary correction is legally defined as an interest rate fixed by government and revised periodically, neutral conversion depends on whether the fixed rate stands above or below inflation.\footnote{The second treatment was adopted by the Bresser program. It avoided the distortions mentioned in note 13 above.}\\ Departures from the neutrality criterion derived also from technical difficulties in finding out the neutral value. When the price freeze is anticipated, equilibrium contractual values are distorted by inflation rate acceleration caused by price settlers willing to stand in a favorable position when the stabilization program comes. The average past value shrinks while using observed inflation rates to deflate fixed payments becomes questionable. The reference to long historical real averages bypasses the distortions caused by short run inflation rate acceleration at the cost of mixing possibly distinct economic structures. Difficulties do not disappear if inflation rate acceleration before the stabilization program is small. In this case, the conversion of staggered contracts to average real values may require reductions in nominal values existing at the launching of the stabilization program. In financial markets, the application of the neutrality criterion required disentangling a complex
web of contracts. Additional problems are posed by factors of difficult evaluation.

As to indexation, the policy message that emerged from the sawtooth model was that indexation was inflationary. Authorities should resist to the maximum possible extent labor demands for shortening indexing lags. Deindexation was viewed as central to price stability. Wage deindexation proposals, however, refer to a variety of situations that is convenient to distinguish from the analytical viewpoint.

The first sense of deindexation was in vogue in policy circles well before the series of stabilization programs in the second half of the 1980s. Wage deindexation in the first sense consisted in stretching over time adjustment intervals. It may be accompanied by loose price controls to speed up the transition to the equilibrium inflation rate associated with longer indexing lags. Deindexation proposals in this first sense were never implemented in practice.

Wage deindexation proposals, however, have two other senses directly relevant to stabilization programs. Deindexation in the second sense is suspending indexation clauses established

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33 For an example in the passbook savings/housing system, see Arida, 1987.

34 The economics of information is a case in point. Information on relative prices requires search in high inflation to be concentrated in time because of high price variability. A price freeze lowers information gathering costs by increasing the time validity of price information. As a consequence, the purchasing power of real wages increases momentarily as consumers pick up carefully undervalued items.
during the inflation status quo. A price freeze provokes rapid disinflation. Previous COLA provisions, if still effective after the launching of the stabilization program, raise after-program nominal wages by the full extent of inflation elapsed since the previous wage increase. Wage deindexation in this second sense is required for wage realignment.

The third sense of deindexation pertains to COLA provisions contingent on after-program inflation. Following the sawtooth model, authorities strove for long adjustment intervals. The larger the real wage decline provoked by a given after-program inflation rate, the higher would be the ex-ante success probability of the stabilization program. The negative effect of inflation on aggregate demand under large indexing lags -- the wage stabilization mechanism -- was deemed central to stabilization programs.

In Brazilian experience both entry wage realignment and deindexation faced strong political resistance. Tight price controls and the neutrality criterion for wage conversion were not enough to persuade labor to accept the desired changes in wage setting. Workers "fair" value of entry real wage was the peak real wage of inflationary times. Concern with after-program inflation in turn posed pressures for COLA provisions. Although constantly present in political agenda, social pacts could never be worked out.

The setting of wages posed a trade-off to authorities in charge of stabilization programs. The larger the initial real
wage, the weaker tended to be the political pressure for after
program indexation. A too high entry wage level was feared to
undermine the price control; conceding generous indexation
clauses at the outset of the program could magnify inflation
in face of supply shocks.

The wage policies adopted by the several stabilization
programs were not uniform. Although sharing the same view on
neutrality and deindexation, they varied on the degree of
compromising as well as in the evaluation of the entry
wage-indexation trade-off. It is useful to review briefly the
wage policies of the various stabilization programs.

The Cruzado Plan was conceived under the expectation that
flat neutrality conversion plus deindexation would pose a risk
of outright, instant rejection of the stabilization program by
workers. To facilitate the acceptance of the program, a wage
bonus was extended to all workers on top of conversion rules
designed to align relative wages. All but minimum wages were
increased by 8%. Minimum wage bonus was 15%. In addition, a
trigger wage indexation was put in place. It did not offer
full protection to real wages because the trigger was subject
to a cut-off limit of 20%. The excess of inflation over the
20% limit was carried over to the end of wage contract period.
The trigger was deemed consistent with major inflation program
targets. Taken together with the bonus, the real wage decline
for a 20% year inflation rate compared to pre-program value
would be of 2% only.\textsuperscript{35} The decline of real wages for higher inflation rates was larger because of the cut-off limit, thus providing room for the wage stabilizing mechanism above discussed should residual inflation exceed 20%.

The wage policy of the Cruzado program was overgenerous. Probably, the program would have been accepted without it. Problems came on two grounds. First, the wage-price realignment did not take place. The neutrality conversions that depended on nominal wage decrease (wages above average) were in practice replaced by a freeze at existing values. In turn, conversions that required nominal wage increases were followed strictly. The bonus added additional impetus to the average wage increase. The discrepancy between minimum and other wages bonuses created an imbalance in relative wage structure that later led to further wage increases in the orbit of comparison of minimum wages. Second, the trigger limit of 20% proved to be too tight. It explains to a good extent why the monthly inflation rate after the lifting of price controls stabilized slightly above 20% with trigger increases of 20% taking place monthly.

The imbalances created by excessive entry real wages during the Cruzado program led authorities to stick to neutrality in the Bresser program. Although not concerned with relative wage realignment, it conceded wages a general increase roughly

\textsuperscript{35} For the same inflation rate, minimum wage still exhibits a 5% increase. See formula (4) in the Third Essay.
enough to restore average real values calculated over the trigger indexing period. The trigger indexation was replaced by a lagged fixed period indexation. The so-called URP indexation established monthly wage increases of 100% of the average monthly inflation of previous quarter. The first quarter was a grace period during which there was no wage increases. Second quarter wage increases reflected average inflation during the first quarter and so on. To compensate workers for the quarter indexing lag, 100% plus clauses applied without restrictions.

The Summer program opted for a radical wage deindexation. As in the Bresser program, entry wages were on average in line with prices. The Summer program, however, suppressed COLA provisions. Wage increases were programmed to occur at the end of annual wage contracts and even so depending on direct bargaining or court rulings. Holding nominal wages constant even in face of high inflation rate expectation was held of essence to the stabilization program.

The cold turkey policy of the Summer program was not successful. As had happened with the Bresser program, the attempt to impose neutrality on average, that is, without taking into account relative wage structure, led to a series of adverse court rulings granting to workers peak real wages observed during inflationary times. On top of adverse court rulings, Congress pressures for enacting protective safeguards for wages led later the issuance of a new indexing system that
shortened indexation lags to an unparalleled extent. At the Summer program flexibilization stage, the wage law conceded monthly wage increases of 100% of past month inflation.

Reflection on previous experiences led authorities in charge of the first Collor program to change the wage policy. In the evaluation of trade-off between entry wages and indexing, authorities preferred excessive high entry real wages to tight wage indexation. In contrast to other programs, the neutrality criterion was abandoned. The Collor 1 program allowed an additional round of wage increases according to pre-program inflation rate of 85% to take place after the launching of the price freeze. It was the only stabilization program that did not apply deindexation in the second sense referred to above. As a consequence, initial real wages were larger than average real wages prevailing before. The sharp decline in demand caused by the blockage of financial assets exacerbated the wage-price imbalance.

The Collor 1 plan, however, limited severely wage indexation. Building upon Summer program experience, it offered from the outset a given indexation scheme to avoid Congress pressures. Compulsory adjustments were stretched back to the six-months intervals that prevailed before the Cruzado program. Indexation clauses were set to restore average, rather than peak wages. As a consequence, strict adherence to official indexation implied that any constant positive inflation rate, however small, caused a continuous decline in
real wages as each period average wage set the peak wage of
the next period.

The Collor I attempt to restrain indexation did not hold in
practice. After inflation had resumed, direct bargaining
ensured peak real wages at the end of every indexing period.
The frequency of adjustments surpassed the legal requirement.
The resulting indexing pattern, however, varied considerably
across economic sectors as well as between firms in the same
sector.³⁶

The evidence on the reinstatement of wage indexation after
failed stabilization programs is frequently interpreted as
consistent with the thesis of endogenous indexation. The path
to indexation is multiple. Wage indexation may result from the
activation of COLA provisions already included in the
stabilization program (Cruzado and Bresser), from Congress
frustration with the failure of stabilization program (Summer)
or from market bargaining (Collor I). The argument is that if
inflation is high enough, wage indexation becomes inevitable.

In this broad sense the endogenous indexation thesis is
hardly disputable. Yet it does not imply that formal
indexation is irrelevant. The law imposes a minimum frequency
of adjustments and (with the exception of the Collor I
program) 100% plus clauses. Formal indexation can only be

³⁶ Indexation lags were shorter for large corporations,
industry and private sector than for small companies, commerce
and public sector employees. They responded to the existing
decree of competition, the power of unions and the adoption of
wage incentives to diminish labor turnover.
irrelevant if the market outcome that would have taken place
without the law never exhibited longer indexing intervals or
less than 100% adjustments. In loose labor market settings,
however, workers would not be able to extract by bargaining
the very same adjustments granted by law.

Another reason for the relevance of formal indexation is
that spontaneous indexing does not replicate formal
indexation. When straight indexing laws are in place, the
variance of indexing patterns is small. In contrast, the
co-existence of monthly, bimonthly, quarterly and semester
indexing intervals observed after the Collor 1 Plan has no
parallel in previous experience. Similar results were also
observed in previous experiences limiting drastically the
extent of formal indexation. 37

The third reason the casting of indexing laws is not
irrelevant is that legal indexing hardly mirrored previous
practices in private or public contracts. Indexation changed
with every stabilization program and there was no sensitivity
of indexing laws to the very large inflation rate
accelerations observed between stabilization programs.
Resilience was also true of indexation before the series of

37 In 1983 an IMF inspired wage decree prohibited 100% plus escalator clauses for high wages. The reduction factor
was progressive: the higher the wage, the smaller the percentage increase of past inflation. The distortions caused
to relative wage structure were very large. Bypasses took place as corporations offered workers subsidized loans and
fringe benefits. After a while the law was no longer effective in practice. The resulting rearrangement of indexing schemes,
however, exhibited discrepancies not seen before.
stabilization programs.\textsuperscript{38} Moreover, the revision on legal indexing carried out by stabilization programs reflected current policy views and not previous inflation or unemployment.\textsuperscript{39}

The above discussion of the casting of legal indexation shows that the search for the indexing laws that suits best stabilization cannot be easily dismissed. The joint attainment of the two policy objectives of neutrality and deindexation was not possible in practice. The design issue posed by the experience of the series of stabilization programs relates to the trade-off between the two objectives. If the initial real

\textsuperscript{38} The Cruzado trigger indexing persisted for inflation rates ranging from 0\% to 26\% per month. Similar patterns were observed for URP and Collor 1 indexing schemes. The most notable resilience example occurred after the Summer program. Inflation accelerated from 10\% to 85\% per month without revising the indexing laws. Resilience was also true of indexing before the series of stabilization programs in the second half of the 1980s. The semi-annual indexation scheme introduced in 1980 lasted until the Cruzado Plan. Monthly inflation in the period accelerated from 6\% to 14\%.

\textsuperscript{39} The mere classification of the legal indexing schemes according to their inflationary effect is difficult. A possible criterion is to compare the inflation produced by different legal rules for the same equilibrium wages but under different base wages. If one legal indexing rule produces larger inflation for all possible wage gaps, this legal rule may be said to be more inflationary than the other. The criterion, however, does not lead to a regular ranking ordering. The one month indexing lag that prevailed from the collapse of the Summer program to the Collor 1 program is more inflationary than any other indexing scheme. Trigger indexation, however, is more inflationary than URP indexation only for a limited range of possible wage gaps. For a short time horizon, trigger indexing may be less inflationary than the Collor 1 indexation. The result, however, does not hold for large wage gaps. The case for an endogenous determination of legal frameworks can hardly be built.
wage is above equilibrium, what is the indexation scheme that suits best stabilization?
IV. The essays.

The first essay focuses on the design consistency of stabilization programs in Brazil. On the one hand, they handled wage and other contractual incomes according to the neutrality principle. Although in practice major departures from neutrality took place, neutrality was the basic principle that guided contract conversions to the new currency. On the other hand, all stabilization programs included measures to offset the decline in the demand for indexed bonds. The sensitivity of the demand for indexed bonds to inflation, however, is hardly compatible with the neutrality criterion because it implies that the equilibrium set of relative prices change with inflation. For analytical clarity, the first essay checks design consistency in an ideal stabilization setting in which budget deficits are zero. As mentioned above, the purely inertial inflation rate case was invoked by authorities in charge of stabilization programs to justify the use of neutrality rules.

The first essay offers an interpretation of the dependence of indexed bonds demand on inflation that does not depart from rational behavior. It emphasizes the role of inflation rate uncertainty in wealth allocation. The starting point is the assumption that higher mean inflation brings larger inflation uncertainty. More inflation rate uncertainty in turn causes larger fluctuations in the purchasing power of real assets.
measured in consumption goods. Depending on the degree of risk aversion, wealth holders prefer more indexed bonds -- which by assumption have constant consumption purchasing power -- and less real assets as mean inflation rate rises.

The model of the first essay captures several characteristics of Brazilian economy such as the widespread adoption of formal indexation clauses, passive money, and the external constraint mentioned above. If the stabilization program provokes a current account deficit, the program is not sustainable over time.

A major result of the first essay is that the reverse absorption effect makes neutrality rules to fail even in the purely inertial inflation rate case. The increase in the demand for capital following the decline in inflation raises capital price and stimulates capital accumulation. The real wages increase over time. The new steady state equilibrium position still exhibits positive inflation. The current account in turn exhibits a deficit in the new equilibrium.

Offsetting changes in portfolio allocation elicited by less uncertain inflation require either massive interest rates or domestic debt stock reductions. Massive interest rates are not sustainable over the long run. Stabilization without external support demands a reduction in the domestic debt stock. The result is intuitive when one realizes that because of the absorption effect, the domestic debt stock the public is willing to hold in inflation equilibrium is larger than at
price stability. If inflation is to succeed, all the effects
of high inflation on assets demands have to be offset by
adjustments in fundamentals.

Compensatory fiscal policy does not belittle the role of
incomes policy. Wage realignment, however, is shown to be
preferable to wage deindexation. When domestic debt stock is
reduced, the optimal rule prescribes entry real wages smaller
than peak real wages but larger than average real wages. The
reason is that stabilization is expansionary. Price stability
comes with higher real wages and larger stocks of capital.

The essay considers several extensions of the model such as
inflation uncertainty effects on savings and endogenous
indexation. The design of stabilization programs in Brazil
does not pass the test of consistency. The debt overhang
problem was never integrated systematically into the thinking
of stabilization programs. Even in a purely inertial inflation
world, neutrality can only be justified in particular
circumstances.

The relevance of the results to the evaluation of actual
experience is of course restricted by the fact that Brazilian
inflation has never been purely inertial. Yet they suggest a
shift of emphasis worth emphasizing.

In view of the results, the role ascribed to wage policy in
Brazilian stabilization programs seems exaggerate. Neutrality
is not a necessary precondition for the success of
stabilization. Entry real wages may exceed before program
average real wages without jeopardizing the attainment of stabilization targets. The effect of changes in indexing intervals does not also conform to the neutrality viewpoint. Stretching indexing intervals over time provokes a more than proportional fall in inflation and raises real wages.

In contrast, the role of fiscal policy was understated. To address changes in wealth allocation and savings, budget equilibrium suffices only at the right domestic debt stock. A surplus becomes necessary if the debt stock is above the level compatible with price stability. Because of the domestic debt overhang, fiscal policy has to be carried out both in flow and stock dimensions.  

The results give an additional argument in favor of the expansionary impact of stabilization mentioned above. The role of external support in stabilization is also enlarged. Apart from backing domestic currency, external support diminishes

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40 The flow dimension refers to the effect of domestic debt stock on the budget. After several stabilization rounds, the debt overhang problem today is smaller than before. The discretionary handling of monetary correction reduced domestic debt stocks as discussed in note 19 above. Reduction of debt stocks also came from the acceptance of private certificates. All stabilization programs adopted to varying degrees a cash constraint approach to private claims on government. Payment arrears increased over time. With the privatization momentum in the 1990s, there was a gradual conversion of unpaid claims into privatization certificates good only to buy government assets. Private certifications diminish the domestic debt overhang to the extent to which they do not serve as collateral to financial transactions.
the extent of domestic debt overhang problem.\textsuperscript{41}

The second essay focuses on the Collor 1 Monetary Reform. As mentioned above, this Monetary Reform was framed not to ensure neutrality in contracts realignment but rather to inhibit portfolio shifts (the reverse absorption effect).\textsuperscript{42} It imposed a compulsory lengthening of the maturity of domestic debt coupled with a capital levy to reduce its size. The Collor 1 Monetary Reform was an unprecedented attempt to deal with the domestic debt overhang problem in Brazilian experience.

The singularity of the Monetary Reform lies in the use of a double currency system. A new currency -- the cruzeiro -- was introduced as the legal tender but the Reform withheld a sizable fraction of financial wealth in Central Bank deposits denominated in cruzados, the old currency. All banking accounts were duplicated into cruzeiros and cruzados.

Agents were allowed to use blocked funds to settle obligations. The rules governing the use of cruzados were strict. The transfer of cruzados was lawful only to settle

\textsuperscript{41} The results becomes intuitive when one realizes that the domestic debt overhang was to a substantial extent created by the prolonged shortage of external finance discussed above. Access to external finance may also be welfare improving if the social cost of domestic debt reductions is too large. The argument is that the current generation may not be willing to bear the costs of a capital levy or temporary budget surpluses if the fruits will be enjoyed by the next one. Access to external finance works then like a loan to current generation to smooth costs over time.

\textsuperscript{42} It will be seen, however, that the neutrality criterion was used to settle the cost of the "cruizado deficiency".
non-wage obligations incurred before the launching of the Monetary Reform. Transactions eligible for cruzados settlement could be settled in cruzeiros if the agent was short of cruzados but not vice-versa. The use of cruzados was limited in time. Six months after the program blockage positions became final.

Cruzados were allowed to settle transactions to avoid the bankruptcies caused by the forced lengthening of financial assets maturity. The transactions rules for cruzados were derived under the assumption that blockage should hit only net financial wealth positions. A complex net of cruzado transactions thus took place side by side with regular cruzeiro transactions.

The complexity of the Monetary Reform appeared clearly in the cruzados accounts of financial intermediaries. Passbook savings and other banking liabilities were subject to blockage at maturity. Financial intermediaries deposited cruzados at Central Bank on behalf of wealth holders. The long term housing and mortgage loans financed by passbook savings deposits, however, did not come to maturity over the period in which the double currency system was effective. As a consequence, financial intermediaries became short of cruzados. A special discount window was created to finance the so-called "cruzado deficiency" of financial intermediaries. Settling the "cruzado deficiency" loans was only possible in cruzeiros.
The analytical framework of the Collor 1 Monetary Reform was never presented systematically in the literature. By abstracting from practical problems of implementation, the design of the Monetary Reform emerges clearly. Apart from providing a short evaluation of the overall program, the essay settles a series of controversies on the Monetary Reform. It was frequently held, for instance, that allowing a secondary market for cruzados would be harmless to the blockage in aggregate terms because cruzados checks could not be cashed into cruzeiros. Another criticism draws attention to the fact that blockage was effective over the entire stock of financial assets (inside and outside money broadly defined). The Monetary Reform would then enlarge the stock of domestic debt. The results derived in the essay show that these two criticisms are ungrounded.

The essay sets in perspective some claims of the authorities responsible for the Monetary Reform design. The "cruzado deficiency" loans, for instance, were presented as a major instrument for monetary policy. Instead of selling bonds to control money supply, monetary authorities could demand payment of cruzado loans. The essay shows that the capacity of paying back cruzados loans depends on the stock of outside money in cruzeiros being positive or negative. Monetary control problems were also rendered difficult by the permission granted by the Reform to settle taxes in cruzados. Since government expenditure was in cruzeiros, the public
sector borrowing requirement in cruzeiros bears by consequence no relation to budget deficits.

Wage indexation forms the subject of the third essay. It compares fixed length and trigger indexation. Contrast is obtained by presenting the two indexing schemes in their purest form. Trigger or variable length indexing makes real wage sticky in the sense that, if inflation is positive, real wages are a function of the trigger threshold and not of inflation. Fixed length indexation imparts flexibility to real wages. Trigger or variable length indexing ensures no change in nominal wages if inflation lies below the trigger threshold. Fixed period indexation levers up residual inflation.

The comparison is first carried out for orthodox stabilization programs. The exogenous variable is a reduction in the rate of growth of money supply. It is shown that with fixed length indexing, the usual argument justifying heterodox programs applies. Disinflation causes output losses in the short run. With trigger indexing, however, disinflation is accompanied by longer adjustment intervals. Real wages are constant and the reduction in money supply has no short run effects on output. Deindexation in the first sense discussed above is not recommendable -- it is preferable to move to trigger indexing at the launching of restrictive policies rather than extending the length of wage indexing intervals. From the viewpoint of the sacrifice ratio, trigger indexing
exhibits the same properties of base wage realignment. Heterodox stabilization programs can be carried out both ways.

The second context of comparison is the flexibilization stage of heterodox stabilization programs. Lifting of price controls is the most critical time in heterodox stabilization.\(^{43}\) The relative price imbalances caused by the price freeze raise the price level. Doubts on the extent and permanence of fiscal effort, however, spread among the population. If the inflation rate is relatively high, the program is not expected to last. The pressures towards relaxing fiscal policy mount and speculative attacks on nominal anchors develop. In contrast, a low inflation rate following prices decontrol reinforces the political support of the stabilization program. The sustainment of fiscal effort over time becomes easier and portfolio shifts betting on the temporariness of stabilization diminish.

In this context, the policy issue is finding out the wage indexing scheme that minimizes the inflation rate following the lifting of price controls. Although long run inflation depends solely upon the rate of expansion of money supply, initial inflation depends also on wage indexing. The major result obtained is that if real wages at the decontrol phase stand above steady state equilibrium, fixed length indexation is preferable to trigger indexation and vice-versa.

The result helps in evaluating the indexation choices

\(^{43}\) See Kigel and Liviatan, 1989.
adopted by the several stabilization programs in Brazil. The Cruzado trigger indexing was unfortunate because the loose fiscal and monetary policies in the control phase made real wages at flexibilization ostensibly larger than real equilibrium. The Collor 1 fixed length choice was in turn appropriate because of the initial wage-price imbalance.
Heterodox programs and inflation rate uncertainty.

Persio Arida

I. Introduction.

This essay aims at getting insight on Brazilian heterodox programs by focusing, at a high degree of abstraction, on inflation rate uncertainty. Heterodox programs based on temporary price freezes provoke sudden reductions of both inflation rate and uncertainty. While most research has focused on inflation rates, the policy implications of changes elicited by the reduction in inflation rate uncertainty have been largely neglected.¹

Inflation rate uncertainty matters in this essay in two different ways. From the viewpoint of allocation of wealth, it increases the demand for indexed bonds at the expense of real assets. More inflation rate uncertainty causes larger fluctuations of the purchasing power of real assets in terms of consumption goods. Depending on the degree of risk aversion, wealth holders prefer more indexed bonds (which have

¹ Brazilian evidence shows that the mean rate of inflation is associated with inflation rate variability. Although the latter is not equivalent to inflation rate uncertainty, it seems fairly safe to assume that inflation rate variability and uncertainty come together.
constant consumption purchasing power) and less real assets as inflation rises. Inflation rate uncertainty also affects savings. With backward looking, fixed length indexation, more inflation rate uncertainty increases ex-ante real wage uncertainty. If workers are averse to risk, savings out of wage income will increase with inflation as uncertainty stimulates postponement of consumption.

This essay is motivated by the changes in the demand for real assets and consumption observed after the launching of stabilization programs in Brazilian experience. We discussed in the Introduction how the several stabilization programs handled the expansionary drift caused by the fall in the demand for indexed bonds. After the demise of stabilization packages, authorities concerned in keeping inflation bounded hasten to reinstall financial asset indexation to reduce the demand for real goods and assets.

The changes in the demand for indexed bonds that took place under stabilization programs can hardly be explained by monetary correction illusion or forms of non-rational behavior that reflect nominal interest rates. In our view, they reflect the substantial decrease in inflation rate uncertainty provoked by price freezes. As such, these expansionary drifts would take place without any change in expected real interest rates. In Brazilian experience they were magnified by negative ex-ante rates of interest and widespread skepticism on the attainment of fiscal targets
announced by the stabilization programs.

The dependence of the demand for indexed bonds and savings on inflation rate uncertainty has also implications for current account, government finance and the design of stabilization programs. A large stock of government domestic debt stimulates private investment by increasing capital relative price and depresses private savings by the wealth effect. The increase in inflation, however, makes indexed bonds and savings more attractive to wealth holders at the same real interest rate. The decline in the current account deficit induced by higher inflation rates helps adjusting to scarce external savings. From the viewpoint of government finance, high inflation rates are helpful in inducing the public to hold a domestic debt stock that would not be held at the same real rate of interest under price stability. The design of stabilization programs is affected by inflation rate uncertainty because the contractionary impact of high inflation is reversed when price stability comes.

This essay is organized as follows. In Section II we review the purely inertial inflation case. As discussed in the Introduction, this paradigm motivated the adoption of neutrality rules in the design of stabilization programs. The basic model is presented in Section III. Section IV discusses disinflation by different incomes policies such as temporary price freezes, deindexation and base wage realignment with uncertainty in asset demands. Section V introduces uncertainty
in savings. Section VI introduces endogenous wage settings. Section VII summarizes policy issues.
II. The pure inertial inflation paradigm.

Consider an ideal stabilization setting in which fundamentals are right in the sense that government deficit is zero and the current account deficit does not exceed the available supply of external savings. The inflation rate required by seigniorage is zero by hypothesis. There are no external shocks. Wages are indexed with fixed length, backward looking 100% plus escalating clauses. Money is passive.

According to the paradigm that guided the design of stabilization programs in Brazil, inflation in this ideal setting would not be zero. If base or beginning of period wages exceeds equilibrium wages, inflation is positive. The shorter the indexing lag, the higher inflation is. Inflation makes the average real wage during the indexing interval period consistent with general equilibrium in all markets.

Central to the paradigm is the notion that, if budget is balanced, monetary correction in financial assets and wages is a veil in the sense of not altering real equilibrium. The equilibrium average real wage would not be inflation dependent. In this ideal setting, the paradigm holds that a temporary price freeze accompanied by neutral wage realignment induces a rapid transition to price stability provided that budget is kept in equilibrium at stable prices. Neutral wage realignment makes base wages at the launching of stabilization equal to average real wages observed during the inflationary
equilibrium. Tight price controls in turn perform the double duty of facilitating the acceptance of lower base wages by workers and coordinating decisions of price setters.

We will argue in this essay that the pure inertial inflation paradigm is true in a world without inflation rate uncertainty effects. It, however, requires a substitutability condition on assets demands that seems to have been unnoticed, namely, that changes in inflation alter the desired composition of financial assets between money and bonds but not the desired composition of wealth between financial and real assets. Inflation rate uncertainty alters these results. Even for pure inertial inflation, incomes policy has to be accompanied by a reduction of domestic debt stock to ensure price stability without provoking a current account deficit. Moreover, real wages and capital accumulation may increase with stabilization. Stability reduces inflation uncertainty and therefore elicits changes in wealth allocation and savings not contemplated by the pure inertial inflation paradigm.
III. The model.

To discuss the pure inertial inflation paradigm, we want the model to capture four institutional features of Brazilian reality. The first is the widespread adoption of indexing rules in assets and labor markets. To simplify the analysis, we disregard non-indexed bonds. The second is the difference in indexation effectiveness in assets and labor markets. Inflation in the model changes real wages but not the real value of indexed bonds. As discussed in the Introduction, monetary correction was frequently set below inflation in Brazilian experience. During several periods over the past two decades, the real value of indexed bonds was inflation dependent. The effect of inflation on indexed bonds, however, is of secondary magnitude when compared to the effect on wages. For this reason, we will assume throughout that the real rate of interest on indexed bonds does not depend on the inflation rate.

The third institutional feature we want to capture is passive money in the sense that Central Bank pegs the real rate of interest on indexed bonds while accommodating money demand. Central Bank accommodates portfolio shifts between money and indexed bonds by overnight operations.

The fourth feature is the current account constraint on private sector indebtedness. Rationing of foreign savings came with the debt crisis of 1982. Under a centralized exchange
regime and no priority rules for allocating scarce reserves, credit was suspended by a negative evaluation of sovereign risk. As a consequence, private borrowing was restrained even though private indebtedness was small relative to public debt. Taken together with the assumption of a balanced budget, this feature implies that private savings are equal to private investment.

The model has three assets -- money, government indexed bonds and capital or equity -- and one consumption good that serves as the numeraire. Asset demands for money \( m^d \), bonds \( b^d \) and equity \( k^d \) as a function of wealth \( W \) are given by (1)-(3). Inflation \( p \) is the rate of change of the price of the consumption good. Indexed bonds pay a real rate of interest \( i \). The real rate of return on capital is \( r \).

(1) \[ m^d = m(r, i, p) . W \]

(2) \[ b^d = b(r, i, p) . W \]

(3) \[ k^d = f(r, i, p) . W \]

Asset demands depend as usual on rates of return and wealth \( W \). Central to our analysis is the sign of \( df/dp \) or \( f_p \). A larger inflation decreases money demand and in general stimulates both indexed bonds and equity demand. But because

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\(^2\) The model builds upon Dornbusch, 1980, ch. 14.
it is accompanied by more inflation uncertainty, it tends to increase the fraction of wealth held as indexed bonds at the expenses of capital. If the increase in uncertainty and/or the degree of risk aversion is strong enough, a higher inflation rate depresses the demand for real assets.³

To simplify the analysis, we will not derive explicitly assets demands from utility maximization. For analytical convenience, we assume throughout that inflation uncertainty is a continuous and positive function of inflation. Three cases will be considered. If \( f_p = 0 \), changes in inflation alter the desired portfolio composition between financial assets but not between real and financial assets. It will be seen that \( f_p = 0 \) is a necessary condition for the pure inertial inflation paradigm to be true. If \( f_p \) is negative, higher inflation rates decrease the demand for real assets as inflation rate uncertainty rises. This case will be of interest to us because it generates the expansionary demand drifts observed in Brazilian experience. If \( f_p \) is positive, inflation uncertainty does not impact aggregate demand through assets equilibrium but may still be operative through savings.⁴

Wealth is defined by (4). Variable \( q \) is the relative price

³ See Fischer, 1986, cases C and D.

⁴ For the sake of comparative analysis, we impose the condition that capital demand for zero inflation is the same irrespective of the effect of inflation on capital demand. The condition holds true, for instance, for additive specifications such as \( f(r,i,W,p) = g(r,i,W) + j(p), j(0) = 0 \) irrespective of \( dj/dp \).
of capital while \( m, b \) and \( K \) stand for the existing stocks of money, bonds and capital.

\[(4) \quad W = m + b + q.K\]

Fiscal policy ensures that real domestic government debt is constant. We capture the zero deficit condition of the pure inertial inflation paradigm by assuming a fiscal regime in which the primary surplus always matches interest on government debt. In this fiscal regime, the sum of money and bonds in real terms is a constant term \( v \) defined by \((5)\). The composition of domestic debt \( v \) between money and bonds, however, is endogenous because Central Bank accommodates money demand.

\[(5) \quad v = m + b\]

At any given point in time, debt stock \( v \) and physical capital stock \( K \) are given. Since debt composition between money and bonds is by hypothesis satisfied by Central Bank, portfolio equilibrium depends solely in inducing the public to hold the existing capital stock. Portfolio equilibrium is then given by \((6)\) below:

\[(6) \quad q.K = f(r, i, p).(v + q.K)\]
We turn next to the current account. With budget equilibrium, the current account depends solely on the difference between private investment \( I(.) \) and private savings \( S(.) \). There are neither claims on the rest of the world nor external debt held by domestic residents. Because of the external savings constraint, the current account deficit has to be zero.

\[
(7) \quad I(q) - S(r, i, W) = 0
\]

Domestic savings depend positively on the real rate of interest and the return on capital and negatively on wealth. Investment is defined by (8) as the value of the physical output of new investment goods \( F(.) \). As a supply function, \( F(.) \) increases with relative price \( q \). As a consequence, investment is also a positive function of capital relative price.

\[
(8) \quad I(q) = F(q) \cdot q
\]

(9) gives the rate of change of capital stock. For simplicity, we take a constant rate of depreciation \( d \).

\[
(9) \quad \dot{k} = F(q) - d.K
\]

We turn next to the production side to discuss the relation
between the interest rate on capital \( r \), capital relative price \( q \) and the wage rate \( w \). We assume the capital goods industry to be labor intensive. With neo-classical production functions or fixed coefficients, a higher capital price depresses the rate of return on capital and a higher rate of return in turn depresses real wages along the factor price frontier.\(^5\)

\[
(10) \quad r = r(q), \quad r_q < 0.
\]

\[
(11) \quad w = w(r), \quad w_r < 0.
\]

To complete the model, we have to specify the wage setting. In Brazilian institutional arrangement, wages for every labor category are regulated by year-long staggered contracts. The real wage at the beginning of the contract year is \( z \). The base real wage \( z \) results from collective bargaining or arbitration by specialized labor courts. During the contract year, base wages are periodically reset by 100% plus escalator clauses. The last nominal wage increase contemplated by the contract

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\(^5\) By the Stolper-Samuelson theorem, an increase in capital relative price raises the real wage and lowers the rental rate in both goods. Since the rental rate in terms of capital goods is the marginal product of capital, or the own rate of interest on capital, a higher relative price depresses capital yield. For fixed proportions, consider the price equation for capital and consumption goods:

\[
(1 + r). (w.a_1 + q.a_2) = q
\]

\[
(1 + r). (w.a_3 + q.a_4) = 1
\]

The same condition on capital goods as the labor intensity industry can be seen with fixed coefficients. (10) and (11) hold is \( a_1.a_4 > a_2.a_3 \).
restores $z$ at the end of the contract year. The relevant concept for wages is the average real wage that prevails between wage adjustments. It is given by the right-hand side of (12):

$$w(q) = z - p/n, \quad w_q > 0$$

where $p$ is the annual rate of inflation and $n$ stands for two times the number of adjustments during the year.\(^6\)

In the left-hand side of (12) we used (10) and (11). The equilibrium average real wage is a positive function of capital relative price because it depresses the rate of return on capital. The right-hand side of (12) reflects the indexation setting. Except for deflation, $z$ is the peak wage in the sense of the highest average real wage possible. The frequency of adjustments $n/2$ varies inversely with the indexing lag measured by the number of days in which nominal wages are constant. Both $z$ and $n$ are exogenous.

The wage setting equation (12) does not capture wage contracts staggering. Inflation in the model cannot therefore be said to be inertial in the "core" inflation sense of sluggish response to shocks or changes in policy. It will be seen below that inertia is present in the sense that, if equilibrium wages are smaller than base wages, inflation persists above the level dictated by seigniorage (which in our model is zero) because of backward looking indexation clauses.

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\(^6\) See the Third Essay on (12).
**Unlimited foreign savings.**

For simplicity, we start by leaving aside the external constraint (7). By assumption, any current account deficit can be financed by external savings. Policy parameters (v,i) are exogenous. The model is given by (6), (9) and (12-A).

(6) \[ q.K = f(r(q), i, p).(v + q.K) \]

(9) \[ k = F(q) - d.K \]

(12-A) \[ p = n.[z - w(q)] \]

(12-A) shows that inflation p is proportional to the gap between peak and equilibrium real wages, the proportion being n, the frequency of wage adjustments. We refer to \[ z - w(q) \] as the wage gap.

In the above model, for any given capital stock, assets equilibrium (6) and wage indexation (12-A) give capital relative price while the interaction between the supply of new capital F(q) and depreciation at the given capital stock dK gives net capital accumulation. Convergence to a stationary steady state capital stock requires net capital accumulation to decrease with capital stock. Substituting (6) and (12-A) into (9), we derive the convergence condition below.
(13) \[ F_q \left( -g(1-f)/x_1 \right) < d \]

where \( x_1 = K(1-f) - W(f_r r_q + f_p p_q) \).

Convergence is well behaved if a larger capital stock decreases capital relative price and increases the rate of return required to induce the public to hold the existing stock. Well-behaved convergence requires that \( x_1 \) is positive. This will necessarily be the case if \( f_p \) is greater than or equal to zero.

Consider the negative \( f_p \) case. \( x_1 \) shows, for a given capital stock, the effect of a change in capital relative price on excess supply of capital \([K(1-f)-fW]\). If a smaller capital price reduces excess supply, \( x_1 \) is positive. If \( f_p, 0, x_1 \) may still be positive even with \( (f_r r_q + f_p p_q) \) negative. The interpretation of this expression is simple. A higher price of capital has two effects on the desired fraction of wealth held as capital. The direct effect \( (f_r r_q) \) is negative because a higher capital price depresses the rate of return on capital. The indirect effect comes from wage indexation. The lower rate of return on capital makes room for a higher real wage and hence for a smaller inflation rate. If capital demand is a positive function of inflation, the indirect effect \( (f_p p_q) \) is negative and vice-versa.

We assume that the direct effect dominates thereby ruling
out the possibility that uncertainty in assets demands is so strong that the public holds more capital with a smaller rate of return provided that inflation is higher. Then $x_1$ is positive and (13) holds even for negative $f_p$.

Figure 1 shows the determination of steady state capital stock. We consider economies identical in every aspect except the sensitivity of capital demand to inflation. At every given capital stock, capital price $q$ satisfies simultaneously assets equilibrium (6) and wage setting (12-A). Net capital accumulation is the difference between the supply of new capital goods at the equilibrium capital price and depreciation.

In Figure 1, $K^*$ is the capital stock at which inflation is zero. That is, $K^*$ is the capital stock that satisfies (6) for $q = w^{-1}(z)$. By assumption, net capital accumulation at $K^*$ is positive. This will occur whenever base wages are relatively high. As capital accumulates, inflation rises. $K_0, K_1$ and $K_2$ are the steady state capital stocks with negative, zero and positive $f_p$ respectively.

Figure 1 shows that steady state real wages are higher and inflation is lower in the economy with positive $f_p$. The reason is apparent. For any given capital stock larger than $K^*$, the asset equilibrium capital price is higher when $f_p > 0$ than with $f_p < 0$. For if inflation stimulates capital demand, the rate of return required by the public to hold the existing capital
Figure 1.
stock is smaller than the rate that obtains when inflation stimulates the demand for indexed bonds. For any given capital stock, capital accumulation is larger with positive than negative \( f_p \). Since the rate of return is smaller with \( f_p \) positive, real wages are higher and hence the equilibrium inflation is also smaller.

Steady state current account in the above model also depends on \( f_p \). The current account varies inversely to capital relative price because the later stimulates investment and depresses savings by lowering the rate of return on capital and increasing wealth. We saw that steady state capital price and capital stock are higher when capital demand increases with inflation. As a consequence, the current account deficit is larger with \( f_p > 0 \). In an indexed economy in which peak real wages are too high for steady state inflation to be zero, the larger the increase in the demand for capital caused by inflation, the larger will be steady state output, wages and current account deficits.

**Foreign savings rationing.**

We now introduce the external rationing (7). Since by (13) convergence is assured, we may confine the analysis to the comparison of steady states in which \( k = 0 \). The steady state model is given below.
\[ (6) \quad q.K = f(r(q), i, p).(v + q.K) \]

\[ (9-A) \quad K = F(q)/d \]

\[ (12-A) \quad p = n.[z - w(q)] \]

\[ (7) \quad I(q) - S[r(q), i, v + q.K] = 0 \]

Substituting (9-A) and (12-A) into (6), we may solve for steady state capital price as a function of debt stock and interest rates. This is the internal equilibrium solution because it satisfies assets equilibrium but ignores the external constraint.

In Figure 2 the internal equilibrium loci in the \((q,v)\) plane appears in the positively sloped curves that meet at point \(T\) and differ solely on the sign of \(f_p\). The slope of the internal equilibrium loci is positive by (14) because a larger debt stock reduces the rate of return on capital required to hold the existing stock and by consequence increases capital relative price.

\[ (14) \quad dq/dv = f/x_2 > 0 \]

where \(x_2 = x_1 + q(1-f).F_q d^{-1} > 0\).

(14) shows that the slope of the internal equilibrium loci
Figure 2.
decreases with \( f_p \). The debt stock associated with zero inflation capital price \( w^{-1}(z) \) is \( v' \). For \( v < v' \), the steady state inflation rate is positive in internal equilibrium. Note that the larger the domestic debt, the lower the inflation rate dictated by internal equilibrium. The reason is that a large domestic debt decreases the rate of return on capital and by consequence the gap between peak and average real wages.

In Figure 2 steady state capital stock can be read as a direct function of steady state capital price \( q \) because of (9-A). By (12-A) steady state inflation is a direct function of the distance between \( q \) and \( w^{-1}(z) \). Inflation is larger and capital stock smaller with negative \( f_p \) for \( v < v' \). The same effect of capital demand sensitivity to inflation on internal equilibrium appeared in Figure 1 above.

Substituting (9-A) into (7), we may solve for steady state capital price as a function of domestic debt and interest rates. This is the external equilibrium capital price because it satisfies the external constraint but ignores assets equilibrium. The external equilibrium locus in the \( (q,v) \) plane is shown in Figure 2 by the XX curve. Its slope is given by (15):

\[
(15) \quad dq/dv = S_w / x_3 < 0
\]
where \( x_3 = I_q - S_zr_q - S_w(K + qFq^{-1}) > 0 \).

The external locus in Figure 2 was drawn for a positive \( S_w \). A larger debt stock depresses savings by the wealth effect and requires a larger steady state rate of return (lower \( q \)) not to violate (7). Without the wealth effect, the external equilibrium locus is a straight horizontal line in the (\( q,v \)) plane.

The solution to the model can be visualized in Figure 2. For any given debt stock, the current account shows a deficit if the value of \( q \) in the internal equilibrium locus exceeds the value indicated by the external locus and vice-versa. The positive, zero and negative \( f_p \) equilibria are A, B and C, respectively. An economy with negative \( f_p \) can absorb a larger domestic debt stock than economies with zero or positive \( f_p \).

The model captures the "absorption" effect discussed in the Introduction in a partial form. The sensitivity of indexed bonds demand to inflation helps in inducing the public to hold domestic debt. Inflation, however, is higher with negative \( f_p \). The result will be revisited in Section VI below. Under the assumption that the domestic debt stock grows until the current account constraint becomes binding, the above model implies that a larger stock of domestic debt is associated with a higher steady state inflation and a lower capital stock.
Introducing a positive natural growth rate in the model presents no difficulty. Note, however, that the "warranted" deficit that can be financed domestically without increasing the domestic debt/capital ratio depends on the natural growth rate and the initial debt/capital ratio. With a zero natural rate, the warranted deficit is also zero irrespective of the steady state debt to capital ratio. Thus in our model steady state debt to capital ratio is larger with negative \( f_p \) but the zero deficit condition holds independently of \( f_p \). With a positive natural growth rate, the warranted deficit is larger with negative \( f_p \).

Recasting the above analysis with the interest rate as a policy variable is also simple. A lower interest rate works like a larger debt stock in increasing relative price of capital to preserve assets equilibrium and depressing savings. Interest rates capable of inducing internal and external equilibrium are smaller when capital demand is depressed by inflation.\(^7\)

\(^7\) The steady state real rate of interest consistent with a fiscal regime that maintains domestic debt stock constant cannot be arbitrarily large. To simplify the analysis, we will not discuss the model with the interest rate as the policy variable.
IV. Disinflation.

We now discuss the transition from high inflation to price stability. The model is given by (6), (9-A), (12-A) and (7). The starting point is the ideal stabilization setting contemplated by the paradigm described above: budget deficit is zero, domestic debt stock is at the level compatible with external constraint and inflation is stable.

Taken in isolation, a further reinforcement of fundamentals in such ideal stabilization setting is not recommendable. Consider a temporary budget surplus that reduces the domestic debt stock. Steady state capital price (and capital stock) falls along the internal equilibrium locus. The current account improves but inflation increases. The reason, of course, is that base wages are exogenous.

As to incomes policy, it is apparent that price stability cannot be achieved solely by temporary price controls. The reason is that wage indexation is exogenous. Without suspending the backward looking indexation clauses, a price freeze increases real wages to peak level \( z \), thereby reducing the rate of return on capital and creating an excess supply of capital in assets markets even if capital demand is stimulated by inflation.\(^8\) Dynamics under price controls depends on rationing assumptions but controls alone cannot ensure assets and labor market equilibrium at the same time.

\(^8\) This follows from convergence condition (13).
In this section we compare two forms of incomes policy. The first is deindexation, namely, a reduction in the frequency of wage adjustments n. The second is base wage realignment to close the gap between equilibrium and base wages.\(^9\) Although both forms of incomes policy are disinflationary, they provoke a current account deficit with negative \(f_p\). We conclude the section by discussing the adjustments in domestic debt stock (or interest rates) required to adjust the current account.

Deindexation.

(12-A) implies that the longer the adjustment period, the smaller the inflation rate for given real equilibrium wages. A major limitation to the effectiveness of wage deindexation in the Brazilian context is that it is not feasible to delay wage adjustments for more than one year. The standard contract length is one year long --- a duration that was not either shortened in the inflation acceleration of the 1980s or stretched out over time in stabilization programs. If the initial inflation rate is already large as in Brazilian experience in the eighties, the values of n required to generate the same real wage for low equilibrium inflation

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\(^9\) Deindexation in this essay corresponds to the first sense of deindexation referred to in the Introduction. Base wage realignment assumes deindexation in the second sense.
rates stand well below the unit value.  

The changes in steady state capital price and inflation provoked by deindexation for a given debt stock and interest rate are given by (16) and (17).

\[
(16) \quad \frac{dq}{dn} = \frac{f_p W[z - w(q)]}{x_2} 
\]

\[
(17) \quad \frac{dp}{dn} = [z - w(q)].(1 - f_p.nw/W/x_2) > 0 
\]

(16) shows the sign of the change in steady state capital price depends solely on \( f_p \). Deindexation is expansionary iff \( f_p \) is negative and vice-versa. It affects neither internal nor external equilibrium in the neutrality case \( f_p = 0 \).

The reason the impact of deindexation on inflation depends on \( f_p \) is simple. The smaller frequency of wage adjustments reduces in itself inflation. If the lower inflation does not alter the rate of return required to induce the holding of

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\(^{10}\) A simple example illustrates the point. The wage indexation regime in place before the Cruzado Plan had six months indexing intervals. \( z \) is normalized at the unit value.

\[
w = \sum_{t=1}^{6} (1+p)^{-t} 
\]

Suppose equilibrium inflation is 11% per month. Average real equilibrium wage is 0.7067. Adjustment intervals have to augment from six months to 3 years to generate the same equilibrium wages for a 2% monthly inflation rate. We discuss further the role of the constant length of wage contracts in Section VI below.
existing capital stock, equilibrium wages are invariant to
deindexation. But if capital demand increases with inflation,
the rate of return falls and equilibrium wages rise, thereby
provoking a further decline in inflation rate. If capital
demand falls with inflation, the assets equilibrium effect
works in the opposite direction. Using the above definition of $x_2$
we find that $(1 - f_p \cdot nW_0W/x_2)$ -- the second term in the right-hand
side of (17) -- is positive even with $f_p > 0$. Deindexation
always reduces inflation.

Consider first the $f_p = 0$ case. A smaller frequency of wage
adjustments translates entirely into lower inflation without
any change in real wages or other variables. The model
dichotomizes relative to wage indexation; alternatively
stated, wage indexation is a "veil". Steady state inflation
decreases without any change in real equilibrium. With the
same wage gap, inflation may be arbitrarily close to zero if
$n$ is small enough. Price stability, however, cannot obtain
because at zero inflation real wages have to equal $z$. The
problem of deindexation in the $f_p = 0$ case is that low
inflation may require $n$ less than unity.

If $f_p < 0$, the reduction in inflation rate caused by
deindexation reduces the assets equilibrium rate of return on
capital. Because deindexation increases equilibrium real
wages, the gap between base and equilibrium wages is a direct
function of $n$. Depending on the absolute value of $f_p$, it is
possible that price stability is generated by positive n values (the second term in the right-hand side of (17) is larger than one). Deindexation in the negative $f_p$ case causes a current account deficit. The reduction in the rate of return on capital stimulates investment and capital accumulation. Savings fall in turn because of the reduction in the rate of return and the wealth effect.

If $f_p > 0$, deindexation increases the rate of return on capital and by consequence depresses equilibrium wages. The gap between base and equilibrium wages increases as inflation falls (the second term in the right-hand side of (17) is smaller than one). Deindexation reduces the steady state capital stock and improves the current account but is less effective as a disinflation tool than in other cases.

These results also show the effect of a compulsory shortening of wage indexing intervals motivated by the concern of raising or protecting real wages. In the discussion of inflation acceleration in Brazilian experience it was frequently held that in a pure inertial inflation world exogenous wage indexation shocks are neutral: halving the indexing interval doubles inflation rate without altering real wages. The analysis suggests that this will occur if the higher inflation rate does not alter the desired wealth composition between real and financial assets. But if $f_p$ is

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11 The 1979 law that shortened the wage indexing interval from one year to six months is an example of such policy.
negative, halving the indexing interval decreases equilibrium real wages and more than doubles the inflation rate.

Realignment of base wages.

Inflation in the model is a mechanism to offset base wages exceeding equilibrium values. Indexation only magnifies the problem of having too high initial wages. Another incomes policy is to reduce (or eliminate) the gap between base and equilibrium wages. Since in our model there is no wage contract staggering, the effects of base wage realignment may be captured by reducing $z$. Instead of (12-A), we now have (18) where $M$ stands for the base wage realignment:

\[(18) \quad p = n.(z - M - w(q))\]

The neutrality rule used in Monetary Reforms consisted in eliminating the excess of peak to average real wages. It gives different results depending on the initial steady state equilibrium. The reduction in base wages is larger with negative than positive $f_p$ because real wages are lower in the former case. The neutrality base wage realignment is given by (19).

\[(19) \quad M = z - w(q) = p/n.\]
The impacts of base wage realignment on steady state capital relative price and inflation for a given debt stock and interest rate are given by (20) and (21):

\[\text{(20)}\quad \frac{dq}{dM} = -f_p \cdot \frac{W_n}{x_2}\]

\[\text{(21)}\quad \frac{dp}{dM} = -n \cdot (1 - f_p \cdot \frac{w_q w}{x_2^2}) < 0\]

(20) and (21) show that base wage realignment works similarly to deindexation. The effect on steady state capital price depends on \(f_p\) but in all cases it reduces steady state inflation. Besides the direct disinflation effect (lower beginning of period wages) there is an additional effect that depends on assets markets. If \(f_p = 0\), the indirect effect does not exist. Realignment is neutral and the neutrality rule (19) is validated.

If \(f_p < 0\), realignment depresses the rate of return on capital. Average real wages increase which means that the neutrality rule (19) overstates the size of the reduction of base wages required to produce price stability. The reduction is smaller than the steady state gap between peak and equilibrium wages. As with deindexation, base wage realignment provokes a current account deficit because it expands the sustainable capital stock.

If \(f_p > 0\), realignment is contractionary. Because real wage falls, the neutrality rule understates the required reduction
in base wages. Price stability requires a base wage realignment larger than the initial wage gap.

These results also show the effect of exogenous changes in base wages. Consider for instance a policy rule that imposes minimum base wage adjustments to exceed past inflation by a given percentage amount.\textsuperscript{12} Since relative wage structure has little flexibility, changes in minimum wage set the pattern for higher wages as well. We capture such policy rule in the model by a negative $M$ that raises $z$. (21) shows that the policy objective of increasing real wages only obtains with positive $f_p$. Higher minimum wages will always raise steady state inflation but more so with negative $f_p$. In this case, policy results are the opposite of intentions as real wages fall.

Compensatory policies.

The current account deficit provoked by incomes policy with negative $f_p$ can be offset by contractionary adjustment in fundamentals. A lower inflation increases the demand for capital but smaller domestic debts or higher rates of interest exert the opposite effect by making capital relatively less scarce or increasing the attractiveness of indexed bonds. The

\textsuperscript{12} As mentioned in the Introduction, such rules were frequently adopted in the 1980s. The recovery of the purchasing power of minimum wages was already a major topic in policy debates before democratization.
policy issue discussed now is how to stabilize with the smallest possible cost. In the analysis below, incomes policy is captured by base wage realignment while the compensatory adjustments are circumscribed to changes in domestic debt stock. The problem is to find out the smallest possible reduction in debt and base wages capable of generating price stability without incurring into a current account deficit.

Consider again Figure 2. A, B and C are the initial equilibria for positive, zero and negative $f_p$, respectively. Base wage realignment decreases the zero inflation steady state capital price to $w^1(z - M)$. The internal equilibrium locus for $f_p = 0$ is unaltered by $M$. The internal equilibrium loci for $f_p$ different from zero are given by the two inside parallel curves. The slopes of the new equilibrium loci for positive and negative $f_p$ are the same as before but they now meet at point Q.

In Figure 2, F, B and E stand for positive, zero and negative $f_p$ after realignment equilibria. The current account exhibits a surplus (deficit) for positive (negative) $f_p$. In all cases, inflation will be lower. The zero inflation capital

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13 Note that without a capital levy the reduction of domestic debt stock takes time while base wage realignment coupled with a temporary price freeze provokes rapid disinflation. Monetary policy through higher interest rates tends to be the preferred policy compensation in the short run. Because we confine our analysis to steady state comparisons, the emphasis laid on fiscal policy is more appropriate.
price falls from $w(z)$ to $w(z-M)$. The equilibrium capital price also changes if $f_p$ is not zero. If $f_p$ is negative, the internal equilibrium $q$ value is larger at the given capital stock $v_0$.

Current account adjustment with negative $f_p$ requires the reduction of debt stock from $v_0$ to $v_1$, the largest debt stock at which the external constraint still holds. Final equilibrium will be $F$. If $f_p$ is positive, domestic debt can be expanded up to point $H$ without provoking a current account deficit.

In Figure 2, the realignment of base wages was not enough to generate price stability. As $M$ increases, the zero inflation capital price falls along the internal equilibrium locus with $f_p = 0$. In the negative $f_p$ case, inflation falls but the fiscal effort increases as domestic debt stock is reduced along the external constraint locus. When $q_2$ is the zero inflation capital price, inflation is zero and domestic debt stock is $v_2$.

From the policy viewpoint, the minimum fiscal effort required to generate price stability with negative $f_p$ is indicated by $[v_0 - v_2]$. The interpretation of this result is apparent. $v_2$ is the maximum debt stock that the economy can tolerate without provoking a current account deficit if $f_p = 0$. Domestic debt at point $C$ is larger than at $B$ because inflation depresses capital demand; when inflation is zero, the debt stock that the public is willing to hold at the same
rate of interest is smaller than before.

Another aspect of interest is that stabilization increases real wages with negative $f_p$. If inflation depresses capital demand, the rate of return on capital has to be larger and accordingly steady state real wages are smaller. The widely held notion that inflation erodes real wages has thus a facet of truth -- not in the sense that peak real wages are zero inflation equilibrium wages but rather in that real wages increase with price stability.

It follows that the neutrality rule (19) is misleading iff $f_p$ is negative. The excess of peak to average real wages evaluated at the C equilibrium is $M = [z - w(q_3)]$. But the implementation of this neutrality rule would magnify either the current account deficit at $v = v_0$ or the fiscal effort required to produce price stability from $[v_0 - v_2]$ to $[v_0 - v_3]$. The optimal realignment of base wages for negative $f_p$ is the neutrality rule evaluated at the $f_p = 0$ equilibrium, namely, $M = [z - w(q_2)]$.

Recasting the analysis for deindexation presents no difficulty. A smaller $n$ rotates downwards (upwards) the internal equilibrium locus for positive (negative) $f_p$ leaving unaltered the zero inflation capital price $w^{-1}(z)$. The impact on inflation, however, cannot be read in the $(v,q)$ plane because inflation is no longer a constant multiple of $[z - w(q)]$. Deindexation is neutral if $f_p$ is zero but also

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requires a reduction of debt stock to satisfy the external constraint if \( f_p \) is negative.

The adjustments in domestic debt stock may be stated formally. Let \( G^1(q,v;\beta) = 0 \) and \( G^2(q,v;\beta) = 0 \) be the internal and external equilibrium functions where \( \beta \) is either \( M \) or \( n \). The effects of incomes policy on the pair \((q,v)\) that satisfies simultaneously internal and external equilibrium are then given by (22) and (23).

\[
(22) \quad \frac{dq}{d\beta} = - (f_p.S_w)(p\beta/J)
\]

\[
(23) \quad \frac{dv}{d\beta} = -(f_p.x_3)(p\beta/J)
\]

where \( J = -S_wx_2 + f_wx_3 > 0 \) is the endogenous variable Jacobian. By (12-A) \( dp/dM = -n < 0 \) and \( dp/dn = [z-w(q)] > 0 \).

(22) and (23) show that incomes policy is neutral and requires no further adjustment on domestic debt stocks iff \( f_p \) is zero. This is the case contemplated by the pure inertial inflation paradigm. For negative \( f_p \) incomes policy raises real wages and sustainable capital stock if the wealth effect is present. Debt has to be reduced to keep the current account in equilibrium irrespective of \( S_w \) being positive or zero.

**Domestic debt stock adjustments and the role of foreign finance.**
Domestic debt reductions may occur through temporary fiscal surpluses or a capital levy. We focus here briefly on non-fiscal alternatives to reduce domestic debt: privatization and external finance.

In the Brazilian economy, the budget of the non-banking productive public sector is more than three times the size of Treasury budget and public sector banking activities account for more than half of overall credit supply. The initial impact of privatization is to increase the private capital stock and reduce domestic debt stock. Relative capital price falls and the sustainable capital stock at which net capital accumulation is zero will be smaller than before. The result will be a move along the internal equilibrium locus decreasing q and v. The effect on overall capital stock, however, depends on the determinants of public sector investment.\textsuperscript{14}

Foreign saving has different effects depending on whether it flows to private or public sector. It is possible to attract finance to the private sector even with interest arrears in public external debt.\textsuperscript{15} In our model, a positive

\textsuperscript{14} It is likely that, because of the Tanzi effect and the political rigidity of real government consumption expenditure, keeping budget balanced under high inflation requires cuts in public investment. Privatization may then increase overall capital stock by augmenting the equilibrium public sector capital stock.

\textsuperscript{15} In 1991 domestic firms were allowed to issue commercial papers with their own exports as collateral. This meant that new loans enjoy a priority status on the allocation of reserves. The immediate consequences was an inflow of foreign finance to the private sector.
right-hand side of (7) shifts the external constraint to the right. Equilibrium may then obtain with lower interest rates or higher debt stocks. Inflation falls and sustainable capital stocks are larger. In disinflation, larger foreign savings channelled to private sector current account reduce the necessity of a further tightening of fiscal policy. In Figure 2, for instance, point E can become feasible after base wage realignment if curve XX moves to the right.

The same trade-off between fiscal effort and external support can be viewed in the public sector current account. In the assumed fiscal regime the primary budget surplus equals the sum of interest service on domestic debt plus net transfers to creditors abroad. For the same primary budget surplus, more external finance allows government to redeem domestic debt. The replacement of domestic by external debt works from the stabilization viewpoint as a reduction in domestic debt without capital levy or temporary budget surplus.16

16 Reversing the process by which internal debt accumulated mentioned in the Introduction can only help stabilization if the time horizon for paying back external debt is large. We did not include in our model complications arising from inter-temporal budget equilibrium or the dependence of savings on the specification of disposable income.
V. Uncertainty in savings.

In (12), the variability of the average real wage is \( \sigma^2(p)/n^2 \), where \( \sigma^2(p) \) is inflation rate variability. Under the two-fold assumption that inflation variability and uncertainty come together and increase with mean inflation, wage income uncertainty increases with inflation for a given indexing lag parametrized by \( n \). With risk aversion, wage income uncertainty decreases workers expected utility and creates an additional precautionary motive for savings.\(^{17}\)

We capture the uncertainty effect on savings by modifying (7) to (24) below. For simplicity, we disregard measure differences between inflation rate uncertainty and variability. We also assume inflation rate standard deviation to be proportional to mean inflation: \( \sigma(p) = a \cdot p \), the constant \( a \) being positive and taken as unity in the derivations below. Savings increase with inflation but decrease with more frequent wage adjustments.\(^{18}\)

\[
(24) \quad I(q) - S(r(q), i, v + q.K, p/n) = 0
\]

\(^{17}\) See Blanchard and Fischer, 1989, ch. 6.

\(^{18}\) It has been frequently suggested in Brazilian Policy circles that savings increase with inflation because inflation reduces real wages and the propensity to save of capitalists is higher than that of workers. The major weakness of the forced savings argument is the twofold assumption that higher inflation always decreases real wages and savings are strictly proportional to income. The resemblance of (24) to the forced savings argument is superficial.
The slope of the external equilibrium *locus* in the \((q,v)\) plane is now given by (25) instead of (15):

\[(25) \quad dq/dv = S_{n}/x_{4} < 0\]

where \(x_{4} = x_{3} - n^{-1}S_{p}/n_{p_{q}} > 0\).

Figure 3 shows base wage realignment with uncertainty in savings. The zero inflation capital price before the reduction of base wages is \(w^{-1}(z)\). The external *locus* XX assumes \(S_{p/n} = 0\) while YY assumes that \(S_{p/n}\) is positive. For simplicity, we show the internal equilibrium *loci* only for zero and negative \(f_{p}\). The zero \(f_{p}\) equilibria are A and C; the negative \(f_{p}\) equilibria are B and D. If inflation is positive, the steady state capital price for any given debt stock is larger with uncertainty in savings. The reason is that the increase in savings caused by inflation renders more investment possible without incurring into a current account deficit. Savings sensitivity to inflation yields a larger debt stock, a larger sustainable capital stock and lower inflation because it works like a less restrictive external constraint.\(^{19}\)

The initial equilibria in Figure 3 are C and D. Consider a base wage realignment given by the neutrality rule calculated at the \(f_{p} = 0\) equilibrium, that is, \(M_{1} = z - w(q_{1})\). As indicated

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\(^{19}\) As with capital demand, comparison is carried out under the assumption that, everything else being the same, savings at zero inflation are invariant to the value of \(dS/d(p/n)\).
in Figure 2, this base wage reduction suffices to generate price stability in the neutral case. But with savings uncertainty, point C cannot be an equilibrium. Real wages are unaltered but consumption increases because of less inflation rate uncertainty, thus provoking a current account deficit. With base realignment $M_1$, the external locus shifts to VV. The new equilibria are $E$ (for zero $f_p$) and $F$ (for negative $f_p$). Inflation will persist in both cases. It stands to reason that the minimum base wage realignment required by price stability is $M = z - w(q_2)$.

Savings uncertainty complicates the stabilization process. From the viewpoint of domestic debt, it magnifies the problems posed by assets market uncertainty. Domestic debt reduction is necessary with $f_p = 0$ and, depending on the size of $S_{p/n}$ may be needed even for positive $f_p$. In Figure 3, the minimum debt adjustment for negative $f_p$ can be decomposed into $[v_0 - v_1]$, the adjustment required to offset assets uncertainty and $[v_1 - v_2]$, the adjustment required to offset savings uncertainty. For zero $f_p$, debt stock adjustment is limited to offsetting savings uncertainty.

Uncertainty in savings also magnifies the labor problem by increasing the size of the base wage reduction. With negative $f_p$ but no savings uncertainty, real wages increase with stabilization as indicated by the distance between the
coordinates of D and C in the vertical axis. With savings uncertainty the net outcome is ambiguous. The zero inflation real wage is \(w(q_2)\) which may be larger or smaller than the real wage at point D. It follows that the neutrality rule for base wage realignment may be inaccurate even when calculated at the \(f_p = 0\) equilibrium.

The effect of inflation uncertainty on savings may be stated formally using the internal and external equilibrium equations \(G^1(.) = 0\) and \(G^2(.) = 0\). The implicit functions analogous to (22) and (23) with savings uncertainty for base wage realignment are (26) and (27).

\[
(26) \quad \frac{d\gamma}{dM} = - (p_H/J) (f_p S_H - n^{-1} f W S_{p/n})
\]

\[
(27) \quad \frac{dv}{dM} = - (p_H/J) (f_p x_4 - n^{-1} x_2 S_{p/n})
\]

where \(J = S_H x_2 + f W x_4 > 0\) is the endogenous variable Jacobian and by (12-A) \(p_H = -n < 0\).

The isolated effect of savings uncertainty appears in the last term of (26) and (27). Savings uncertainty as such requires a reduction of domestic debt stock and is contractionary. If \(f_p\) is negative, it magnifies the size of domestic debt reduction and renders the effect of stabilization on real wages and capital stock ambiguous. The pure inertial inflation paradigm holds true if uncertainty
effects are not present: \( f_p = S_{p/n} = 0 \).

For deindexation, the presence of savings uncertainty does not add new terms to (22) and (23). Wage income variability stays constant if disinflation is accomplished by longer indexing intervals. The result, of course, depends critically on the assumption that inflation rate standard deviation is proportional to the mean inflation rate. Savings uncertainty makes deindexation attractive because real wage variability decreases more with base wage realignment.

A final remark on wage income uncertainty is appropriate. In principle, it would shift portfolios in the direction of assets the holding of which offsets the riskiness of the real return on human capital.\(^{20}\) Capital may seem a strong hedge candidate because of the factor price frontier (11). Two aspects of Brazilian reality, however, inhibit hedging through capital assets.

The first is relative price uncertainty. In Brazilian experience higher inflation rates increase relative price uncertainty. The holding of capital assets becomes by consequence less attractive for risk averse workers as inflation rises. The second is the little presence of mutual funds for real assets diversification. The stock exchange is poorly regulated and regarded as a highly speculative gamble. As a consequence, minimizing relative risk uncertainty by a

portfolio of capital assets involves large transaction costs. In contrast, the access to indexed bonds is simple and safe in Brazilian institutional set-up.\textsuperscript{21}

\textsuperscript{21} As discussed in the \textit{Introduction}, passbook savings accounts are available on demand, have no minimum deposit requirements and enjoy government insurance.
VI. Endogenous wage settings.

In the standard description of backward looking indexation (12-A), beginning of period real wages, the frequency of wage adjustments and the response of adjustments to current inflation are exogenous. We discuss in this section the effects of inflation and unemployment on z and n.

In Brazilian institutional arrangement, base wage share revised by collective bargaining or specialized labor courts at the expiration date of wage contracts. The only exception is the minimum wage that is regulated by government. Wage contracts are staggered and the overlapping calendar for the several labor categories is fixed by law.

In spite of the inflation rate acceleration in the 1980s, the duration of wage contracts was not shortened. The standard contract remained one year long which implies that base wages changed once per year. The main endogenous determinant of base wages was the state of labor market during the collective bargaining period. In contrast, the indexing lag responded to changes in inflation rates. Two forms of adaptation may be distinguished. Market adaptations took place through spontaneous wage increases not contemplated by the wage indexing law in place. Market adaptations were backward looking in the sense of being motivated by previous changes in inflation rate. Legal adaptations took place through revisions in the indexing law that accompanied every stabilization.
program in the 1980s.

This evidence suggests two questions. First, why increases in inflation rates were not matched by larger base wages? Second, was adaptation through shortened wage adjustment intervals enough to prevent inflation from eroding real wages?

Two possible answers can be given to the first question. The first relies on risk aversion. With a given contract duration, the same expected average real wage can be obtained by larger base wages or shorter intervals. But the wage income uncertainty is larger with the former than with the latter. The second answer relies on the concern to keep the "fairness" of relative wages. With staggered contracts, adaptation to higher inflation through base wages lead to large fluctuations in relative wages. In contrast, matching inflation rate changes through synchronized across-the-board increases keep relative wage structure undistorted.

As to the second question, in Brazilian experience adaptations of n to inflation were partial. On the one hand, market adaptations took time to materialize. An increase in inflation rate always depressed real wages at least temporarily. Making up the ground lost to inflation was impossible in the periods with inflation rate acceleration. On the other hand, institutional adaptation responded to a large extent to the design of stabilization programs. As discussed in the Introduction, stabilization programs faced a trade-off between the setting of initial nominal wages and the
introduction of COLA provisions. There was no revision of the adopted indexing scheme between stabilization programs is spite of the large inflation rate acceleration that took place in the intervening periods.

A full discussion of the dependence of real wages on inflation is misplaced here. A possible explanation may be found in the association between mean inflation rates and inflation rate uncertainty. Firms are risk neutral but workers are risk averse with utility functions depending on expected real wages and real wage uncertainty. As inflation rises, utility falls for the same expected real wage. Workers and firms are better off with smaller expected real wages at higher inflation rates provided that the increase in inflation rate uncertainty is attenuated. This means that as inflation rises wage adjustments become more frequent -- indexation is endogenous -- and expected real wages fall and vice-versa.22

These considerations motivate the three different wage settings below. Every one differs from (12) by a single aspect.

\[
(28) \quad w(q) = z - p/n(p) = H(z, p), \quad H_p < 0.
\]

Note that the suggested explanation ignores that indexing laws imposes a minimum frequency of wage adjustments. The legal framework becomes a relevant constraint if the optimal market choice of \( n \) is smaller than the compulsory frequency. See Liviatan, 1983, for a related formulation of the problem leading to partial indexation.
\[ w(q) = z - b \beta, \quad b > 0. \]

\[ w(q) = z(K) - p/n \]

(28) introduces partial endogenous indexation. A larger inflation rate decreases real wages because the adaptation of wage adjustment frequency is not complete. It will be seen that partial endogenous indexation is inflationary and reinforces the stabilization problems posed by negative \( f_p \).

(29) assumes that the adaptation is complete but takes time to develop. Changes in \( n \) are triggered by the observation of prior changes in inflation. A permanent acceleration of inflation rate reduces real wages permanently according to a constant proportionality factor \( b \). (29) captures the distributive conflict theories of inflation.

(30) introduces base wages sensitivity to unemployment. With a fixed or low elasticity labor supply, an increase in capital stock reduces unemployment and raises base wages. It will be seen that if base wage sensitivity is large enough, the absorption effect discussed in the Introduction holds for both domestic debt and inflation.

The three specifications are not exclusive. It is possible to combine base wage sensitivity to unemployment to partial or complete indexation. It is worth noting that none of the specifications capture the asymmetric sensitivity to inflation and unemployment mentioned in the Introduction.
The model with (28).

To gain insight on endogenous indexation, consider two economies differing only on the effect of inflation upon n. Assume that n has the same value for the two economies in the initial equilibrium. We know from the previous analysis that an increase in base wages without any compensatory adjustment in domestic debt stocks or interest rates always increases inflation. It stands to reason that the increase in inflation will be always larger in the endogenous indexation economy. If $f_p = 0$, endogenous indexation is inflationary but does not affect real equilibrium. If $f_p < 0$, the additional inflationary impact provoked by shorter wage intervals depresses capital demand and hence capital relative price. The steady state capital stock following the increase in base wages is smaller in the endogenous indexation economy.

Reversibly, base wage realignment is more effective in reducing inflation with endogenous indexation because a lower inflation rate induces a lengthening of wage adjustment intervals. If $f_p < 0$, the current account deficit provoked by incomes policy will be larger in the endogenous indexation economy and the required adjustment in fundamentals will be consequently larger.

This can be stated formally in (22) and (23) above with $\beta$ taken as M. The difference between exogenous indexation (12)
and endogenous indexation (28) appears in $p_m$. It is apparent that $p_m$ is larger in absolute value in the endogenous indexation economy. If we assume for the sake of comparison that $n$ is the same for both economies in the equilibrium before base wage realignment, (22) and (23) show that with negative $f_p$, endogenous indexation makes stabilization more expansionary and requires an even larger adjustment in domestic debt to maintain current account equilibrium. The increase in real wages following stabilization is coherent with the rationale suggested above for partial endogenous wage indexation.

The model with (29).

Consider the model (6), (9), (29) and (7). For any given capital stock and inflation rate, let $q(K,p)$ and $v(K,p)$ stand for the capital relative price and debt stock that satisfy at the same time assets market equilibrium and the external constraint. A higher capital stock increases capital price while the impact of inflation on $q$ depends on $f_p$ as seen above. If we assume that policy variables adjust to satisfy $v(K,p)$, the model can be stated as:

$$\dot{k} = F[q(K,p)] - dK$$
Figure 4.
\[ p = b^{-1} \left( z - w[q(K,p)] \right) \]

Figure 4 shows the dynamics in the \((K,p)\) plane with \(f_p = 0\). Steady state capital stock is \(K_s\). The vertical line over \(K'\) is the constant inflation locus in which real wages are equal to \(z\). Inflation accelerates in steady state because we assumed that \(z\) is high enough as to make \(K' < K_s\).

Figure 4 describes the story underlying distributive conflict theories. Inflation can only be stable if equilibrium wages are equal to target or desired peak real wage \(z\). Complete endogenous indexation may cause hyperinflation even though the budget is balanced. This is possible, of course, because money is passive.

In the model, a price freeze is successful only if \(K' = K_s\). It has to be preceded by a base wage realignment that shifts the constant inflation locus to the right. In the particular case in which inflation is indeterminate a price freeze suffices alone to generate price stability.

In Figure 4, inflation acceleration is constant in steady state equilibrium. The model with \((30)\) and \(f_p = 0\) is nothing but a "one-derivative-ahead" version of the model with \((12)\) in which inflation acceleration, and not inflation, affects real wages. Not surprisingly, the "right" \(M\) that makes the loci coincide is given by the neutrality rule \(M = z - w[q(K_s,0)]\).

The substitution of inflation by inflation rate

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acceleration as a determinant of capital demand offers no
difficulty. The "one-derivative-ahead" model with capital
demand increasing with inflation rate acceleration can be
interpreted as reflecting lags in inflation date collection.
Because it takes time to calculate the inflation rate, the
real rate of return on indexed bonds may fall below the coupon
rate if inflation accelerates continuously.

To complete the analysis, we have to examine the other $f_p$
cases. Suppose capital demand increases with inflation. The
two loci of Figure 4 rotate to the right with $(0,K^*)$ and
$(0,K_q)$ as fixed points. The equilibrium exists and is globally
stable. Steady state capital stock is larger than $K_q$ and real
wages are $z$. Price controls taken in isolation provoke
repressed inflation. If $f_p$ is negative, the two loci rotate to
the left with the same fixed points. Equilibrium exists and
exhibits negative inflation for $K^*<K_q$ and vice-versa. In
contrast to the positive $f_p$ case, equilibrium is a saddle
point.²³

The model with (30).

²³ The reason for the saddle point property is simple. For
a given capital stock $K$, there is just one inflation rate $p(K)$
that ensures through assets equilibrium that real wages are $z$.
$p(K)$ is the stable inflation for capital stock $K$. Suppose the
existing inflation is higher than $p(K)$. If $df/dp$ is positive,
real wages will be larger than $z$ and inflation will fall. But
if $df/dp$ is negative, real wages will be smaller than $z$ and
inflation with be even higher.
Consider the model given by (6), (9) and (30). The convergence condition to a stationary capital stock is now given by (33) instead of (13).

\[(33) \quad F_q(x_0/x_1) < d\]

where \(x_0 = -q(1-f) + Wf_p p_x\).

If \(f_p = 0\), (33) is identical to (13). The reason is that, in this case, the increase in base wages as capital accumulates provokes more inflation but does not affect assets equilibrium.

\(x_0\) shows the effect of capital stock on excess demand for capital \((fW - qK)\). Besides the direct negative effect \([-q(1-f)]\), there is now another effect that depends on \(f_p\). A larger capital stock increases base wages and hence inflation. If more inflation reduces capital demand, the indirect effect reinforces the direct effect. With negative \(f_p\), well-behaved convergence depends solely upon \(x_1\).

If \(f_p\) is positive, convergence may still be well behaved as long as \(x_0\) is negative. To stress the parallel with the above analysis of the model with (12), we rule out the possibility that the increase in the demand for capital as inflation rises is so strong that the public is willing to hold a larger capital stock with a smaller rate of return. With \(z > 0\), the convergence condition puts an upper bound on \(f_p\) besides the
positive $x_1$ lower bound for negative $f_p$.\footnote{The complete condition of $f_p$ for well behaved convergence is: $-(1/w_q).([K(1-f)/W] - f_x r_q) < n.f_p < (1/z_k).[q(1-f)/W].}$

From the viewpoint of comparative statics, the z exogenous model implies that inflation declines as steady state capital price rises. A temporary budget surplus that reduces $v$ permanently, for instance, increases inflation with exogenous $z$ because relative capital price is lower in the new equilibrium. With endogenous $z$, however, the effect is indeterminate because base wages also fall following the reduction in the sustainable capital stock. Using (12) and (9-A), all the previous results hold true if (34) below is negative:

\begin{equation}
(34) \quad z_F d^{-1} - w_q
\end{equation}

(34) becomes positive for large $z_k$. In this case, steady state inflation increases with capital relative price. A reduction in debt stock decreases inflation in spite of the fall in equilibrium wages.

Figure 5 below shows internal and external equilibrium loci with positive (34). For simplicity, we assume $s_{p/m} = 0$. The zero inflation domestic debt stock is $v^*$. The initial equilibrium is A, B and C for positive, zero and negative $f_p$, respectively.
The comparison between Figures 5 and 2 is of interest. There is inflation with positive (34) because the domestic debt stock is too large and not because of the current account constraint. As before, the domestic debt stock compatible with the external constraint is larger with negative \( f_p \). The difference lies in that with positive (34) the steady state equilibrium with negative \( f_p \) also exhibits smaller inflation. This is the absorption effect discussed in the Introduction in its complete form.

With positive (34), a reduction in debt stocks improves the current account and decreases inflation. The specification of the model thus removes the perverse effect on inflation of adjustments in fundamentals taken in isolation discussed above. Policy implications, however, are similar. Base wage realignment shifts equilibrium at the same debt stocks to F, B and E for positive, zero and negative \( f_p \), respectively. Incomes policy with negative \( f_p \) causes a current account deficit. Relying solely on fundamentals places in turn a heavy burden on fiscal policy as the economy has to move from C to T. Real wages falls and the current account exhibits a surplus. The best solution is to combine incomes policy with domestic debt reduction to move the economy from C to B.

Whether (34) is negative or positive is an empirical issue. Evidence on the difficulties of stabilizing indexed economies suggests that \( z_k \) is not very large. If it were large, a small
change in unemployment would suffice to bring inflation to zero without incomes policy.
VII. **Conclusions.**

The principle that emerges from the above analysis is intuitive. Successful stabilization requires offsetting all the effects of high inflation on assets demand and savings. Because of inflation rate uncertainty, the domestic debt stock compatible with the external constraint in inflation equilibrium exceeds demand under price stability. Stabilization requires a reduction in domestic debt stock to keep the current account balanced. The result does not depend on the wage setting specification. It holds for exogenous wage setting (12), endogenous indexation (28) or (30) and even if base wages are very sensitive to unemployment (positive 34).

The analysis casts doubt on the notion of monetary correction as a "veil". It is surely a veil in the sense that economic agents do not mistake monetary correction of nominal values for changes in real values. It is not a veil, however, in the sense that real variables in inflation equilibrium and price stability have the same values. The pure inertial inflation paradigm addresses the case $f_p = S_{p/n} = 0$. In this particular case, neutral base wage realignment suffices for price stability. In general, price stability cannot be obtained without adjustment in fundamentals even if inflation is purely inertial.

These results do not challenge the usefulness of incomes
policy. In the model with exogenous wage setting, further reductions in domestic debt taken in isolation serve to adjust the current account but increase inflation rates. Incomes policy is an essential ingredient of stabilization. In the model with large sensitivity of base wages to unemployment (positive (34)), incomes policy may be left aside because debt stock reductions improve the current account and decrease inflation at the same time. From the social point of view, however, the best solution is to combine debt reductions to incomes policy.

The results also suggest that the heuristic use of neutrality wage conversions is in general misleading. The specification of incomes policy that suits best the stabilization program depends on properties of overall equilibrium. With zero budget deficits, neutrality overstates the reduction of base wages if uncertainty comes from assets demands and more so if indexation is endogenous. The effects become ambiguous when savings uncertainty is added to the picture. In general, reckoning the gap between average and base wages at inflation equilibrium does not indicate the appropriate reduction of base wages in stabilization programs.

The effects of stabilization on real wages cannot be established independently of the effects of inflation rate uncertainty. If the assets uncertainty effect dominates, real wages increase with stabilization. This condition may provide a rationale for the widespread popular support of
stabilization programs. It also suggests that the emphasis laid by the inertial paradigm on controlling nominal wages is exaggerative. If the net effect of incomes policy is expansionary, raising real wages do not necessarily lead to repressed inflation. Apparently overgenerous wage policies that reduce base wages by less than the initial wage gap do not necessarily jeopardize the equilibrium in the current account. The counterpart is that the inertial paradigm underplays the fiscal problem. Stabilization is eventually expansionary but requires the adjustment of domestic debt stock to an economic setting in which inflation rate uncertainty is much lower.

As to incomes policy instruments, the above analysis suggests that base wage realignment is preferable to deindexation. The advantage of the later emerges with savings uncertainty but has to weighted against the once per year minimum frequency of wage adjustments. If inflation in the starting point is large, deindexation is not a feasible incomes policy.

The assumption that domestic debt expands until the current account constraint is met is central to the above results. From the political economy viewpoint, this assumption means that balance of payment disequilibrium and not inflation provides the warning sign of a budget problem. The assumption is realistic in that the restraint of foreign finance has been a necessary precondition for the imposition of fiscal controls.
in Brazilian experience. It was not a sufficient condition, though. As discussed in the Introduction, Brazilian stabilization programs targeted simultaneously on budget balance, current account equilibrium and incomes policy. The reference to an ideal stabilization setting is intended not as a description of Brazilian stabilization experience but rather to test the design consistency of Brazilian stabilization programs.

A final remark on the role of external support is appropriate. The expansionary effect of incomes policy provokes a current account deficit at a given domestic debt stock. External support helps solving the domestic debt overhang problem. External savings channeled to the private sector improve the current account at the same domestic debt stock. External finance may also allow government to redeem domestic debt without raising the primary budget surplus or imposing a capital levy. Because of the domestic debt overhang, the role of external support in stabilization goes beyond the traditional function of providing foreign exchange to back the domestic currency.
The Analytics of the Collor 1 Monetary Reform.¹

Persio Arida

I. Introduction.

In Brazilian stabilization programs, Monetary Reforms were adopted to realign base wages and/or alter wage indexation rules. In the Collor 1 Plan of March 15, 1990, the Monetary Reform served also to impose a forced lengthening of the maturity of financial assets. There was no cutting of zeroes and the old currency -- the "novo cruzado" or simply the cruzado -- was replaced by a new currency named as the cruzeiro. The conversion rate of cruzados into cruzeiros was one to one. The novelty lay in that a large fraction of financial wealth was blocked in cruzados.

With the exception of cash (notes and coins) and financial assets possessed by government entities such as the Federal and states governments and municipalities, all other financial assets were subject to blockage at maturity independently of their nature. Private and government debt was treated alike.

¹ Thanks go to Andre Lara-Resende for discussions on the second essay. He should be considered the co-author of the T accounts scheme.
There were just two blockage rules. For demand deposits and passbook savings, conversion into cruzeiros was limited to a maximum of 50,000 cruzeiros, equivalent to 625 dollars by the average black market exchange rate of the days preceding the Reform. For all other financial assets, conversion into cruzeiros was limited to 20%. Conversion of funds retained in cruzados into cruzeiros took place in 12 monthly installments starting 18 months after the initial blockage. The 12+18 months schedule for releasing retained funds admitted no exceptions.

The outstanding effect of the Monetary Reform was to impose a compulsory lengthening of the maturity of financial assets. Before the Collor Plan, financial assets maturity was very short. For all assets daily repurchase agreements were operative. In contrast, the Monetary Reform blocked access to a substantial fraction of financial wealth for 18 months. Taking into account the 12 month period of restitution, the average maturity for wealth withheld in cruzados was two years.

Blocked cruzados were allowed to settle some kinds of transactions during the initial six months of the Collor Plan. The general criterion was that contractual obligations incurred before the issuance of the Monetary Reform could be settled in cruzados depending solely on the decision of the debtor. This feature of the Reform minimized the risk of bankruptcies that could take place if a straight compulsory
lengthening of maturity of financial assets was imposed by surprise. Since the cruzeiro was the legal tender, transactions eligible for cruzados could be settled in cruzeiros as well. The Monetary Reform introduced a parallel double currency mechanism that has no precedent in previous monetary history.

The Reform was the most surprising, but not the only major change in the economy provoked by the Collor 1 Plan. The conditions it faced for basic policy reform were favorable. The trauma provoked by a peak inflation rate of 85% shortly before the program was announced created the willingness to adjust. A newly elected democratic government backed by the majority of the population and without evident ties to established interest groups seemed well positioned to promote overdue delayed reforms.

Besides the Monetary Reform, the Collor 1 program replaced the crawling peg systems of exchange rate devaluations by floating exchange rates. It suspended the effectiveness of wage indexation clauses after a one month round of wage increases. Ambitious deregulation and privatization programs were announced. On the fiscal side, the Plan canceled a large number of regional subsidies and tax exemptions. Ags in tax collection were shortened by indexing taxes daily. Several government agencies were extinguished. A once and for all 25% taxation on equities portfolios was imposed. Banking bearer accounts were prohibited. Banks and Insurance companies were
forced to buy privatization bonds to be later exchanged for public sector assets. Tariffs and prices of public sector goods were increased. The aim of the fiscal adjustment was to reverse the 1989 budget deficit of 8% of GDP into a 2% surplus in 1990.

Although the target fiscal adjustment was impressive and the move towards a free market economy a major novelty by Brazilian history, it was the Monetary Reform that provided the cornerstone of the stabilization program. Collor 1 Plan was designed to eliminate inflation. In Presidents Collor own description, the objective was "to kill the inflation tiger with a single bullet." As in previous stabilization programs, a temporary price freeze was announced. The major role in impeding inflation to resume in the short to medium run, however, was ascribed to the Monetary Reform. The strong reduction of the financial wealth stock available to buy goods and assets coupled with sticky nominal prices, in particular wages, was expected to provoke a major depression in economic activity and halt immediately the inflation process. A careful monitoring of money supply over the subsequent months was viewed as of essence to impede inflation to increase during the period in which fiscal adjustment was still incomplete.

Authorities in charge of the Collor 1 Plan did not provide an official rationale for the blockage. As discussed in the Introduction, the decision to impose a compulsory lengthening of the maturity of financial wealth was shaped by the Cruzado
and Summer experiences. The domestic debt overhang was addressed in two ways. First, the blockage impeded adverse portfolio shifts. It will be suggested below that the relative penalty imposed on passbook savings is coherent with the interpretation of the debt overhang gave in the First Essay. Second, the Monetary Reform was framed to impose a disguised capital levy on domestic debt stock.

The capital levy was already embedded in the Monetary Reform decree and further magnified by a discretionary handling of monetary correction. The yield on blocked funds was by law equal to the passbook savings yield, namely, monetary correction plus 0.5% per month or 6.17% per year. As seen in the Introduction, this was in Brazilian institutional set-up the floor interest rate from the viewpoint of wealth holders. Besides the low rate, monetary correction was less than inflation during the first months of the Collor Plan. When equality between monetary correction and inflation was rendered a policy rule, there was no monetary correction overshooting to compensate for previous losses suffered by indexed financial assets. As a consequence, triple A banking Certificates of Deposits rates exceeded blocked cruzados rates by 105.76% in the in the first 18 months after the Collor Plan.

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2 Because the passbook savings blockage was 100% of amount exceeding 50,000 cruzeiros, the cruzeiros break even to other interest-bearing assets (overnight deposits, money market, banking CDs, etc.) was 250,000 cruzeiros or roughly 400 dollars. Passbook savings deposits greater than 400 dollars yielded less cruzeiros than other interest-bearing financial assets of equal value.
Plan.\textsuperscript{3}

The architecture of the Monetary Reform was of difficult apprehension. One example is the Central Bank "cruzado" discount window. For reasons that will be clear below, the setting of transactions in cruzados led to a surprising coexistence between wealth holders with excess cruzados deposited at Central Bank and financial intermediaries short of cruzados. Such an outcome of the cruzado circulation was already contemplated by the legal decree that established the Monetary Reform. It created a special discount window based on the shortage of cruzados or, to use the technical term defined in the Reform decree, based on the "cruzado deficiency" of financial intermediaries.

Three features distinguished the "cruzado" discount window from a regular discount window. First, borrowing from Central Bank in this window was a right granted to financial institutions and not a privilege conceded by Central Bank during the six months following the issuance of the Monetary Reform. Discount loans were thus automatic during the period in which cruzados transfers to settle debts were possible. Second, borrowing was limited to the shortage of cruzados. Third, the discount rate on "cruzado deficiency" loans had to

\textsuperscript{3} The size of the capital levy cannot be calculated before September 1992 when 12+18 months' period end. From the counterfactual viewpoint, the difference between cruzado and cruzeiro rates underestimates the capital levy because without the blockage the interest rates required by wealth holders not to buy goods and assets would have been higher than observed market rates for CDs in cruzeiros.
compatible with the yield on assets backed by the "cruzado" discount loan. All three features were legal requirements of the Monetary Reform.

The crucial feature of the "cruzado deficiency" discount loans was that borrowed amounts from Central Bank could only be settled in cruzeiros. As it will be clear blow, the shortage of cruzados of financial intermediaries was a deliberate outcome of the architecture of the Monetary Reform and not an unexpected unfolding of the circulation of cruzados. The "cruzado" discount window removed the risk of insolvency of financial intermediaries posed by the compulsory lengthening of maturity of financial assets. It was also meant as an additional monetary instrument to shift over time the expansionary effects of Treasury deficits or intervention in exchange markets, a point to which we return later.

The initial results of the Monetary Reform were dramatic. Unable to cope with the complexities of a double standard of value, the banking clearing system collapsed. Financial intermediaries could hardly inform their clients about their accounts. Prudent behavior led to hoarding of cash currency. A tacit moratorium developed in practice as most contractual obligations were rolled over by mutual agreement between debtors and creditors. 4

M4, the broad aggregate of financial assets that had a

4 A notable exception was the payment of wages. The collapse of banking clearing system was no excuse for postponing the payment of wages.
stable relation to nominal GDP over the entire decade of the 1980s, fell overnight to 25% of its nominal value the day before. The stock market index plunged to successive lows at minus 10% per day. Compliance with the price freeze took place more because of lack of demand than because of legal coercion. Shortages were rare. Most analysts forecasted a prolonged depression as nominal prices and wages proved to have little downward flexibility. The potential unemployment problem was further aggravated by a compulsory wage increase of 85% that took place at the end of March. As mentioned in the Introduction, the Collor 1 was the only program not to practice deindexation in the second sense.

In contrast to the initial depression, the scenario changed dramatically over the next two months. Financial wealth in cruzeiros increased at a very fast rate. Monetization came from three sources.

The first was the way the Monetary Reform handled public accounts. It allowed tax payers to settle taxes in cruzados but imposed government expenditure to be in cruzeiros. Even if budget was balanced, the borrowing requirements of government in cruzeiros would be positive by the difference between expenditures and the fraction of taxes settled in cruzeiros. The implicit monetization process led to a decline in domestic debt stock in cruzados matched by an increase in domestic debt.
stock in cruzeiros.\textsuperscript{5}

The second monetization source was the series of discretionary conversions of blocked funds into cruzeiros at par value. Only financial assets held by states and municipalities were exempted from the blockage in the original Monetary Reform decree. Two months after, 48 legal documents were issued to authorize "special" conversions.\textsuperscript{6} In addition, a vast number of expedients helped agents to transfer cruzados. An illegal secondary market in which cruzados were sold at a discount for cruzeiros developed. It will be seen below that the existence of a secondary market decreases the final aggregate blocked amount even though blocked funds could not be released in cruzeiros without special authorization.

The third monetization source was the expansionary impact of the external accounts. The initial sharp contraction of financial wealth coupled with a move towards a floating exchange regime would have produced a major appreciation of

\textsuperscript{5} The Monetary Reform contemplated an additional monetization mechanism: auctions of cruzeiros with bids in cruzados. Predictably, the exchange rate between the two monies that would emerge from such auctions would display a discount on the cruzado because the blocked cruzado rate of interest was smaller than the cruzeiro rate. Auctions were suspended because the discount could be interpreted from the legal viewpoint as a confiscation of financial wealth and hence a violation to the right of property.

\textsuperscript{6} Exemptions from the blockage mounted over time because of all sorts of political and social pressures. The list of beneficiaries was vast: retired workers, hospitals, charity institutions, trade unions, holders of Central Bank import deposits, development funds made of fiscal incentives, credit cooperatives, corporations in the transportation business, government pension funds and many other unrelated businesses.
domestic currency. To prevent appreciation, Central Bank intervened in exchange markets. Intervention was also motivated by the 85% increase in nominal wages. Central Bank authorities viewed the constancy of the wage/exchange ratio as a major policy target. Reserve accumulation was substantial in the first months following the Monetary Reform.

Monetization provoked a strong liquidity expansion. In June M4 in dollars reached 59% of the value before the Reform. In the first two weeks of the program, the monthly prime rate was 20%; by late April it reached 5%. The exchange rate in the black market came back to its level of 80 cruzeiros per dollar reached before the Collor Plan, after a plunge to 37 cruzeiros per dollar the day after the Plan. The prices of other real assets followed a similar pattern. Shortly after the lifting of price controls, inflation reached in June a temporary plateau of 8 to 10% per month without being ruled by wage indexation and in spite of a Treasury zero cash deficit.

The policy answer was to provoke a liquidity squeeze. Contractionary monetary policy was the rule from June onwards. All sorts of instruments were used. The discretionary handling of monetary correction policy was abandoned to increase the return on passbook savings. The automatic repurchase of government bonds by Central Bank was suspended. Discount rates for cruzeiros loans were set above market rates. The size of cruzado discount loans was reduced. A tight rationing of banking personal loans and credit card finance was imposed.
Effective compulsory reserve requirements were increased by the prohibition of now-accounts. The rates of interest on government bonds were increased above inflation by open market operations.

The credit crunch had devastating effects on economic activity. Domestic currency appreciated to unprecedented highs in the new floating rate regime. Inflation, however, remained unabated. Fiscal deficits in intertemporal perspective (that is, taking into account the interest on blocked funds and debt arrears to domestic suppliers and foreign banks) remained incompatible with price stability. In January 1991, monthly inflation surpassed 20%. Another stabilization program, the Collor 2 Plan, was then announced.

In this essay, we derive an analytical expression for the double currency system of Collor 1 Monetary Reform. By understanding the analytics of the Monetary Reform, it becomes possible to evaluate its merits and demerits and point out frequent misinterpretations. The essay is organized as follows. Section II gives a first view of the cruzados transfer rules for non-financial agents. Section III develops the basic framework of analysis. Section IV presents cruzado circulation and cruzeiro circulation for the economy as a whole. Analysis and comments appear in Sections V and VI.
II. Cruzado transfer rules for the public.

The singularity of the Monetary Reform for the Collor Plan was that blocked funds were accepted as valid means of payment for certain transactions. A straight blockage of funds may pose the risk of corporate or individual bankruptcy to the extent to which agents need the blocked funds to face contractual obligations. To minimize the risk of bankruptcies, the Monetary Reform allowed agents to settle extant contractual obligations with blocked funds. The major exception was provided by labor liabilities such as wages, pensions and compensations. Contractual obligations incurred after the Monetary Reform were not eligible to be settled in cruzados.  

The first event in the Monetary Reform was the decomposition of financial assets in cruzeiros and cruzados. Any financial asset issued before the Monetary Reform was denominated in cruzados, the only legal tender in existence at the time of issuance. At maturity, the Monetary Reform decree instructed the financial intermediary to pay to the holder 20% of its value (or up to 50,000 cruzeiros) in cruzeiros. The remainder was compulsorily deposited at Central Bank thus giving origin to a cruzados account in favor of the holder of

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7 The exception was motivated by fairness considerations. Workers ending up with blocked cruzados instead of wages needed for subsistence was felt outrageous. Retired people, however, were penalized from the stock viewpoint because of the blockage rule that applied to passbook savings.
the asset. Central Bank required financial intermediaries to duplicate all accounting and clearing procedures to deal with cruzado accounts.

The "communication" between the two accounts was a one way road. A cruzeiro check could be deposited in the cruzado account and immediately transformed into cruzados but the reverse was impossible. A check in cruzeiros could be cashed but a check in cruzados could only be deposited in the cruzado account of another agent.

Regulations governing cruzados checks were strict. The transfer of cruzados was lawful only to settle liabilities incurred before the launching of the Monetary Reform. Every cruzado check had to specify on the back side the nature of the transaction it was settling. Cruzado checks were not negotiable;\(^8\) bearer checks in cruzados were prohibited.\(^9\) Illegal cruzado transfers were punished with heavy fees.

Cruzado transfers were permitted for six months.\(^{10}\) After

\(^{8}\) The restriction impeded the endorsement of cruzados checks as well as using cruzado checks as collateral for financial transactions.

\(^{9}\) Bearer checks were restricted to cruzeiro accounts and limited to small transactions. An important component of Collor 1 Plan domestic debt consolidation was the end of bearer financial instruments. Identification was required before receiving the 20% cruzeiro and the 80% blocked portions. Many holders of bearer accounts preferred full capital loss to identification.

\(^{10}\) The time limit depended on the nature of the transaction. Six months was the maximum time limit for utilization of cruzados but for some transactions such as paying taxes the time limit was shorter. We will abstract from these complications in the analysis that follows.
this period, cruzado checks were no longer compensated and the blockage of funds was final. During the initial period of six months, the Brazilian economy had therefore a double money standard. The cruzeiro was the universal legal tender while the cruzado was a currency restricted to settling non-labor obligations incurred by contracts signed before the Monetary Reform. Contractual obligations eligible but not settled in cruzados had to be settled in cruzeiros to avoid default. We refer to the first six months of the program as the cruzado circulation period.

After the initial blockage, agents economized on cruzeiros by using blocked cruzados to the maximum extent possible. Three major uses of cruzados may be distinguished. The first was to settle banking debts signed before the Monetary Reform. This use was limited to interest or principal payments due over the cruzado circulation period. Long term debts in particular could not be redeemed using cruzados, a point to which we return later.

The second use of cruzados was to pay taxes referring to economic events that happened before the Monetary Reform. This was the case of year income taxes. Brazilian tax year ends at April. The income tax date of payment for 1989 taxes was thus April 1990 -- within therefore the cruzado circulation period.

The third use of cruzados was to settle non-financial private debts. A suppliers credit given by industry to commerce, for instance, falls in this category provided that
the delivery of the commodity took place before the issuance of the Monetary Reform.

Non-financial private debts imprint complexity to cruzado transfers. The reason is that the decision to settle non-financial private debts in cruzados or cruzeiros belongs to the debtor. The creditor, by consequence, is unsure about his cruzado balance until he knows the debtors decision. An agent may become short of cruzados in the sense of having more debts payable in cruzados than his amount blocked if his credits are paid in cruzeiros. Another agent may exhibit a cruzado surplus if credits settled in cruzados exceed debts eligible for cruzado transfers.

Non-financial agents were not allowed by Central Bank to run negative cruzados accounts. Overdrafts in cruzados account were automatically zeroed by an equivalent transfer from the cruzeiro account of the same agent. The access to the Central Bank discount window for cruzado overdrafts was limited to financial intermediaries, as will be seen below.
III. Before and after.

We develop in this Section a simple framework consisting of three entities: the Central Bank, a pure financial intermediary or bank and the public. We merge Treasury accounts into Central Bank accounts under the assumption that Central Bank provides the funding for Treasury deficit.\textsuperscript{11} We also lump together government and private sector companies.\textsuperscript{12} The public stands for all non-financial agents. In this we take a picture of financial wealth interrelations between the three entities the day before the plan and the day after, leaving for the next Section the discussion of cruzados and cruzeiros circulation.

The day before the Plan is given by the Time 0 three $T$ accounts. It will be seen that by construction $A_j = D_j$ for $j = 1, \ldots, 4$.

Consider first the Central Bank. The day before the Plan it has two types of liabilities: $D_1$ and $D_4$. The former is the domestic debt stock or the present value of past deficits financed domestically. The later are contractual liabilities already incurred but not paid yet such as wages of

\textsuperscript{11} It will become apparent in the analysis below that it does not matter for our purposes whether monetized deficits are later sterilized by open market operations or not.

\textsuperscript{12} The Monetary Reform established no difference in blockage rules applying to state or private companies. Exemptions from the blockage were circumscribed to Federal and states' governments and municipalities.
TIME 0: THE DAY BEFORE.

**CENTRAL BANK**

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**FINANCIAL INTERMEDIARY**

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**PUBLIC**

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\( A_j = D_j, \ j = 1, \ldots, 4. \)
public sector employees, suppliers credits, etc. On the assets side, \( T \) stands for taxes not yet paid but referring to economic events that happened before the Reform. \( T \) would be zero if there were no tax collection lags.

We assume a closed economy. The virtual deficit \([D_4 - T]\) has to be financed domestically.\(^{13}\) Over time, \([D_4 - T]\) will materialize as an increase in \( D_4 \). Even if deficit is zero from Time 0 onwards, the mere settling of all debts and obligations already incurred at that moment would change domestic debt from \( D_1 \) to (1) below. We refer to (1) as the virtual domestic debt stock.

(1) \[ D_1 + D_4 - T \]

The second entity is a pure financial intermediary. It borrows from the public and lends to or buys securities from Central Bank and the private sector. In the assets side, \( A_1 \) and \( A_2 \) stand for Central Bank and private sector credit, respectively. The financial intermediary is pure in the sense that it has no own capital. We also abstract from running costs such as wages by assuming that loans are equal to deposits. Its size is normalized at 100.

\(^{13}\) As mentioned in the Introduction, stabilization programs in Brazil could not rely on external support.
(2) \[ A_1 + A_2 = 100 \]

The third entity is the non-financial sector or the public. On the assets side, there are two elements. First, deposits in the financial intermediary of 100. We refer to 100 as the financial wealth of the public. Second, receivables from the Central Bank that refer to contracts signed before the Monetary Reform in the value of \( A_4 \). On the liabilities side, we have financial debts \( D_2 \) and taxes \( T \).

Four remarks are appropriate. First, we left real assets aside. The reason is that we are concerned solely with the analytics of the blockage. The net claim against Central Bank is the net worth of the aggregate \( T \) account encompassing the financial intermediary and the public. The net claim, of course, is the virtual stock of outside money (1).

Second, we assume that there is neither cash (notes and coins) nor direct holding of debt bonds by the public. With these two assumptions, the financial wealth held by the public is necessarily equal to the financial intermediary liability. They two assumptions are good approximations to Brazilian reality the day before the Collor Plan.\(^1\) As will be clear

\(^1\) Widespread acceptance of checks for small transactions and now-accounts rendered the fraction of financial wealth held as cash negligible. Direct holding of government bonds by the public was confined to pension funds (by force of Central Bank regulations) and multinationals (which held bonds with exchange rate clauses by hedging). The bulk of government debt was absorbed by financial intermediaries and served as collateral to overnight or money market deposits. Passbook
below, they simplify the exposition without changing the conclusions.

Third, we did not include in the T account of the public non-financial debts and receivables. They appear, of course, with equal value in aggregate assets and liabilities.

Fourth, there is no borrowing from Central Bank discount window. Because Central Bank has no assets to offset the indebtedness to the financial intermediary, $D_1$ is also the stock of outside money that exists in Time 0. We may also define (1) as the virtual stock of outside money that exists in Time 0. It differs from $D_1$, the actual stock of outside money, only in that the unavoidable expansion or contraction \([D_1 - T]\) has not taken place yet. We define here "money" in the broad sense of including high liquidity indexed bonds that formed the bulk of government debt.\footnote{The distinction between zero nominal interest money and bonds is not necessary for our analysis. We also do not distinguish between base money and M1.}

The Time 1 shows the day after. To simplify the exposition, we assume that the 20/80 blockage rule applies to all assets.\footnote{As mentioned above, the assumption holds exactly only for the 250,000 cruzeiros break-even on demand deposits and passbook savings. Cash holdings were exempted from the blockage thus diminishing the size of the blockage. In practice, the aggregate blockage proportion defined over M4 savings deposits provided the funding to $A_2$ in the case of housing and mortgage loans but also increased $A_1$ when financial intermediary opted for the deposit facility at Central Bank mentioned in the Introduction.}

For all entities, the upper and lower parts of the

\footnote{As mentioned above, the assumption holds exactly only for the 250,000 cruzeiros break-even on demand deposits and passbook savings. Cash holdings were exempted from the blockage thus diminishing the size of the blockage. In practice, the aggregate blockage proportion defined over M4}
T accounts show the T accounts in cruzeiros and cruzados, respectively.

Consider first the public. Of its financial wealth of 100, 20 become deposits in the financial intermediary in cruzeiros and 80 become Central Bank deposits in cruzados. In the liabilities side, D₁ and T appear in the cruzado T account because by Monetary Reform rules they may be settled in cruzados. A₄ appears in the cruzeiro T account because the Monetary Reform required government to settle its obligations in cruzeiros.

Consider next the financial intermediary. The public debt was also subject to the 20/80 blockage rule. Central Bank paid 20% of D₁ in cruzeiros. The remainder 80% was transformed into a cruzado deposit at Central Bank. Private loans appear in the cruzados T account as they may be settled in cruzados. The seemingly difficult part of the story is the liabilities side. The financial intermediary is supposed to open a Central Bank deposit of 80 cruzados on behalf of his client. Where is the financial intermediary going to find the cruzados necessary to make this deposit? The answer is: borrowing from Central Bank cruzados discount window.

Note the difference among the four values of 80 that appear in the T accounts in cruzados. The 80 that is in the assets side of the public is a deposit at Central Bank; its was 75%. 

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Time 1: The Day After.

**Central Bank (CB)**

- 20% \( D_1 \)
- \( D_4 \)

**Financial Intermediary (FI)**

- 20% \( A_1 \)
- \( A_2 \)
- 80% \( A_1 \)

**Public**

- 20
- \( A_4 \)

- 80 (CB)
- \( D_2 \)
- \( T \)
counterpart is a Central Bank liability of 80 to the public. The 80 that appears in the liabilities side of the financial intermediary is a debt to Central Bank. Its counterpart is the discount loan in cruzados gave by Central Bank to the financial intermediary that appears in the assets side in Central Bank accounts. There are no blocked cruzados funds deposited at the financial intermediary.

Finally, consider Central Bank. The discount loan in cruzados for the financial intermediary is matched by a liability in cruzados to the public. Taxes lay in the cruzado T account because in principle they may be paid in cruzados while $D_A$ stays in the cruzeiro account because it must be settled in cruzeiros. The partition of debt stock $D_A$ in cruzeiros and cruzados follows the 20/80 blockage rule.

In moving from Time 0 to Time 1, we abstracted from credit multiplier effects. The financial intermediary repurchased government securities using all available cruzeiros, namely, 20%. $A_1$, thus leaving unaltered the credit to the public. To simplify the analysis, credit multiplier effects will be ruled out throughout.
IV. The cruzado and cruzeiro circulation.

In this Section, we discuss how the settling of obligations changed the T accounts of Time 1. By the sake of clarity, we study first the cruzado circulation from the viewpoint of the public, then the cruzado balance between the financial intermediary and the Central Bank and finally the settling of debts in cruzeiros. In real time all processes happened simultaneously.

Consider first the public. If all agents were equal, there would be no non-financial private debts or receivables. The result of the blockage would be simply given by \([80 - D_2 - T]\), if positive, with \(D_2\) and \(T\) being the sum of banking debts and taxes payable in cruzados for the representative agent times the number of agents.

To gain insight into the complexities created by the cruzado transfers, consider an abstract economy with just two agents. The day before the Monetary Reform, agent I has certificates of deposit of 90, taxes to be paid of 20 and short term (that is, of residual maturity shorter than six months) banking debts of 10. Agent II has certificates of deposit of 10, taxes to be paid of 10 and short term banking debts of 20. In addition, agent II owns 8 to agent I. The two agents economy has therefore a financial wealth of 100, \(D_2 = 30\) and \(T = 30\). The 80% blockage hits both agents in the same manner. The aggregate initial blockage is 80, of which 72
belong to agent I and 8 to Agent II.

Agent I cannot escape the compulsory lengthening of its financial assets. His blocked amount exceeds the sum of all possible transactions payable in cruzados. His final cruzado balance depends on whether agent II settles the debt of 8 in cruzados or cruzeiros. The maximum amount of cruzados he may end up with is 50 ( = 72 - 20 - 10 + 8) which occurs if agent II chooses the cruzado as the settling money for his non-financial debt. The minimum amount of cruzados he may end up with is 42.

Agent II is short of cruzados. Because his net financial wealth is negative, he may be forced to sell real assets to comply with its liabilities. From our viewpoint, however, the relevant aspect is that depending on the use of his scarce cruzados the net aggregate blockage changes.

There are three extreme cases.

First, agent II may allocate all of his cruzados to pay taxes. In this case, a proportion of 28/30 of taxes will be settled in cruzados while the remaining portion will have to be settled in cruzeiros. As to banking loans, a proportion 10/30 will be settled in cruzados while the remainder will have to be settled in cruzeiros. The aggregate blockage after cruzado transactions reaches 42 as the debt to Agent I will also be settled in cruzeiros.

Second, agent II may also allocate all of his cruzados to settle banking debt. The proportion of taxes settled in
cruzados falls to 20/30 but the proportion of banking loans raises to 18/30. Aggregate blockage is the same.

Third, agent II may allocate all of its cruzados to settle its debt to agent I. The proportion of taxes and banking loans settled in cruzados is 20/30 and 10/30, respectively, but the aggregate blockage raises to 50.

The two agents economy illustrates the complexities posed by the circulation of cruzados. The Monetary Reform does not impose on agent II all-or-nothing rules for cruzado allocation: he may settle both taxes and debts partly in cruzados and partly in cruzeiros. From the viewpoint of the aggregate blockage of funds, agent II use of cruzados to pay taxes or banking debts exert the same subtraction effect. Both the aggregate blockage after the cruzado circulation period and the proportions of taxes and banking debts paid with cruzados, however, are affected by his decision on how to settle non-financial private debt.

In the analysis that follows, we define as \( \beta \) and \( q \) the proportion of banking deposits and taxes settled in cruzados, respectively. The general expression for the aggregate blockage after cruzado circulation is (3):

\[
\phi = 80 - \beta A_2 - qT
\]

As the two agent economy suggests, the values of \( \beta \) and \( q \) that emerge from the circulation of cruzados can not be
predicted beforehand. The value of $\beta$ was limited from above by long term loans. The closing date for all cruzado transfers was September 15, 1990. With March 15, 1990 as the base date, no extant banking asset with maturity date beyond September 15 was allowed to be settled in cruzados. The bulk of housing and mortgage loans fit in this case. The list also included private short term loans that banks rolled over beyond the cruzado circulation period to attend debtors in temporary financial trouble.\footnote{The list of assets that banks could not cash in the cruzado circulation period was enlarged by non-performing loans to government agencies or state companies. As mentioned in the Introduction, the cash constraint on government agencies and state companies in effect since the Cruzado program provoked a mounting stock of unpaid debt. Non-performing loans were rolled over because by Brazilian law Treasury owned companies are not allowed to declare bankruptcy. The few exceptions occurred when the legal figure of the debtor agency itself was extinguished by law. Non-performing loans to government are not captured in our simple framework because we defined $\beta$ as the proportion of private loans not settled in cruzados. There is difficulty, of course, in introducing two other terms D and A to capture such loans. As mentioned above, non-performing loans to Treasury owned or controlled companies were also financed by the cruzado discount window. Central Bank, however, did not allow private financial intermediaries to set off the discount window loans against the credit to government agencies.} That $\beta$ lay below the blockage proportion was crucial for the discount window mechanism discussed later.

An important aspect of the double currency scheme was that private contracts offered opportunities for both parties to bypass the blockage. In our example, agent I will be better off if agent II settles its debt to agent I in cruzeiros than
in cruzados. He may then offer a discount to Agent II to settle the debt in cruzeiros. For Agent II, in turn, it is better to bargain with Agent I a discount and use the scarce cruzados to pay taxes (Treasury accepted no discount) than otherwise. It follows that the blockage outcome is then more likely to be 42 than 50 and the proportion \( q \) more likely to be 28/30 than 20/30.

The example is also useful to assess the effects of a secondary market in cruzados. The Monetary Reform did not allow such a market to take place. Transfers of cruzados were only permitted if grounded on the existence of contractual obligations incurred before the launching of the Reform. In our example, if such a market existed, it would be to the advantage of agent II to "buy" cruzados at a discount from agent I to settle taxes or banking debts. It would also be to the advantage of agent I to exchange cruzados for cruzeiros up to the extent agent II seems a worthwhile credit risk.

It is apparent that secondary market transactions reinforce the effect of private arrangements in raising \( q \) and \( \beta \) and therefore decreasing \( \phi \). Since the rate of interest in cruzeiros was much higher than the yield on blocked funds, the cruzado/cruzeiro exchange was in the interest of both parties. The eagerness to engage in such transactions was magnified by widely held doubts on the restitution of blocked funds, a point that is further discussed in Section VI below.

In practice, a secondary market developed as agents used
all sorts of expedients to fabricate contracts justifying cruzado transfers.\textsuperscript{18} The cruzado was sold at a discount that varied from 40\% in the first weeks to 15\% close to the end of the cruzado circulation period. The reduction in the market discount along the first six months reflects the increasing scarcity of cruzados as the monetization discussed above restored to some extent the financial wealth in cruzeiros.

The Time 2 captures the effects of cruzado circulation (3) from the viewpoint of the public. Taxes and banking debts not paid in cruzados must be settled in cruzeiros. In the Central Bank cruzado accounts, deposits in favor of the public fell by $\beta A_2$ while deposits in favor of the financial intermediary increased by $\beta A_2$. Taxes to be collected fell to $[(1-q)T]$ since the public used cruzados to settle a fraction $q$ of taxes due in Time 0.

The next step is the reconciliation of cruzado accounts between the financial intermediary and Central Bank. To offset the overdraft in cruzados from Central Bank, the cruzado account of the financial intermediary at Central Bank has $[80\%.A_1 + \beta A_2]$ cruzados. Central to the Monetary Reform is the net position of the financial intermediary in cruzados $R$:

\begin{equation}
R = 80 - 80\%.A_1 - \beta A_2
\end{equation}

\textsuperscript{18} Because contract fabrication is easier for corporations than to individuals, the result of the Monetary Reform after the cruzado circulation period displayed a disproportionately high percentage of blocked funds owned by the latter.
### Time 2: Cruzado Circulation

<table>
<thead>
<tr>
<th>Central Bank</th>
<th>Financial Intermediary</th>
</tr>
</thead>
<tbody>
<tr>
<td>((1-\varphi)T)</td>
<td>(20% A_1)</td>
</tr>
<tr>
<td>(D_1)</td>
<td>((1-\beta)A_2)</td>
</tr>
<tr>
<td>(\phi)</td>
<td>(20)</td>
</tr>
<tr>
<td>(80% D_1 + \beta A_2)</td>
<td>(80% A_1 + \beta A_2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(20)</td>
<td>((1-\beta)D_2)</td>
</tr>
<tr>
<td>(A_1)</td>
<td>((1-\varphi)T)</td>
</tr>
<tr>
<td>(\phi)</td>
<td></td>
</tr>
</tbody>
</table>
If $R$ is positive, the financial intermediary has a "cruzado deficiency" to use the terminology of the Monetary Reform legal decree. Using (2), we may restate $R$ as (5) below.

(5) \[ R = (80\% - \beta).A_2 \]

$R$ is positive if $\beta$ is smaller than 80%. The reason is apparent. The 80% blockage in cruzados applies to all liabilities. In the assets side, 80% of public debt (or Central Bank loans) generates cruzados. Cruzados assets and liabilities are even if the proportion of private loans paid in cruzados is also 80%. The financial intermediary is short of cruzados if less than 80% of the private loans are settled in cruzados.\(^{19}\)

Although the size of $R$ depends on the cruzado shortage of the financial intermediary, it can only be settled in cruzeiros. The reason is also apparent. The ($80\% - \beta$) proportion of loans that borrowers did not settle in cruzados has by exclusion to be settled in cruzeiros. As a consequence, the financial intermediary can only settle the "cruzado" discount loan in cruzeiros.

The Monetary Reform legal decree sets the discount rate

\(^{19}\) We will not discuss in this essay the theoretical possibility of negative $R$. It can happen with too low blockage percentage. As discussed in Section VI, the way the Monetary Reform was construed induces to fixing the largest possible initial blockage percentage.
according to the rate of return on long term assets. This procedure attended a neutrality criterion: the Monetary Reform was not supposed to provoke, by itself, gains or losses. In practice, the size of housing and mortgage loans was so large that the neutrality criterion led to fixing the cost of borrowing at the cruzados discount window very close to the legal yield of passbook savings. This aspect of the discount loan will be of importance in discussing the fiscal gains of the Monetary Reform below.

Time 3 reflects cruzado accounts reconciliation. The "cruzado deficiency" discount loan is a cruzeiro asset of Central Bank and a cruzeiro liability of the financial intermediary. The latter shrinks with the Monetary Reform. Its previous size of 100 is reduced to 20 plus the "cruzado" discount loan.

To complete the picture, we now add the cruzeiro circulation. The residual tax to be paid in cruzeiros is \((1-q)T\). Central Bank has to comply with contractual obligations in cruzeiros of \(D_i\). In addition, we have to introduce "leaks". The blockage was reduced by special authorizations granted by Central Bank to convert cruzados

---

20 The cost of the so-called "cruzado deficiency" loan varied for every financial intermediary. It was calculated on a case by case basis reflecting the weighted average rate of return on loans not settled in the cruzado circulation period.

21 See the Introduction on the housing system institutional set-up.
into cruzeiros at par. Leaks denoted by $L$ started with financial assets of state governments and municipalities but grew over time as mentioned above. Leaks provoke a one-by-one change in the stocks of cruzeiros and cruzados. The final blockage amount is $[\phi - L]$; abstracting as before from credit multiplier effects, $U$ below is the net effect of cruzeiro circulation:

\[
(6) \quad U = [A_4 - (1-q)T] + L
\]

$U$ reflects two of the three sources of monetization discussed above. $L$ responded to political pressures but $[A_4 - (1-q)T]$ was already embedded in the design of the Monetary Reform. $U$ may be interpreted as public sector borrowing requirements. Note that $U$ would be positive even if the virtual deficit $[D_4 - T]$ were zero and there were no leaks. In that case, $U$ is equal to $qT$, the fraction of taxes paid in cruzados.

The Time 4 displays the final picture of the blockage. It was derived under two simplifying assumptions: no cash money and no government bonds held by the public. Since notes and coins were exempted from the blockage, the introduction of cash into the analysis adds an additional leak term in (6). Direct bond holdings by the public just adds an additional term to the financial wealth subject to blockage because government bonds coming to maturity were subject to the 20/80
**Time 3: The Credit Reconciliation.**

<table>
<thead>
<tr>
<th>Central Bank</th>
<th>Financial Intermediary</th>
</tr>
</thead>
<tbody>
<tr>
<td>((1-q)T)</td>
<td>20% (D_1)</td>
</tr>
<tr>
<td>(R)</td>
<td>(D_1)</td>
</tr>
<tr>
<td>(\phi)</td>
<td>20% (A_1)</td>
</tr>
<tr>
<td>((1-\beta)A_2)</td>
<td>(R)</td>
</tr>
</tbody>
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<tr>
<th>Public</th>
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</tr>
</thead>
<tbody>
<tr>
<td>20% (A_1)</td>
<td>((1-\beta)D_2)</td>
</tr>
<tr>
<td>((1-q)T)</td>
<td>(\phi)</td>
</tr>
</tbody>
</table>
rule irrespective of the owner. It stands to reason that these simplifying assumptions do not alter the analytics of the Monetary Reform captured by the differences between Time 4 and Time 0.

Because of the absence of cash and direct bond holdings by the public, financial wealth in cruzeiros in Time 0 yields the same number whether measured by the liabilities side of the financial intermediary T account or by the assets side of public. In Time 4, however, this is no longer true. The reason has nothing to do with cash or direct bond holdings that is the same in both cases. In Time 4, the two measures differ by R. Since without the "cruzado" discount loan the financial intermediary cannot make the same amount of loans to the public, the measurement by the liabilities side is preferable on a conceptual level.

The proper measurement of the liquidity squeeze in the broad money concept is given by (7) below. The left-hand side is the difference between financial wealth between Time 0 and Time 4 measured by the liabilities side of the financial intermediary.

\[
(7) \quad 100 - (20 + U + R) = 80A_1 + \beta A_2 - U
\]

The interpretation of the right-hand side of (7) is immediate. A straight blockage of 80% applied to all financial assets held by the public would give a liquidity contraction
TIME 4: THE FINAL BLOCKADE POSITION.

<table>
<thead>
<tr>
<th>CENTRAL BANK</th>
<th>FINANCIAL INTERMEDIARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>20% A_1 + U</td>
</tr>
<tr>
<td></td>
<td>(1 - \beta) A_2</td>
</tr>
<tr>
<td>\phi - 4</td>
<td>20 + U</td>
</tr>
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<table>
<thead>
<tr>
<th>PUBLIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 + U</td>
</tr>
<tr>
<td>(1 - \beta) D_2</td>
</tr>
<tr>
<td>\phi - 4</td>
</tr>
</tbody>
</table>
of 80. The design of the Monetary Reform yielded to a smaller result because of leaks captured by U and the presence of long term loans that caused \( \beta \) to lie below 80%.

For completeness, we show in Time 5 the T accounts after the 18+12 months restitution calendar. At the end of the blockage period, the financial intermediary has to settle the "cruzado" discount loan in full. Time 5 ignores the domestic debt consolidation element of the Monetary Reform. Time 5 is nothing but the unfolding of Time 0 with domestic debt incorporating the virtual deficit already present before the Collor 1 Plan.
Time $t'$: After the blockage period.

**Central Bank**
- $A_1 + A_y - T$

**Financial Intermediary**
- $A_1 + A_y - T$
- $(1-\beta)A_x$
- $100 - \beta A_2 - T + A_y$

**Public**
- $100 - \beta A_2 - T + A_y$
- $(1-\beta)D_2$
V. Analysis.

With the help of the above framework, we discuss in this Section some frequent misinterpretations of the Collor I Monetary Reform.

First, it has been frequently held that leaving aside the capital levy component, the Reform increased public debt. The alleged reason is that blockage of private financial assets would add to public indebtedness. The argument was also frequently supported by comparisons between debt stock before the Reform and the sum of cruzeiro and cruzado debt after the Reform.

Using previous definitions, however, we may derive (8) below:

\[ 20\%D_1 + U + \phi - L - R = D_1 + D_4 - T \]

The left hand side of (8) is the domestic debt in Time 4; the right hand side is the virtual domestic debt in Time 0 given by (2). (8) shows that the compulsory lengthening of financial assets does not alter therefore the size of domestic debt. The comparison of the left-hand side of (8) to \( D_1 \), the stock of domestic debt existing at the launching of the Reform is misleading because it ignores the virtual deficit \( [D_4 - T] \).

Another frequent misinterpretation is that cruzado transfers do not alter the aggregate stock of retained funds.
The alleged reason is that cruzado transfers are a zero sum: the decrease in the cruzado balance of one agent is equal to the increase in the cruzado balance of another agent. As a consequence, the aggregate blockage without leaks would depend solely on the initial blockage rule (20/80 in our case).

The argument gained acceptance because it seemed to derive from the ban imposed on cashing cruzado checks. Since cruzado checks can never be compensated against cruzeiros except with special authorization, cruzado transfers would be harmless to the aggregate blockage result. The zero sum view of the Reform led to policy proposals in favor of secondary markets. Eliminating cruzado transfer restrictions was viewed as innocuous to aggregate blockage targets and welfare improving from the viewpoint to individual agents.

The mistake of the zero sum view lies in not realizing that the proportion of domestic debt blocked in cruzados depends on $\beta$, $q$ and $T$. Because these are behavioral parameters that reflect individual choice and the existing distribution of contracts and obligations at the launching of the Monetary Reform, the aggregate amount blocked cannot be predicted a priori. The above analysis showed that the effect of a secondary market is to diminish the final aggregate blockage by increasing $\beta$ and $q$. Authorities in charge of the Monetary Reform were thus right in resisting the secondary market proposals because they would undermine the Monetary Reform.

The calculation of the debt relief produced by the Monetary
Reform gave rise to another misinterpretation. It was frequently held that debt relief is a direct function of the final amount blocked. This view, however, ignores the rediscount facility. As seen above, the discount rate was roughly equal to the yield of blocked funds. The cost of debt after the Monetary Reform may then be approximated by (9) below, where \( r \) is the market rate and \( r^* \) is the fixed low rate.

\[
(9) \quad r(20\%D_1 + U) + r^*(\phi - L) - r^*R
\]

The first term of (9) is the cost of the cruzeiros debt. The second term is the cost of blocked cruzados debt. The third term is the proceeds of the cruzado discount window.\(^22\) Manipulating (9), we obtain (10) below:

\[
(10) \quad r(D_1 + D_2 - T) - (r - r^*).(80\%.D_1 - L - qT)
\]

The interpretation of (10) is immediate. Without the Monetary Reform, \( r^* = r \) and the debt burden is given simply by the market interest rate times virtual domestic debt or the first term of (10). Debt relief is given by the second term.

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\(^22\) To be precise, (9) shows the debt relief from the 7th month after the Monetary Reform when cruzado circulation ends to the 18th month when the restitution of blocked funds starts. (9) overstates the debt relief from the 18th month onwards. In the first six months, debt relief depends on the timing of cruzado and cruzeiro circulation.
If all taxes had to be settled in cruzeiros and there were no leaks, the relief would be simply given by the difference between \( r \) and \( r^* \) over 80% of the virtual debt stock the day before the Reform. Settling taxes in cruzados works like a leak in decreasing the extent of Monetary Reform debt relief. In contrast to final blockage \([\Phi - L]\), the debt relief does not depend on \( \beta \) because if agents settle more banking debts in cruzados, the discount loan in cruzados falls by the same amount.

The working of the "cruzado" discount loan was also of difficult understanding. The Monetary Reform required Central Bank to finance overdrafts during the cruzado circulation period. There was no Central Bank commitment, however, to extend the cruzado discount line beyond six months. According to authorities in charge of the Collor 1 Plan, \( R \) was contrived to be positive to create an additional monetary instrument operative after blockage positions became final. Central Bank was in principle allowed to demand financial intermediaries to pay back the "cruzado deficiency" when the money stock in the broad concept was considered too high. Reducing \( R \) after Time 4 was announced as a major monetary instrument to control liquidity.

Reflection on the analytics of the Monetary Reform, however, shows that there are limits to the discretionary use of the "cruzado" discount line. The effect of changes in \( R \) is not the same in all cases. To analyze the issue, we define \( Q \)
below. $Q$ is the difference between the domestic cruzeiro debt held by financial intermediaries and the "cruzado" discount loan.

$$Q = 20\% A_1 + U - R$$

If $Q$ is positive, Central Bank may eliminate the discount loan by compensating $R$ against public debt. $Q$ is be the residual stock of domestic debt held by financial intermediaries. Since the rate of interest on debt stock in cruzeiros is larger than $r^*$, the fiscal gain obtained in demanding full payment of the discount loan is $[(r - r^*)Q]$. In this case, eliminating the discount loan is not an instrument to counteract excessive liquidity.

The picture changes with negative $Q$. Central Bank cannot eliminate the discount loan by compensating $R$ against public debt. The residual discount loan after compensation is $[-Q]$. From this point onwards, paying one cruzeiro to Central Bank requires cutting credit to the private sector by one cruzeiro. Two problems appear.

The first is a legal problem. A large fraction of the loans outstanding in cruzeiros after the cruzado circulation period were long term. To oblige financial intermediaries to pay back the discount loan when they cannot reduce assets poses the risk of insolvency of financial intermediaries. With long term contracts, the effects of eliminating the discount line are
similar to a run on financial intermediaries' deposits.

The second problem is economic. Double entry accounting shows that the financial intermediary cannot pay Central Bank the \([20\% \cdot A_1 + U]_{\text{the}}\) cruzeiro. The reason is that to do so they have to demand the public to pay one cruzeiro out of the short term fraction of loans \([(1-\beta)D_2]\). But when the public pays one cruzeiro, banking deposits also fall by one cruzeiro. When \(Q\) is negative, \([- Q]\) is the residual size of the discount loan that financial intermediaries cannot pay back to Central Bank.

The reason the process is self-defeating becomes evident in (12). Using previous definitions, we obtain that \(Q\) is negative if and only if inequality (12) holds. \(Q\) is negative if the final amount blocked (the left-hand side) exceeds the virtual stock of outside money that existed in Time 0 (the right-hand side). Because of (12), \(Q\) may be interpreted as the stock of outside money in cruzeiros. When the stock of outside money is negative, financial intermediaries cannot survive without the "cruzado" discount loan.

\[
(12) \quad \phi - L > A_1 + A_4 - T
\]

The negative \(Q\) case was possible in the architecture of the Monetary Reform because the blockage applied to all financial assets. If the blockage was limited to domestic debt \(D_1\), the residual stock of outside money in cruzeiros could not be
negative.

The negative Q case substantiates to some extent the claim of authorities in charge of the Monetary Reform that the discount loan could work as a monetary instrument. Suppose the after Reform Treasury deficit or intervention in exchange markets makes domestic debt in cruzeiros to expand by $S$. Demanding financial intermediaries to pay $S$ out of the discount loan to Central Bank neutralizes the deficit and keeps domestic debt in cruzeiros constant. The size of the discount loan, however, is reduced to $[R - S]$. After the restitution of blocked funds, domestic debt stock will exceed (8) by $S$. The contractionary use of the discount loan serves only to shift over time domestic debt increases during the blockage period.
VI. Comments.

The Monetary Reform of the Collor 1 Plan was an ingenious device to accomplish at the same time several policy objectives. It imposed a compulsory lengthening of the maturity of domestic debt and a disguised capital levy while minimizing the risks of bankruptcy that would follow from a straight liquidity blockage. In this Section, we address a variety of issues on its overall design and objectives.

The first comment is about the initial blockage and bankruptcy risk. The architecture of Reform favors the adoption of a very high initial blockage of financial assets. The preceding results show that the attainment of objectives improves with the initial blockage proportions (80% in our framework). The larger the initial proportion is,

- the larger is the proportion of debt with compulsorily lengthened maturity by (3) and (8);
- the stronger is the liquidity squeeze by (7);
- the larger is the domestic debt interest relief by (10)

and

- the more likely it becomes that $Q$ in (11) is negative, the necessary condition for the discount loan to work as a contractionary monetary instrument.

The only countervailing argument suggesting the adoption of a low initial blockage proportion is the bankruptcy risk. Although the Reform double money standard is superior from the
welfare viewpoint to a straight blockage of financial wealth, it did not eliminate bankruptcy risks. Cruzado transfers were permitted to settle contractual obligations existing at the time of launching of the Reform. Yet in some cases the payment of obligations in cruzados run against the nature of the business; in other cases the expenditure stream was not backed by legal contracts.

Authorities in charge of the Monetary Reform considered the remaining bankruptcy risks of secondary importance. In practice, the observed bankruptcies after the Monetary Reform took place more in consequence of the output contraction it provoked than because of the blockage by itself. The cases of bankruptcies that could have been avoided solely by releasing the blocked funds of the bankrupt company were rare. The evidence, however, cannot be taken as indicating that the double money standard is fully satisfactory. Private arrangements for cruzado transfers, frequently of doubtful legality, and leaks attenuated in practice the liquidity squeeze of the Monetary Reform.

The second comment is on the effectiveness of the compulsory lengthening of financial assets. A major aspect of

\[23\] Consider for instance fire insurance. With technical reserves blocked, the insurance company can only settle obligations in cruzados. The insured, however, cannot replace the lost real asset with cruzados. As a consequence, he may suit the insurance company for not complying with the insurance contract.

\[24\] Consider for instance privately run universities or hospitals supported by endowment funds which end up blocked.
Brazilian experience after the Collor 1 Plan was that the subjective probability of restitution of blocked funds was deemed low. The commitment of authorities to abide to the restitution schedule was met with skepticism. Blocked deposits were viewed at best as a contingent claim on government. As a consequence, borrowing or complying with obligations using blocked funds as collateral was not accepted by banks or creditors.  

The irony of the blockage was therefore that its effectiveness turned out to depend on lack of credibility. The blockage worked to inhibit speculative attacks against nominal anchors and to depress demand by the negative wealth effect because restitution was very much uncertain. Shortly before the restitution of the first installment in September 1991, however, uncertainty was very small. The economic team that had formulated the Collor Plan was stepped out of office. As could be expected, transactions using retained funds as collateral developed, stimulating temporarily economic activity but exerting a major impact on inflation.

The third comment is about the compulsory lengthening of maturity of financial assets. A possible alternative to the Monetary Reform would have been inducing the lengthening by taxation penalizing bonds with short term maturity and/or accompanied by frequent repurchase clauses at par. The

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25 From the social viewpoint, the hit was stronger on the old and retired than upon the young and active members of society.
comparison between the two alternatives is complex. On the one hand, giving a premium to long term instruments seems preferable than locking in wealth holders by fiat. On the other hand, the double standard is more flexible in accommodating contractual obligations.\textsuperscript{26} It may be argued that because of the low subjective probability of restitution, only abnormally high tax rates could impede wealth holders to drawn on financial assets to buy real goods and assets.\textsuperscript{27}

The fourth comment is on the relative blockage penalty imposed on demand deposits and in particular on passbook savings. As mentioned above, demand deposits and passbook savings were subject to full blockage of values exceeding 50,000 cruzeiros. The demand for such financial instruments reflected precautionary behavior and/or very small financial wealth. Under very high inflation rates and low minimum amounts for now-accounts, only the very poor kept idle cash balances in banks. Passbook savings, in contrast, accounted for 28.62\% of M4 before the Collor Plan in spite of being the lowest yield financial instrument. The reason was that it

\textsuperscript{26} Take for instance the case of a company whose extant contractual obligations are exactly equal to the value of financial assets. The Monetary Reform double standard does not affect the financial health of the company. The taxation rate required to produce the same effect is zero.

\textsuperscript{27} The Collor 2 program adopted the taxation scheme to induce the lengthening of financial assets maturity. The parallel to the alternative to the Monetary Reform of the Collor 1 program, however, is misleading. Money market funds after the Collor 2 program have daily maturity and the taxation rate falls to zero if deposits are withdrawn after 15 days.
enjoyed government insurance and had no minimum deposit requirements.

The adoption of a fixed but very small threshold value for the blockage of passbook savings and demand deposits attended the very poor. The same can be said about the exemption of cash (notes and coins) from the blockage. But it certainly penalized a large fraction of employed workers, middle class and retired people that would have obtained more cruzeiros under the 20/80 blockage rule that applied to all other interest-bearing assets. No official justification was presented for the penalty imposed to passbook savings except the reference to the Cruzado and Summer programs when funds drawn from passbook savings had a crucial role in triggering excess demand in goods markets.

As discussed in the Introduction, the perception of a domestic debt "overhang" molded in a variety of ways the design of stabilization programs but was never integrated systematically into the body of thinking on Brazilian stabilization problems. The penalty imposed to passbook savings can be understood by reference to the analysis of the First Essay. Risk averse individuals with little access to real assets diversification and wage or pension income as the main sources of income tend to shift more intensively their portfolios towards real assets and save less when inflation falls. Passbook savings were the preferred financial asset of risk averse individuals. The intuitive apprehension of
inflation rate uncertainty effects led to differentiate between blockage rules.

The fifth comment is on the predictability of monetary aggregates. The strong monetization that took place in the beginning of the program provoked a major debate in Brazilian policy circles. Supporters of the zero-sum view frequently blamed the leaks imposed by political pressures. The above analysis, however, shows that because the final aggregate amount depends on behavioral parameters and the distribution net of contracts existing at the launching of the program, policy makers cannot infer Time 4 positions from the knowledge of Time 0 aggregates $A_1$, $A_2$ and $T$. It is not surprising that the Central Bank set no target expansion for broad monetary aggregates in cruzeiros or cruzados after the Monetary Reform.

The sixth comment is on the cruzado discount loan as an instrument for monetary policy. At the end of the circulation period, $Q$ was not negative. On the one hand, financing of current deficits and intervention in exchange markets increased the stock of cruzeiros held by the public above $U$. On the other hand, setting monetary correction below inflation reduced the stock of blocked funds and the rediscount loan. The negative outside money stock in cruzeiros remained a theoretical possibility.

The use of the rediscount loan as an instrument of policy was also rendered difficult by the fact that the "cruzado deficiency" varied greatly between financial intermediaries.
First, the proportion of long term loans in portfolios was larger for retail banks than investment banks or brokerage houses. Second, the size of own capital minus illiquid investments as real estate varied between financial intermediaries. Since the blockage of liquid own capital generated cruzados to diminish the "cruzado deficiency", there was no direct relation between the proportion of long term loans in banking portfolios ad the size of the rediscount borrowing. The role of the discretionary handling of R in the credit crunch observed after June was small.  

The seventh comment is on the transaction structure of the Monetary Reform. Blockage rules were universal. The right to choose the transaction money, however, was differentiated. Non-financial agents were allowed to settle contractual obligations in cruzados or cruzeiros. Financial intermediaries, however, were required to settle contractual obligations (the liabilities side) according to blockage rules and independently of the way in which their assets were paid by non-financial agents. The asymmetry of treatment was accommodated by the discount loan.

The last comment is on reputation. It has been frequently argued that the capital levy and blockage undermined the

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28 Financial intermediaries with "cruzado deficiency" were requested to deposit in Central Bank 100% of the increase in passbook savings deposits exceeding the amount left over from the initial blockage. The instrument thus worked at the margin. There was no compensation of the "cruzado" discount loan against public sector debt held by financial intermediaries.
confidence of the public on financial contracts. Since the Monetary Reform hit government and private financial assets alike, agents would dollarize portfolios after realizing the domestic financial assets are unsafe regardless of the issuer. The cost of domestic debt would be larger after the Reform as agents would require a premium to offset the risk of default.

It is still early to assess this negative view of the effect of the Monetary Reform on financial contract reputation. Shortly before the Collor 2 program, the reluctance of financial intermediaries in buying Treasury bonds increased by fear of another confiscation round. The solution devised by the Collor 2 program was to impose the compulsory placement of government bonds. All private short term money market funds were required to allocate a large fraction of portfolios to government bonds. While the regulation on credit allocation of financial intermediaries may be taken as evidence of Treasury reputation loss, the demand of money market funds by the public did not show evidence of reputation concerns. As discussed in the Introduction, the demand for indexed bonds after the Collor 2 program followed the pattern observed before the Monetary Reform. Staining the reputation of financial contracts did not seem to have caused a permanent shift in the demand for domestic financial assets.

A possible explanation is that the blockage was perceived as non-repeatable policy experiment. Although the stock of
financial assets was hit the Treasury reputation as a trustworthy payer was not affected. We captured this feature in our model by imposing that Central Bank monetizes (in the broad money sense) all contractual obligations $D_t$. Besides honoring contractual obligations, the calendar for the restitution of blocked funds starting September 1991 has been followed strictly.
Fixed length and trigger wage indexation in disinflation.

Persio Arida

I. Introduction.

Wage indexation provides a major argument in favor of heterodox programs. Backward looking COLA provisions imposed by indexing laws impart inertia to inflation. Orthodox policies based exclusively on fiscal and monetary restrain cause large temporary output losses that erode the political support for stabilization. The combination of temporary price freezes and suppression of COLA provisions provide an immediate opportunity for basic policy reform that would be impossible or unnecessarily delayed in view of the large output losses of orthodox stabilization.¹

Although the above argument in favor of heterodox programs is correct, the challenge is to identify the institutional features of high inflation and isolate out the precise role of wage indexation. The heedless identification of wage indexation to inflation inertia has frequently led analysts to infer that stabilization programs should suppress wage

¹ See Dornbusch and Simonsen, 1991.
indexation. Both empirical evidence and theoretical considerations, however, point to a much more complex decision process that affects in important ways the success of stabilization programs. We saw in the First Essay that in general deindexation does not suffice to generate price stability. Indexation only magnifies the inflationary effect of the wage gap. All Brazilian programs were accompanied by wage indexation. The policy choice problem was not indexation versus fixed nominal wages but rather about the indexing scheme that suits best stabilization.

A first issue is whether inertia comes from COLA provisions as such or from the specific form of implementation of indexation. The wage indexation responsible for inertia is wage adjustments at given exogenous time intervals set by law. Would inertia also follow from COLA indexation with time intervals contingent on inflation?

The comparison of fixed length versus trigger indexing schemes is also of interest for the flexibilization stage of stabilization programs. We discussed in the Introduction the trade-off between entry real wages and the adoption of after-program wage indexation. In the Cruzado program, neutral base wage realignment was intended to minimize real wage distortions. After program residual inflation, however, was a matter of unions and Congress concern. It was addressed by trigger indexation limiting the decline in real wages. Indexation was not eradicated but a 20% change in the price
level was required before the COLA indexing provision became effective.² In contrast, subsequent stabilization programs adopted variants of fixed length indexation. Which is the indexing scheme most conducive to stabilization?

The two schemes share the same backward looking approach to wage indexation. In both cases, nominal wage increases reflect past inflation accumulated since the previous wage increase. They differ on the timing of changes in nominal wages and the sensitivity of real wages to inflation.

With the length of the indexation interval exogenously given, nominal wage increases occur at regular time periods. Real wages defined by the average purchasing power of nominal wages over the indexation interval are a negative function of inflation. If inflation is zero, average real wages coincide with base or beginning of period real wages. There is no downward limit to the decline of average real wages as inflation rises.

With trigger schemes, the length of the wage interval becomes endogenous. Average real wages coincide with base or beginning of period real wages if inflation is zero. Average real wages stand below base wages if inflation is positive but the fall in real wages is not sensitive to the size of inflation. The reason is that a higher inflation rate shortens

² Trigger schemes were also adopted by the Israeli stabilization program of 1985. The trigger was of 4% and later increased to 7% after suspending indexation for the first three months of the program.
the indexing interval length. The average real wage under a trigger point scheme has just two values depending on whether inflation is zero or positive.

The two schemes for wage indexation can be combined. The trigger scheme imposed by the Cruzado Plan contained elements typical of fixed length indexation. The trigger point was 20% but monthly wage increases were not allowed to exceed 20%. At the expiration of year-long wage contracts, beginning of the year base real wages were reset by indexation clauses. The dynamics of nominal wages followed the trigger in that the length of the wage indexing interval responded to inflation. Because of the trigger upper limit, however, average real wages were in general sensitive to inflation. It will be seen below that trigger indexation causes real wages stickiness when compared to fixed length indexation. Supply shocks tend to have more prolonged effects with trigger indexation. Variable length wage adjustment intervals,

3 The last wage increase was the residual between year-long inflation and the trigger increases of 20% each accumulated over the year.

4 If monthly inflation is such that accumulated inflation leaves neither monthly nor year residual, the Cruzado indexing works like a pure trigger scheme. This happen with \( p = 1,531\% \) (one wage increase per year of 20%), \( p = 3,085\% \) (2 wage increases, six months lag), \( p = 4,664\% \) (3 increases, 4 month lag), \( p = 6,266\% \) (4 increases, quarter lag), \( p = 9,545\% \) (6 increases, two months lag) and \( p = 20\% \) (monthly increases). For those particular values, the real wage is invariant to inflation. For other inflation values, real wages depend on inflation. The dependence, however, is not monotonic. Because of the 20% accumulated ceiling, average real wages are higher with an inflation rate of 20%, say, than with 19%. See Modiano, 1988.
however, are more conducive to stabilization in that they minimize the impact of contractionary monetary policy on output growth. With fixed length indexation, the initial impact of lower inflation on real wages is adverse because base wages are given. Output growth falls to impede the rise in real wages. But with variable length indexation, disinflation does not increase real wages for the same rate of growth of output. The decline in the rate of growth of money supply is accommodated in trigger indexing by longer wage adjustment intervals.\(^5\)

In this essay, we compare the two schemes with the help of a very simple model. Our focus is the comparative performance of both schemes in disinflation. We examine the issue in two separate contexts. The first is disinflation in chronic inflation times. Contractionary monetary policy takes place with COLA agreements either in fixed length or trigger point schemes. The problem is to find out the scheme that minimizes output contraction.

It will be seen below that the choice problem in this first context is similar to choice between indexed and non-indexed wages. Wage indexation stabilizes output for nominal disturbances, and destabilizes output when shocks are real.\(^6\) But in chronic high inflation, policy choices are not between indexing and non-indexing but between alternative forms of

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\(^5\) See Arida, 1982.

wage indexing. The similarity lies in that trigger indexation makes real wage sticky while fixed length indexation imparts flexibility to real wages. Trigger schemes are more conducive to stabilization with contractionary monetary policy than fixed length schemes. Moving to trigger schemes is preferable to wage deindexation in the first sense discussed in the Introduction.

The second context of comparison is the flexibilization stage of heterodox programs. As it is often the case, the lifting of price controls occurs before fiscal stabilization is achieved. Adjusting the budget on a permanent basis is a demanding task that goes on for extended time periods. High inflation rates at the flexibilization stage undermine the support for the stabilization program required to enable policy makers to continue the fiscal adjustment. The problem is to find out the wage indexing scheme that minimizes the inflation rate that follows the freeze period.

It will be seen below that it is not always true that trigger systems are preferable to fixed length schemes for the after-freeze period. The main result is that if base or beginning of period real wages are above normal real wages, fixed length schemes causes smaller inflation than trigger schemes and vice-versa. The ex-ante choice between the two schemes carried out at the launching of the stabilization program thus hinges critically on the expected behavior of real wages during the freeze period.
The essay is organized as follows. Section II compares the two indexing schemes for the same base and average real wage. Section III gives the model. Section IV compares the properties of both schemes in the two contexts. Section V concludes.
II. The Two Schemes.

We start with the fixed length scheme. The logarithm of the beginning of period or base real wage \( z \) is given by (1) below.

\[(1) \quad z = \log \left[ \frac{W(0)}{P(0)} \right] \]

where \( W(0) \) and \( P(0) \) stand for nominal wages and prices at time zero. Prices change at a constant rate during the wage indexing interval of exogenously given length \( D \).

\[(2) \quad P(t) = P(0) \cdot e^{pt}, \quad 0 \leq t \leq D. \]

Nominal wages remain constant during the indexing interval: \( W(t) = W(0) \) for \( 0 \leq t \leq D \). At the end of the interval, they rise by COLA provisions. Along the wage interval, the logarithm of the real wage at time \( t \) is given by (3) below:

\[(3) \quad \log \left[ \frac{W(0)}{P(t)} \right] = z - pt \]

The average real wage \( w \) is given by (4) below:

\[(4) \quad w = \frac{1}{D} \int_{0}^{D} \log \left[ \frac{W(0)}{P(t)} \right] dt = z - p \cdot D/2 \]
(4) shows that the higher base wages, the larger the inflation rate required to ensure given average real wages. The shorter the indexing interval is, the smaller the inflation rate becomes for a given gap between base and average real wages.

The variable length scheme may be implemented in two ways. First, an x% increase in the price level is required before indexing provisions become effective. The trigger x is exogenously given. The length of the wage interval $D^y$ becomes endogenous. $D^y$ is given by (5) below.

\[(5) \quad P(D^y) = (1+x)P(0)\]

Substituting (5) into (2), we obtain:

\[(6) \quad D^y = Xp^{-1}, \quad X = \log(1+x).\]

(6) shows that the length of the wage interval increases with X but decreases with inflation. As inflation falls, the length of the wage interval is extended. With price stability, there are no nominal wage increases. Substituting (6) into (4), we obtain real wages under the trigger scheme:

\[(7-a) \quad w = z - x/2 \quad \text{if } p > 0;\]

\[(7-b) \quad w = z \quad \text{if } p = 0.\]
Figure 1 below compares fixed length and trigger indexing schemes for identical base and average real wages. Average real wages in both schemes can be equal either for zero inflation or when inflation is such that $D^v = D$. Using (7) and (4), equality of real wages for positive inflation occurs at $p = X.D^{-1}$.

Real wages are a continuous function of inflation for fixed length but not for trigger indexing. The reason is that with variable indexing length any positive inflation rate erodes the purchasing power of beginning of period wages by the same fixed amount as changes in indexing interval fully compensate inflation rate changes. But with zero inflation there can be no erosion of purchasing power. Function $w(p)$ in (7) is discontinuous at $p = 0$.

The second way of implementing variable length indexation is imposing nominal wage increases when real wages reach a minimum level or floor $k$. The length of the wage interval is then given by (8):

\[(8) \quad \log \left[\frac{W(0)}{P(D^v)}\right] = k\]

Substituting (8) into (2) we obtain the expression for $D^v$.

\[(9) \quad D^v = (w - k).p^{-1}\]
(9) shows that the smaller the discrepancy between base and floor real wages, the shorter the indexing interval becomes. The two ways of implementing the trigger scheme bear a one-to-one relation as shown by (10) below.

(10) \[ k = z - X \]

In this essay, we will carry out the analysis with the trigger being defined as a given increase of \( x\% \) in the price level.
III. The model.

Apart from wage indexation, the economy is described by
(11)–(13) below.

(11) \[ z = z_{-1} + b(y_{-1} - y^*), \quad b > 0, \quad y^* > 0. \]

(12) \[ w = \mu(y - y^*) + ay^*, \quad \mu < 0, \quad a > 0. \]

(13) \[ m = y - p, \quad m - y^* = 0. \]

(11) gives the behavior of base wages. Base wages of period [t−1] are reset by COLA agreements at the end of the wage indexing interval. If the growth during period [t−1] was above the natural rate \( y^* \), workers obtain above inflation increases as labor markets are tight. If the economy during [t−1] was depressed, unemployment makes room for a reduction in real base wages.\(^7\)

(11) does not hold for negative inflation rates. Because of the downward rigidity of nominal wages, a negative inflation rate increases next period base wage if output growth was

\(^7\) The endogenous sensitivity of base wages to unemployment was discussed in specification (30) of the First Essay. Note that (11) also ignores the asymmetries discussed in the Introduction arising from biased specialized labor courts and labor turnover costs.
equal to the normal rate. Although we will specify the conditions under which inflation is negative, the analysis is limited to non-negative inflation rates.

(12) gives current period real wages as a function of current period growth deviations from normal rates. (12) derives from (14) and (15) below. (14) is the aggregate supply for current period. Growth exceeds the natural rate if real wages are below normal real wages $w^*$. (15) gives normal real wages as a function of natural growth rate. For simplicity, we take $y^*$ to be positive.

\[ (14) \quad (y - y^*) = \mu^{-1}(w - w^*), \quad \mu < 0. \]

\[ (15) \quad w^* = a y^*, \quad a > 0. \]

(13) gives aggregate demand by a simple velocity equation. The rate of money expansion $m$ is exogenous. Since we confine the analysis to non-negative inflation rates, we assume that steady state inflation $[m - y^*]$ is non-negative.

To close the model, we have to establish the relation between beginning of period wage $z$ and current or average real wage $w$. Three closures can be specified.

\[ (16) \quad z - w = pD/2 \]
(17-a) \[ z - w = x/2 \quad \text{for } p > 0; \]

(17-b) \[ z - w = 0 \quad \text{for } p = 0. \]

(17-c) \[ x = p.D^v \]

(18) \[ z = w \]

(16) and (17) give fixed and variable length closure, respectively. (18) is the perfect indexation case. (18) is a limiting case in which D or x are zero and by consequence inflation does not reduce real wages. In (18), nominal wages respond contemporaneously to changes in prices while for (16) and (17) there is a response lag that makes real wages sensitive to inflation.

At the beginning of period t, base wages are given. Current money growth coupled with wage indexation determines simultaneously current inflation, output growth and real wages. The growth rate of period t affects in turn base wages for t+1 and the process repeats itself.

**Fixed length indexation.**

We start by deriving output growth and inflation in any given period. Substituting (12) and (13) into (16) for given base wages, we obtain (19) below.
(19-a) \[ y = m.r - C \]

(19-b) \[ p = m.(1-r) + C \]

where \( r \) and \( C \) are constants given by:

(20) \[ C = (z + \mu y^* - ay^*).[(D2) - \mu]^{-1} \]

(21) \[ r = (D/2).[(D2) - \mu]^{-1} \]

In (21), \( 0 < r < 1 \) because \( D \) is positive. (22) below gives the condition for non-negative inflation in any given period. The larger base wages, the smaller the current money growth compatible with non-negative inflation. If \( m \) is constant over time (22) imposes a lower limit on base wages to be satisfied in all time periods.

(22) \[ z \geq ay^* + \mu(m - y^*) \]

We turn next to dynamics. Substituting (11)-(13) into (16), we obtain (23) below.

(23) \[ (y - y^*) = -h.(y_{-1} - y^*) + (\mu - D/2)^{-1}(z_{-1} - z^*) \]

where \( h \) and \( z^* \) are the constants below:

(24) \[ h = b.(D/2 - \mu)^{-1} \]
(25) \( z^* = ay^* + (m - y^*).D/2 \)

The constant \( h \) gives the effect of past period deviations on current period growth deviations. It plays a crucial role in stability. Manipulating the fixed length model, we derive the first order non-homogeneous difference equation (26) for output growth. We assume \( m \) to be constant over time. The general solution is (27), where \( y_0 \) is the initial condition.

(26) \( y - (1 - h).y_{-1} = hy^* \)

(27) \( y_t = (y_0 - y^*).(1 - h)^t + y^* \)

Five cases are possible: non-oscillatory convergence \( (h < 1) \), constant steady state equilibrium \( (h = 1) \), oscillatory convergence \( (1 < h < 2) \) uniform oscillations \( (h = 2) \) and explosive oscillations \( (h > 2) \). To ensure convergence, parameter values have to satisfy (28). Note that the shorter the length of the indexing period, the smaller the maximum responsiveness of base wages to unemployment compatible with convergence, a point to which we return below.

(28) \( b.(D/2 - \mu)^{-1} < 2 \)

(29) is the non-negative inflation condition on the constant money supply growth \( m \). The introduction of \( y_t \)
contemplates the possibility \( y_0 < y^* \) in the oscillatory convergence case.

\[(29) \ m \geq \max (y_0, y^*, y_1)\]

In steady state, inflation is \([m - y^*]\) and the base wage is \(z^*\) in (25). The interpretation of (23) is apparent: the growth rate deviation from the steady state value in any given period depends just on past period growth and base wage deviations.

Two comparative dynamics exercises are of interest. We assume (28) and (29) to hold.

Consider first a permanent reduction in the growth rate of money. (19) shows the short run effect. The first period impact of tight money under given base wages is to reduce both inflation and growth. This is the familiar argument justifying heterodox programs in face of fixed length wage indexation: without suppressing COLA agreements, the fall in output growth may undermine the political support require to maintain contractionary policy over time. In the long run the initial output drop is reversed as growth rates converge to \(y^*\). Stead state inflation and base wages are lower.

The distribution of effects of contractionary monetary policy depends on \(r\) given by (21). Disinflation gains are larger and output decline smaller the shorter is the length of the wage indexing interval. We may define the sacrifice ratio
of orthodox stabilization as the fall in output associated with disinflation without incomes policy \( \frac{dy}{dp} = r(1-r)^{-1} \). The case for heterodox policies that changes on \( D \) relatively large, a point to which we come back.

Consider next shorter indexing intervals (smaller \( D \)). (19) shows that the first period effect is to increase inflation rate and decrease growth. Next period base wages will be accordingly smaller. Since neither steady state growth nor inflation depends on \( D \), the final effect falls entirely upon base wages. (25) shows that shorter indexing intervals reduce steady state base wages.

The result differs from the view that changes in indexing interval length are neutral to real wages because they are compensated by higher inflation rates. Neutrality occurs through base wage adjustment. If money is not accommodative, steady state inflation cannot rise. In the First Essay, money is accommodative but the neutrality of changes in indexing interval length depends on properties of assets demand not captured by the simple velocity equation (13) of this essay.

**Perfect indexation.**

With perfect indexation, real wages cannot differ from base wages. Substituting (12) and (13) into (18), we obtain (30) below which gives output growth and inflation for given base wages.
\[ (30-a) \quad y = y^* + (z - ay^*)\cdot \mu^{-1} \]

\[ (30-b) \quad p = m - [y^* + (z - ay^*)\cdot \mu^{-1}] \]

(30) shows that monetary policy with perfect indexation matters just for inflation. The reason is that the current real wage, and by consequence output growth, is sticky. (30) is a particular case of (19) with \( D = 0 \) and by consequence \( r = 0 \). Manipulating the system (11)-(13) and (18), we obtain the first order non-homogeneous difference equation (31). The general solution is (32).

\[ (31) \quad y - (1 + b\mu^{-1})\cdot y_{-1} = -b\mu^{-1} \cdot y^* \]

\[ (32) \quad y_t = (y_0 - y^*) \cdot (1 + b\mu^{-1})^t + y^* \]

The convergence condition to steady state \( y^* \) is given by (33):

\[ (33) \quad b\mu^{-1} < 2 \]

As before, convergence may or may not be oscillatory depending on the value of \( b\mu^{-1} \). The non-negative inflation condition (29) holds for perfect indexing as well. (31)-(33) describe a limiting case of (26)-(28) with \( D \) taken as zero.
The steady state base wage in the perfect indexing economy is given by (25) with \( D = 0 \). The shorter the length of the indexing interval, the closer the fixed length indexation economy becomes to a perfect indexation economy and the smaller the sacrifice ratio of orthodox stabilization.

**Trigger indexation.**

With trigger indexation, the length of the wage interval is endogenous while real wages are either equal to base wages or differ from base wages by a fixed amount. As before, we start discussing output growth and inflation for given base wages. Substituting (12) and (13) into (17-a) and (17-b), we obtain (34) below.

\[(34-a)\] \[ z > z^{**} + \mu(m - y^*) \text{ implies } p > 0; \]

\[(34-b)\] \[ z = z^{**} + \mu(m - y^*) - X/2 \text{ implies } p = 0, \]

where \( z^{**} \) is the constant given by (35):

\[(35)\] \[ z^{**} = ay^* + X/2 \]

Solving for output growth and inflation with given base wages, we obtain (36) and (37).

\[(36-a)\] \[ y = y^* + (z - z^{**}).\mu^{-1} \]
(36-b) \( p = m - [y^* + (z - z'').\mu^{-1}] \) if \( z \) satisfies (34-a);

(37) \( y = m, p = 0 \) if \( z \) satisfies (34-b).

We turn next to dynamics. The discontinuity in the effect of base wages on inflation complicates the dynamics around zero inflation. We derive the dynamics under the assumption that (34-a) holds for all time periods.

Manipulating the model (11)-(13) and (17), we obtain the same results (31)-(33). The dynamics of trigger and perfect indexing are equal. There are two differences worth emphasizing. The first is that (29) has to hold with strict inequality to avoid the discontinuity around zero inflation. The second is that the steady state base wage (35) exceeds the perfect indexing base wage by \( X/2 \).

The comparison between (36) and (30) shows that monetary policy matter in the same way for trigger and perfect indexing. Consider a reduction in money supply growth such that at given base wages condition (34-a) still holds. It is apparent that the reduction in the rate of money expansion decreases inflation without affecting real output. The length of the wage interval is extended proportionately, thus maintaining the same difference between base and average equilibrium wages that existed before. In contrast to fixed length and similarly to perfect indexing, orthodox stabilization under trigger indexing does not affect output.
growth.

The reason trigger and perfect indexing behave in the same manner is that both exhibit sticky real wages. If inflation is positive, the level of real wages for the same base wages and money supply is smaller in the trigger system. But in both cases the discrepancy between base and current wages, be it zero or X/2, is invariant to inflation. Since current output growth depends just on current wages, changes in money supply affect solely inflation in both cases.

Consider now a tighter limit to real wage variability (smaller X) such that at the given base wage condition (34-a) still holds. As with shorter D in fixed length indexing, the first period effect of a smaller trigger point is to increase inflation rate and decrease growth. Next period base wages will be accordingly smaller. Since neither steady state growth nor inflation depends on X, the final effect falls entirely on base wages.
IV. Policy issues.

In this section, we use the above results to compare fixed length and trigger indexing. The first context of comparison is disinflation without incomes policy. We saw above that short term negative effects on output growth can be avoided with the introduction of trigger indexing. Switching to trigger indexation before contracting money supply is therefore a superior alternative to disinflation with fixed length indexation. There may be no incentive to disinflate in fixed length indexation if policy makers objective function attaches a large weight to unemployment.

To see the point, consider the objective function (38) below.\textsuperscript{8} $V(m)$ is quadratic in the rate of inflation and deviations of output from target level $k_y^*$. The policy variable is money growth.

\[
(38) \quad V(m) = wp^2 + (y - ky^*)^2, \quad w > 0, \quad k > 1.
\]

In (38) $k$ is larger than one to capture the presence of distortions that cause the natural unemployment rate to be too low. An alternative interpretation is that policy makers shaped by electoral processes seek to raise output growth above the natural rate.

\textsuperscript{8} See Fischer and Blanchard, 1989, ch. 11.
If $V(m)$ is defined across steady states, the trivial solution is setting money growth equal to the natural growth rate. The interesting question arises with myopic decision making processes. If $V(m)$ is a single period function, will policy makers always disinflate?

The starting point is a steady state with positive inflation. The steady state rate of growth of money supply is $m_0 > y^*$. Evaluating $dV/dm$ with the help of (19) and (36), we obtain (39) and (40) for fixed length and trigger indexing respectively.

\[(39)\quad dV/dm = 2.[(1 - r).w(m_0 - y^*) - (k - 1).ry^*]\]

\[(40)\quad dV/dm = 2.w(m_0 - y^*) > 0\]

Parameter $r$ gives how close fixed length indexation is to perfect indexation that obtains for $r = 0$. The two derivatives show in another way that the trigger indexation economy behaves as if it were a perfect indexation economy because (40) is a particular case of (39) with $r = 0$.

Since for $r > 0$ (40) is always larger than (39), disinflation is more attractive to policy makers with trigger than fixed length indexation. In both cases, the incentive to disinflate grows with the initial inflation. A positive initial inflation rate, however, does not necessarily induce
policy makers to tight monetary policy with fixed length indexing. Long indexing intervals (large D) or extreme sensitivity of policy makers to unemployment vis-a-vis inflation (small w) may render (39) negative, therefore inducing policy makers to increase the rate of growth of money supply.

The objective function (38) serves also to give some insight (39) on the political economy of inflation with fixed length indexation. Policy makers may change the indexing law towards perfect indexation (smaller D) or deindexation (longer D). Differentiating (38) with respect to D and using (19)-(21), we obtain that myopic policy makers will always be tempted to promote deindexation. The first period effect of shorter indexing intervals is to diminish the value of V(.). We ask next for steady state equilibria inflation rates at which policy makers have no incentive to change monetary policy. Equating (39) to zero and using (21), we obtain:

\[(41) \quad p = D \text{constant},\]

where the constant is \[-(k - 1)y^*(w \mu)^{-1} > 0.\]

(41) shows that the shorter the exogenous length of the wage indexing interval, the smaller the steady state inflation rate which policy makers would leave unaltered. The result is intuitive -- the closer the economy is to perfect indexing, the smaller the sacrifice ratio of orthodox disinflation and
hence the more willing policy makers become to fight inflation. The perverse political economy of fixed length indexation is that the short run political benefit of deindexation is larger than of moving towards perfect indexation.

The second comparison context we discuss is the so-called flexibilization stage of heterodox programs. Tight price controls and a mandatory freeze on entry nominal wages provoke rapid disinflation in the initial phase of heterodox programs. In a second phase, however, controls are lifted. Nominal wages respond to the increase in the price level and the state of labor market. The issue we discuss is whether trigger indexation may ensure a smaller inflation rate than fixed length indexation in this second phase.

The issue is of importance because the inflation performance in the flexibilization stage is critical to the success of the program. Fiscal stabilization takes time. The fiscal austerity and the recession cost it may entail enjoy the approval of public opinion to the extent to which it brings low inflation. High inflation rates emerging from the control phase may be interpreted as signaling the failure of the stabilization program, thus undermining the political support for stabilization. The official explanation of after-controls inflation as a short-lived or bounded process is hardly convincing if inflation is rampant.

The problem is complicated by the fact that real wages in
the flexibilization stage are not necessarily equal to steady state real wages. Base wages for the second phase result from (i) real wages at the launching of stabilization that may have been already above steady state levels, (ii) the compliance with price controls during the freeze period, and (iii) nominal wage increases that may have taken place during the freeze period. In the model of this essay, the second period inflation depends on initial base wages, money supply growth and indexation. The issue is to find out the indexing scheme that minimizes inflation for given z and m.

We start by deriving a correspondence rule. Consider two economies with \( m > y^* \) identical in every aspect except the form of wage indexation. By (17-c), steady state variable length of the trigger economy is equal to the exogenous positive \( D \) of the fixed length economy if \( X \) satisfies (42) below.

\[
(42) \quad X = (m - y^*).D
\]

By setting the trigger according to (42), we impose the condition that the steady state equilibrium is the same for both indexing schemes. Being strictly equivalent in the long run sense, the issues remaining pertain to short term policy choices.

Since at the beginning of the flexibilization stage real wages are given, we may approach the choice between the two types of wage indexation by comparing (19-b) to (36-b) under
the correspondence rule (42). Let \( H \) be the excess of fixed length inflation over trigger inflation. Using the three equations, we obtain (43) below:

\[
(43) \quad H = r \mu^{-1} (z - z')
\]

(43) shows that with \( r = 0 \) both indexing schemes give the same inflation. If indexation is perfect, there is no choice problem. It also implies that if base wages are larger than steady state levels, policy makers should choose fixed length schemes and vice-versa.

The comparison between the indexing schemes for \( m > y' \) in the \((z,p)\) plane is shown in Figure 2. We assume (42) to hold and the economies to be identical in every aspect except wage indexation. The dotted line stands for the perfect indexation economy as given by (30-b); the lines for the trigger and fixed length economies are given by (36-b) and (19-b).

Figure 2 shows that smaller base wages decrease inflation for all forms of wage indexing. With trigger indexation, smaller base wages also lengthen the indexing interval. Inflation is zero for all indexing forms if \( z = ay' + \mu(m - y') \). The function for the trigger economy is not continuous because the fixed discrepancy between base and
Figure 2.
equilibrium wages vanishes at zero inflation as shown by (34).\textsuperscript{9}

In Figure 2, inflation in the perfect indexing economy exceeds inflation in the trigger economy in the appropriate z range by \([- \mu^{-1} \cdot (X/2)]\). The interpretation of the difference is simple. Real wages in the perfect indexing economy exceed trigger real wages for the same base wages by \(X/2\). By (12), output growth in the perfect indexing economy is smaller than trigger growth by \([\mu^{-1} \cdot (X/2)]\) which gives by the velocity equation the above difference.

(42) implies that trigger and fixed length base wages are equal: \(z^* = z'' = [ay^* + (m - y^*) \cdot D/2]\). Steady state base wages for the perfect indexing economy smaller (namely, \(ay^*\)) because \(D\) is positive. In Figure 2 inflation is larger with trigger indexing if initial base wages are larger than steady state values and vice-versa. Alternatively stated, policy makers should choose fixed length schemes when base wages are such that current inflation is larger than steady state inflation and vice-versa.

The reason is simple. With trigger indexing, average real wages differ from base wages by the fixed amount \(X/2\) or using (42) by \([(m - y^*)D/2]\). With fixed length indexing, the

\textsuperscript{9} The extent of the discontinuity is \(X/2\) -- the fall in real wages as inflation rises above zero. In Figure 2, the extent \(X/2\) follows from (42):

\[ay^* + (D/2 + \mu) \cdot (m - y^*) - [ay^* + \mu(m - y^*)] = D/2 \cdot (m - y^*)\]
difference between average and base wages is given by $[pD/2]$. Break even occurs when $p - m - y^*$. Real wages in the fixed length scheme will be lower than with trigger indexing when current inflation is above steady state level. Output growth will then be larger and inflation lower in fixed length than trigger indexing.
V. Conclusions.

As discussed in the Introduction, one of the major distinctions between chronic inflation and hyperinflation is inertia resulting from backward looking wage indexation. Inflation inertia, however, has two different meanings that is convenient to distinguish analytically. Inertia may describe a situation in which inflation remains above the level indicated by fundamentals or may describe a situation in which the response of inflation to shocks or changes in policy is sluggish.

The model of the First Essay has inertia in the first sense while the model of this essay exhibits inertia in the second sense. Inertia in the first sense justifies the widely held argument that the equilibrium steady state inflation in indexed economies may not bear a one-to-one relationship to budget deficits. Inertia in the second sense led policy makers in charge of heterodox programs to the conclusion that wage indexation imparted rigidity to the inflation. In Brazilian experience, all the heterodox programs attempted at eliminating or limiting the extent of wage indexation. After-program indexation was a compromise between the deindexation objective and workers reluctance in giving up COLA agreements.

Policy makers unconditionally negative view of wage indexation, however, is at odds with well-established results
in the wage indexing literature. This essay suggests the results derived for the stability of the price level hold for chronic inflation settings as well provided that the opposition between indexing and non-indexing is translated as the opposition between fixed length and trigger indexing. Fixed length indexation works like non-indexing (flexible real wages) while trigger indexation works like indexing (sticky real wages). Inflation inertia in the second sense derives not from backward looking COLA agreements by themselves but rather from fixing by law the length of the wage indexing period.

The essay also suggests that moving to trigger indexing may provide a better alternative than improving indexation. We saw above that the shorter the exogenously given length of the wage interval, the smaller the contractionary effect of tight monetary policy. The steady state comparison, however, eludes the practical problem of the transition to shorter periods. The reason policy makers resist against decreasing the length of wage interval is that in the short run it increases inflation. But since (i) for every given length there is a certain trigger point that ensures the same steady state inflation and (ii) the absence of short run contractionary effect in trigger indexing does not depend on the value of the trigger point, it follows that it is preferable to switch to trigger indexing than to shorten the wage interval before reducing money supply growth.

Apart from stabilization programs, there is no evidence of
the adoption of trigger schemes in chronic inflation times. In Brazilian experience, policy makers resisted against implementing trigger proposals for practical reasons. The custom of paying wages at regular time intervals is well established. Trigger schemes may demand payments in non-regular time periods if inflation varies over time. Such problems of implementation may occur if the official inflation measurement that serves to calculate the trigger comes in time units different from those that govern the wage payment schedule -- when, for instance, inflation is measured weekly but wages are paid monthly. It stands to reason that practical problems of implementation can be solved by a suitable definition of the trigger limit. The real policy problem posed by trigger indexation appears when shocks come from the real side.

Trigger schemes were also absent in direct bargaining in chronic inflation times. The absence may seem surprising because trigger schemes could be welfare improving. For the same initial base wages and expected inflation rate, real wage variability is always larger with fixed length than trigger indexation. Risk averse workers would always prefer trigger schemes while neutral to risk firms would be indifferent. Under the assumption that real wage variability is correlated with real wage uncertainty, an optimal contract would lead to a trigger scheme with smaller average real wages than under fixed length indexation.
A possible explanation may be found in the similarity between trigger and perfect indexing derived above. Starting from fixed length indexing regime, a gradual approach to perfect indexation comes from increasing the frequency of wage adjustments (smaller D). Although the extreme case of 100% inflation proof real wages was not observed in practice, optimal contracts contemplating a frequency of adjustments higher than the legal frequency were common in Brazil when inflation accelerated.\textsuperscript{10}

Another result of interest pertains to the indexing choice in the flexibilization stage. As discussed in the \textit{Introduction}, all Brazilian stabilization programs turned out to introduce wage indexation clauses. One aspect of the policy problem is the \textit{ex-ante} appraisal of the source of the disturbances likely to occur after the launching of stabilization. Another aspect is the different impacts of wage indexation on after-freeze inflation. We saw above that the solution hinges upon real wages emerging from the freeze period vis-a-vis steady state real wages.

This result provides an assessment of Cruzado Plans trigger indexing choice. Real wages at the Cruzado flexibilization

\textsuperscript{10} The same argument appeared in the \textit{First Essay}. For a perfect endogenous indexation, the frequency of wage increases would adapt to inflation in such a way as to keep real wages constant. Trigger schemes are nothing but a limiting case of (28) in which $\frac{dH}{dp} = 0$ for $p > 0$. An empirical issue not settled so far is whether contracts with shorter indexing intervals showed lower average real wages as predicted by theory.
stage stood above steady state equilibrium because of three factors. First, the realignment of base wages carried out at the launching of the Plan was asymmetric in practice. Below average nominal wages were raised by neutrality conversion procedures while above average wages remained constant. Second, political pressures led to add to the program an across-the-board wage bonus of 8% (15% for minimum wages) above average values. Third, loose monetary and fiscal policy magnified the initial wage problem during the freeze period as nominal wages increased without relaxation of price controls. In this context, the Cruzado Plan ex-ante choice for trigger indexing turned out to be unfortunate.
References.


