

Working Papers

Department of Economics

Vienna University of Economics and Business Administration

***Are Exchange Rate-Based Stabilisations  
Expansionary?***

***Theoretical Considerations  
and the Brazilian Case***

*GERT D. WEHINGER*<sup>1)</sup>

*Working Paper No. 51  
Vienna 1997*

<sup>1)</sup> *Vienna University of Economics and Business Administration  
Department of Economics  
Augasse 2-6  
A-1090 Vienna  
E-mail: Gert.Wehinger@wu-wien.ac.at*

*and*

*Oesterreichische Nationalbank  
Economic Studies Division  
POB 61, A-1010 Vienna, Austria  
Tel.: ++43/1/40 4 20-7212, Fax: -7299  
E-mail: wehinger@oenb.co.at*

*Paper prepared for the EADI VIIIth General Conference on Globalisation, Competitiveness and Human Security, Vienna, 11-14 September 1996 (Working Group on "Monetary and Financial Affairs"). The author gratefully acknowledges helpful comments from Hansjörg Klausinger, J. Hanns Pichler, Franz X. Hof and participants of a seminar at the Vienna University of Economics and Business Administration where an earlier version of the paper's model was presented.*

## **Abstract**

High inflation economies, especially the Latin American cases like Argentina and Brazil, have ultimately been successful in stabilising their prices using the exchange rate as a nominal anchor. Contrary to conventional wisdom inflation in these cases has not been reduced at the cost of temporary recessions, instead, they have shown positive output effects. Various theoretical explanations of such boom-cycles are discussed and a model generating such an outcome is developed.

Some empirical evidence is given by the Brazilian "Real Plan" of 1994. Nevertheless, the medium and long-term effects of such programmes can result in recessions and a resumption of high inflation, although the cases show that such "postponed stabilisation costs" can be overcome by adequate and flexible supply-side policies accompanying the stabilisation programme.

*Keywords: macroeconomic modelling, exchange rate-based stabilisation, high inflation, Brazil, Latin America.*

*JEL Classification: E10, E31, E52, E63.*

# 1 Introduction

Throughout the eighties many countries especially in Latin America were plagued by high inflations, and many of the stabilisation programmes introduced in these years were not able to bring down price rises permanently. This was the case especially in Argentina and Brazil, and their unsuccessful "inflation-stabilisation cycles" are well described by Kiguel and Liviatan (1991).

But these high inflation economies have ultimately been successful in stabilising their prices using the exchange rate as a nominal anchor, a success that could be realised in other cases, too. Early evidence is already given by the stabilisation of the 1920s' hyperinflations, as analysed, e. g., by Sargent (1982). But besides stabilisation, these recent cases have shown boom-recession cycles, contrary to what one would predict from conventional theory and contrary to the typical outcome of the often applied money-based stabilisations, namely a recession-boom cycle.

With a money-based stabilisation programme, output losses are almost unavoidable due to either adaptive expectations or, as a structural element of the economy, slow price adjustments or both. In any case, a money squeeze has to force the price rises to a halt. And while prices are realigning, quantities have to take the burden of adjustment. To speed up the price adjustment, various so-called "heterodox" stabilisation programmes had been implemented in the inflation-prone countries. In such cases price rises were put to a halt through price freezes and strict wage regulations (see, e. g., Kiguel/Liviatan, 1992b, for a survey on such programmes). Often showing a boom shortly after implementation, many economies resumed the old path of high inflation after prices had been released. This fact is mainly due to the difficulty of freezing prices in economies with high inflation (and thus a high price variability) at market clearing levels (as would theoretically be required). Furthermore, the political economy setting often made it necessary for politicians to trade the price and wage freezes for once and for all wage rises right before the implementation of the programme or a certain fiscal accommodation of the drop in private demand caused by it.

So should it be possible to have a successful and almost costless stabilisation (in terms of output losses) by means of fixing the exchange rate, or at least to shift output costs to later periods, when the political acceptance of the programme is larger due to successful inflation stabilisation? In the next section some stylised facts of exchange rate-based stabilisations are presented and theoretical explanations for the observed boom cycles are discussed. Thereafter a rather conventional model within an aggregate-supply/aggregate-demand framework is developed and its exchange rate-based stabilisation implications, namely a boom-cycle adjustment, are analysed in comparison with the recessionary outcome generated, e.g., by a Phillips curve IS/LM-model.

Section 4 presents some empirical evidence on such stabilisation dynamics from the Brazilian "Plano Real". An evaluation of longer term implications and problems that can arise are then part of the conclusions given in the last section.

## 2 Stylised Facts and Theoretical Underpinnings

Some stylised facts and theoretical explanations of such programmes and their outcomes have been compiled by Kiguel and Liviatan (1992a) and are, with some extensions, shown in tables 1 and 2. In almost all cases *output rose* shortly after the implementation of the programme, and in cases where the exchange rate was fixed later on (only after monetary and fiscal stabilisation) this caused at least no recession. Some countries experienced a recession before the stabilisation programme was introduced. This could indicate free capacities and therefore favourable supply side conditions for the stabilisation period.

The *deterioration of the current account* in all cases, mostly due to a real appreciation, was initially financed by capital inflows, and in cases where such inflows could not be sustained or external deficits could not be stabilised the programmes had to be abandoned. The observed *higher real wages* at the end of the stabilisation packages (as compared to the beginning) hide the fact that in many cases wages fell with the implementation of the programme, such wage flexibility allowing favourable supply side effects to develop (e. g., Israel). Some packages, though, contained an initial "once and for all" wage increase (especially where wages were frozen afterwards). Such measures, however, generally brought about a slowdown of the following wage increases. The *fiscal deficit decreased* in many cases, displaying on the one hand the effects of supporting restrictive fiscal measures, and on the other – at least to some extent – effects of automatic stabilisers improving the deficit during the stabilisation boom.

As mentioned before, *higher consumption* and *higher investment* seem to be the typical effects of exchange rate-based stabilisations. In many cases consumption was the first variable to react and thus leading the boom process. Investments were higher (almost only) in cases where they were supported by foreign capital.

Theoretically, various explanations of such favourable output effects have been given in the literature. A more traditional approach relies on the positive effect of a *lower real interest rate* on investment and consumption. The reduction of real interest is due to the fact that, if uncovered interest parity holds (domestic nominal interest equals the foreign one plus devaluation expectations), with *credibly* stopped devaluations the domestic nominal interest rate has to come down; if inflation is still high and can be reduced only slowly (which might be due to structural rigidities), the real interest (as the difference between the nominal rate and inflation) has to be lower during the inflation adjustment.

Table 1: Selected Cases of Exchange Rate-Based Stabilisations: Policy Measures

Country Period <sup>1</sup>	Exchange rate	Income policy	Budget reform	Trade policy	Restr. <sup>2</sup> before	Dev. <sup>3</sup> before
<u>Argentina</u>						
1959.3-1962.2	fixed	no	at beg.	inv. <sup>4</sup>	yes <sup>5</sup>	yes
1967.2-1970.3	fixed	gradual	yes	KA <sup>6</sup>	no	no
1973.3-1975.2	fixed	yes	no	no	no	no
1978.4-1981.1	tab. <sup>7</sup>	no	moderate	CA,KA <sup>8</sup>	yes	no
1985.1-1986.3	fixed	shock	at beg.	no	no	yes
from 1991.2	fixed	yes	yes	CA,KA <sup>8</sup>	yes	yes
<u>Brazil</u>						
1964.2-1968.3	st.fixed <sup>9</sup>	gradual	yes	no	no	yes
1986.1-1986.4	fixed	shock	no	no	no	no
from 1994.2	fixed	gradual	moderate	CA,KA <sup>8</sup>	no	gradual
<u>Chile</u>						
1976.3-1982.3	var. <sup>10</sup>	no	yes	CA,KA <sup>8</sup>	yes	yes
<u>Israel</u>						
from 1985.1	fixed w.d. <sup>11</sup>	shock	yes	no	no	yes
<u>Mexico</u>						
from 1988.1	fixed, c.p. <sup>12</sup>	sml.shock	yes	CA,KA <sup>8</sup>	fiscal p.	yes
<u>Uruguay</u>						
1968.2-1972.1	fixed	shock	at beg.	no	no	yes
1978.4-1982.4	tab. <sup>7</sup>	no	yes	CA <sup>8</sup>	yes	no

A "shock" in income policy indicates a price or wage freeze; "trade policy" refers to changes or reforms in the respective policy at the beginning of or shortly before the stabilisation.

<sup>1</sup>Period: year.quarter.

<sup>2</sup>Restrictive monetary or fiscal measures.

<sup>3</sup>This refers to a large discretionary devaluation with the introduction of the stabilisation programme.

<sup>4</sup>Incentives for foreign direct investment.

<sup>5</sup>Incentives for foreign capital inflows.

<sup>6</sup>IMF adjustment programme implemented six months before actual stabilisation.

<sup>7</sup>Pre-announced devaluation by "tablita".

<sup>8</sup>Liberalisation of the current account (CA) or current and capital account (CA,KA).

<sup>9</sup>Stepwise devaluation with fixed rates between steps.

<sup>10</sup>Various regimes: firstly floating rates, then pre-announced devaluations ("tablita"), then fixed.

<sup>11</sup>Fixed exchange rate with occasional devaluations.

<sup>12</sup>Fixed exchange rate during first year, then crawling peg.

*Sources:* See table 2.

In principle such propagating mechanisms are present in the models of Rodriguez (1982; cf. also his work cited in Kiguel/Liviatan, 1992a, pp. 281ff) and

Table 2: Selected Cases of Exchange Rate-Based Stabilisations: Results

Country Period <sup>1</sup>	Inflation rate <sup>2</sup>	GDP high <sup>3</sup>	Cons. boom	Invst. boom	CA <sup>4</sup>	$\epsilon$ <sup>5</sup>	$\frac{W}{P}$ <sup>6</sup>	$\frac{BD}{GDP}$ <sup>7</sup>
<u>Argentina</u>								
1959.3-1962.2	9,5-1,9	1	yes	yes	-	-	+	-, +
1967.2-1970.3	2,5-2,7	2	yes	yes	-	-	+	-, +
1973.3-1975.2	5,8-0,8	1	yes	no	+, -	-	+, -	+
1978.4-1981.1	8,1-8,6	1	yes	yes	-	-	+, -	+
1985.1-1986.3	24,9-2,6	1	yes	yes	-	-	-	-, +
from 1991.2	27-(1)	1	yes	yes	-	-	+	-
<u>Brazil</u>								
1964.2-1968.3	6,4-4,2	4	n.a.	yes	+, -	-, +	-, +	-
1986.1-1986.4	11,1-1,7	1	yes	n.a.	-	-	+	=
from 1994.2	45,2-(1,6)	(1)	yes	n.a.	(-)	(-)	(+)	n.a.
<u>Chile</u>								
1976.3-1982.3	11,2-6,5	1	yes	yes	-	-, +, -	+, -	-
<u>Israel</u>								
from 1985.1	2,5-2,7	1	yes	yes	-	-	+	-
<u>Mexico</u>								
from 1988.1	21,2-6,1	2	n.a.	yes	-	-	=	-
<u>Uruguay</u>								
1968.2-1972.1	9,5-1,9	1	yes	yes	-	-, +	+, -	-, +
1978.4-1982.4	3,4-4,6	1	yes	no	-	-	-	+

"n.a." indicates an unclear outcome or data not available; "=" indicate no or insignificant changes of respective variables; information within parenthesis indicate preliminary results.

<sup>1</sup>Period: year.quarter.

<sup>2</sup>Monthly percentage change in inflation rates from the starting to the end point of the respective stabilisation programme.

<sup>3</sup>First year in which GDP grew above trend.

<sup>4</sup>Current account: "+" ... improvement, "-" ... deterioration.

<sup>5</sup>Real exchange rate  $\epsilon$ : "+" ... depreciation, "-" ... appreciation.

<sup>6</sup>Real wages  $\frac{W}{P}$ : "+" ... rise, "-" ... fall.

<sup>7</sup>Budget deficit ratio  $\frac{BD}{GDP}$ : "+" ... rise, "-" ... fall.

*Sources:* Basic table from Kiguel/Liviatan (1992a, pp. 286f, table 1). See also Végh (1992), Rama (1992), and, especially for the more recent cases of Argentina (1991, "Cavallo plan"), and Brazil (1994 "Plano Real"), Andrecs (1994), Schweickert (1994), Baer (1995), Baer/Paiva (1994, 1995), Pesendorfer (1995), Conjuntura Econômica, O Estado de S. Paulo, Folha de S. Paulo, Jornal do Brasil and Veja.

Rama (1992), the latter working with a Malinvaud-type disequilibrium model (cf. Malinvaud, 1977) where exchange rate stabilisation brings the economy from

a situation of "repressed inflation" with an output boom to a recessionary one of "Keynesian unemployment".

Another type of models takes into account that especially in the exchange rate-based stabilisation experiences of the eighties boom cycles could be observed in spite of rising real interest rates. *Lacking credibility* of a stabilisation programme is the driving force of the models elaborated by Calvo and Végh (1991; cf. also the summary presentation given in Végh, 1992, pp. 652ff). Intertemporally maximising individuals will shift their consumption and investment to the first period of the stabilisation – taking advantage of the stopped devaluation when exchange rates are stabilised – if they perceive the programme to last only temporarily and to be unsuccessful in its outcome, leading to higher inflation and devaluation later on. Such a demand shift will generate a boom in absorption, and, through second round and other effects, in output in general. As shown in the theoretical model, the real interest rate drops initially and then, starting from this lower level, will rise in the course of the programme (and it may even fall again by some smaller amount), never reaching its old level until stabilisation is abandoned. If stabilisation were totally credible, nothing would happen in the real variables due to the "Ricardian equivalence structure" of these micro-founded models. Only a backward-looking wage mechanism or the introduction of capital controls (as opposed to the full capital mobility assumed in the general model) may lead to a recessionary stabilisation cycle.

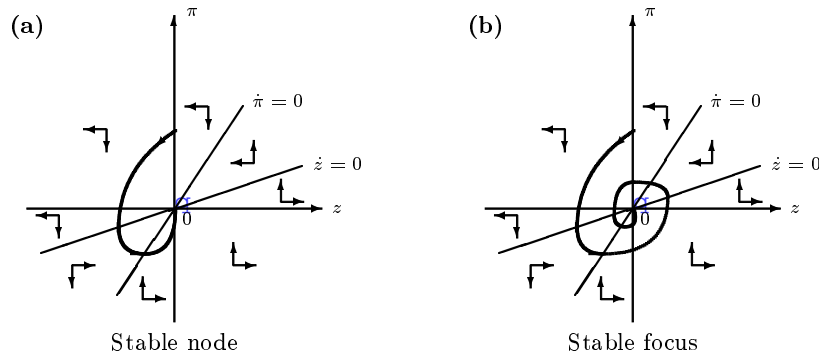
It is a moot question whether the forward-looking information structure assumed in the such models accurately maps real world circumstances, especially in high-inflation economies, where planning horizons tend to be very short. Anyhow, it is also questionable whether the latest experiences of Argentina and Brazil really suffered from low credibility (for Brazil see e. g. the opinion polls cited in various local newspapers shortly after the implementation of the "Plano Real"). Low credibility may certainly have been present in some of the "follow-up" heterodox programmes in the mid-eighties in these countries, when individuals had learned about the failure of preceding stabilisation packages. And, in fact, the presence of substitution effects in these periods seemed to have been responsible for more than sixty percent of the respective output booms, as shown in Reinhart and Végh (1992, Nominal Interest Rates, Consumption Booms, and Lack of Credibility: A Quantitative Examination, Washington, D.C.: International Monetary Fund, mimeo; cited in Végh, 1992, pp. 665f).

The model outlined in the following section follows the more conventional lines of Rodriguez (1982) and will show how boom-cycles of exchange rate-based stabilisations can exist together with – or even due to – high credibility. As mentioned for the models above this outcome relies mainly on interest rate effects, but, as will be discussed, such effects will have to be supported by wage flexibility. The general structure is such that the effects are very sensitive to changes in parameters, and "the wrong" setting can turn the adjustment unstable (for a more detailed presentation of the following see Wehinger, 1995, pp. 235ff and 395ff).

### 3 Exchange Rate-Based Stabilisation in an AS/AD Model

The conventional recessionary dynamics of stabilisation can be generated in simple IS/LM-models including a Phillips curve and adaptive expectations (for a closed economy version see, e. g., the textbook of Simonsen/Cysne; 1989, pp. 421ff; an open economy extension is presented and discussed in Wehinger, 1995, pp. 259ff). The latter and the inflation-output trade-off are then responsible for the temporary slump in output if the exchange rate and/or the money base are stabilised. Typical adjustment paths in the inflation-output plane ( $\pi$ - $z$ ) are shown in figures 1 (a) and (b).

Figure 1: Exchange Rate-Based Stabilisation in a Phillips Curve Model: Phase Diagram



In the course of the stabilisation programme, starting at a full employment level ( $z = 0$ ), output and inflation begin to fall. At a certain point in time inflation even turns negative, meaning the price level then starts to decrease from its maximum value. Depending on the parameters of the dynamic system (the stable solutions can then have (a) two real roots or (b) two complex conjugated roots), inflation stays negative, converging to zero "from below", as does the output gap (fig. a), or output and inflation show cyclical behaviour, converging with ever smaller amplitudes to their zero values (fig. b). The price level then has to fall steadily or cyclically to its new steady-state value. If we define the costs of stabilisation in terms of the accumulated output gap, one can see that they are certainly positive. A model's analysis can show that the costs are



higher the higher is the inertia in inflationary expectations, the higher is the Phillips curve trade-off and the more open is the economy.

The main driving force behind the recessionary dynamics in the former model was the Phillips curve trade-off. If the Phillips-curve, the assumption of a relation between wage growth and output, is dropped from the model and substituted by an equation of aggregate supply, one can generate the typical positive output effects of exchange rate-based stabilisations described above. The model is presented as a whole in table 3, in the following its equations will be commented on shortly. All variables are in logs, the interest and other rates ("x") can be understood as transformed by  $\log(1+x)$ .

Table 3: Equations of the AS/AD Model

---

$y^s$	$= \bar{y} - \delta \varepsilon - \psi (w - q), \delta, \psi > 0$	<i>(aggr. supply, AS),</i>	(1)
$y^d$	$= \bar{y} + \gamma \varepsilon - \rho r, \quad \gamma, \rho > 0$	<i>(aggr. demand, AD),</i>	(2)
$m - p$	$= \eta y - \alpha i + \phi, \quad \eta, \alpha > 0$	<i>(money demand, LM),</i>	(3)
$\dot{\hat{\pi}}$	$= \beta(\pi - \hat{\pi}), \quad \beta > 0$	<i>(adaptive expectations),</i>	(4)
$y$	$= y^s = y^d$	<i>(market equilibrium),</i>	(5)
$w$	$= \hat{p} + a$	<i>(wage formation),</i>	(6)
$p$	$= (1 - \kappa)q + \kappa(e + p^*), 0 < \kappa < 1$	<i>(consumer price index),</i>	(7)
$\pi$	$\equiv \dot{p}, \quad \hat{\pi} \equiv \dot{\hat{p}}, \quad \pi^* \equiv \dot{p}^*$	<i>(inflation rates),</i>	(8)
$z$	$\equiv y - \bar{y}$	<i>(output gap),</i>	(9)
$\varepsilon$	$\equiv e + p^* - q$	<i>(real exchange rate),</i>	(10)
$r$	$\equiv i - \hat{\pi}$	<i>(real interest rate),</i>	(11)
$i$	$= i^* + \varphi \dot{e}, \quad \varphi > 0$	<i>(interest parity).</i>	(12)

---

*Aggregate supply*  $y^s$  in equation (1) is determined by the real exchange rate  $\varepsilon$  (defined in (10)) and the real wage  $(w - q)$ , where the both the nominal exchange rate  $e$  and nominal wages  $w$  are deflated by the producer price index  $q$ ;  $p^*$  in (10) is the foreign price level,  $\bar{y}$  in (9) the full-employment (or potential) output, and  $\delta$  and  $\psi$  are respective elasticity parameters. A real appreciation (decrease in  $\varepsilon$ ) tends to increase supply, and higher real wages will lower it (for a similar, discrete time version of such an AS-equation cf. Fischer, 1986, pp. 248, equ. (2), and 1988, p. 31, equ. (2)).

As a counterpart, *aggregate demand*  $y^d$  in equation (2) is lower the more appreciated is the real exchange rate and, as common in an IS/LM context, the higher is the real interest rate  $r$ . *Real money demand* in (3), based on the consumer price index  $p$  and  $m$  being nominal money, is positively driven by real income  $y$  and negatively by the nominal interest rate  $i$ , as typical for an LM equation.  $\phi$  is a scaling or shock parameter.

*Adaptive expectations* for CPI inflation defined in (8) (a hat on the variables indicate their expected values) are modelled in (4) in the usual form, the adjustment factor  $\beta$  determining the speed of adjustment. It is important to note that if one wants to give up the assumption of individuals adapting their expectations gradually and backward-looking, such an equation can also describe some *nominal rigidities* in wage adjustment, caused for example by overlapping contracts (see, e. g., Barbosa, 1991, and Evans/Yarrow, 1981). In this sense "adaptive" expectations are not inconsistent with the immediately credible stabilisation (and "rational expectations") described later.

The market equilibrium condition is given in (5), bringing together aggregate demand and supply.

The *wage formation* in (6) proposes that nominal wages will be paid according to the expected CPI level,  $a$  being a scaling factor. In a dynamic interpretation wage increases will follow expected CPI inflation (possibly corrected for, e. g., productivity shocks  $\dot{a}$ ). This implies the maybe heroic assumption of a vertical Phillips curve (wages being independent of the employment situation), but this can be accepted even for the short term in a high inflation economy model, where nominal wages are usually indexed to inflation and the inflation part of the wage rises makes up for most of the wage increases (for a formal exposition cf., e. g., Lees et al., 1990, pp. 56ff). Indexation then is commonly installed in a backward looking way, so that the wage equation (6) together with adaptive (backward-looking) expectations (4) leads to a consistent and rather realistic description of the wage formation process. For the stabilisation dynamics depicted below one has to note that the supply side effects of real wages depend on the producer prices, not the (expected or actual) CPI.

This *consumer price index*  $p$  (CPI) is given in (7) and is calculated as a weighted average of producer prices and the foreign price level  $p^*$ , adjusted by the nominal exchange rate  $e$  to domestic levels. The (fixed) weighting factor  $\kappa$  is determined by the import share in domestic demand, expressing also the

openness of the economy. An output gap  $z$  is defined in (9) as the difference between actual output  $y$  and its full employment level  $\bar{y}$ .

The open-economy-with-full-capital-mobility assumption is expressed in the *interest parity* (12). As one can see it is not an expected or forward devaluation but the actual value  $\dot{e}$  that enters the respective equation, accounting for the difference between the domestic ( $i$ ) and the foreign interest rate ( $i^*$ ). This should enhance the tractability of the model and can simplify the analysis of a fully credible stabilisation. The parameter  $\varphi$  should then be able to express somewhat any deviation from this interest parity, expectations of a falling (with  $\varphi < 1$ ) or rising (with  $\varphi > 1$ ) inflation or speculative elements in general.

The nominal interest  $i$  determined through international relations is itself the sum of the real rate  $r$  and expected inflation  $\hat{\pi}$ , as shown in (11). To understand part of the stabilisation dynamics in the following, it should be made clear that by (11) and (12) (due to capital mobility) the real interest rate which enters the AD (or IS) relation (2) is given as

$$r = i^* + \varphi \dot{e} - \hat{\pi} \quad (\text{real interest rate}). \quad (13)$$

If  $\dot{e} > 0$  is positive during the high inflation regime, a strict and fully credible exchange rate-based stabilisation, abruptly ending devaluation, leads to  $\dot{e} = 0$ . With adaptive expectations (or structural inflation inertia)  $r$  decreases immediately, gradually converging to its new equilibrium value (c. p. the former level).

Now we assume the *implementation of an exchange rate-based stabilisation programme*, which (in this model's context) has to be double anchored, namely from the exchange rate and the monetary side (see Bruno, 1990, pp. 24ff, for a discussion of using multiple anchors for the purpose of inflation stabilisation).

So from  $t = 0$  on, when the programme starts, we have (for a detailed exposition of the following see Wehinger, 1995, pp. 265ff and 400ff)

$$\dot{e} = \ddot{e} = \dot{\dot{e}} = 0 \quad \forall t \geq 0 \quad (\text{exchange rate-based stabilisation}) \quad (14)$$

and

$$\dot{\hat{m}} \equiv \dot{\hat{\mu}} = 0 \quad \forall t \geq 0 \quad (\text{monetary stabilisation}). \quad (15)$$

Here  $\hat{m}$  and  $\hat{\mu}$  indicate money demand adjusted for influences of potential output,

$$\hat{m} = m - \eta \bar{y}. \quad (16)$$

and its growth ( $\dot{\hat{m}} = \dot{\hat{\mu}}$ ), respectively. It has to be noted that condition (15) also implies full sterilisation of foreign capital movements (mainly inflows). To make the dynamics tractable we further assume

$$\pi^* = \frac{di^*}{dt} = 0 \quad (\text{no foreign shocks}) \quad (17)$$

and

$$e(t) = \hat{m}(t), \quad p^*(t) = i^*(t) = g(t) = 0 \quad \forall t \geq 0 \quad (\text{homogeneity}). \quad (18)$$

The dynamic system in  $z$  and  $\pi$  can then be reduced to

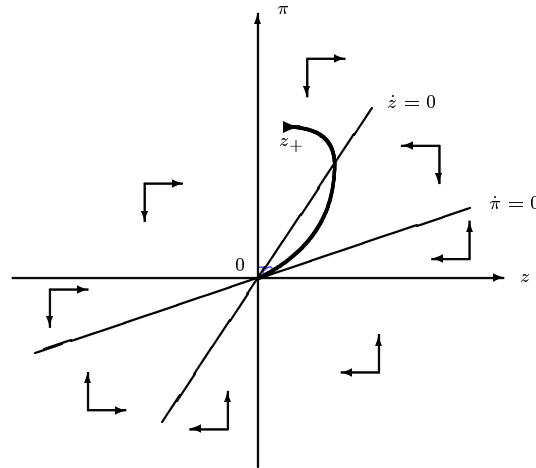
$$\begin{bmatrix} \dot{z} \\ \dot{\pi} \end{bmatrix} = \begin{bmatrix} -\frac{\psi[(1-\kappa)-\gamma\eta]}{\rho(1-\kappa)} & \frac{\delta+\psi}{1-\kappa} \\ \frac{\psi[(1-\kappa)-\gamma\eta](\beta\rho-\psi)}{\rho^2[\delta+\psi+\gamma-\beta\rho(1-\kappa)]} & -\frac{(\delta+\psi+\gamma)(\beta\rho-\psi)}{\rho[\delta+\psi+\gamma-\beta\rho(1-\kappa)]} \end{bmatrix} \begin{bmatrix} z \\ \pi \end{bmatrix}, \quad (19)$$

with stability given by the conditions

$$\begin{aligned} \delta + \psi + \gamma &> \beta\rho(1 - \kappa), \\ 1 - \kappa &> \gamma\eta \quad \text{and} \quad \beta\rho > \psi \quad (\text{stability conditions}). \end{aligned} \quad (20)$$

The phase diagram of the adjustment dynamics during stabilisation is shown in figure 2.

Figure 2: Exchange Rate-Based Stabilisation in the AS/AD Model: Phase Diagram



Economic interpretations of the conditions (20) can be given as follows:

- $1 - \kappa > \gamma\eta$  requires the economy not to be "too open". Then the real exchange rate elasticity of demand ( $\gamma$ ) and the income elasticity of real money demand ( $\eta$ ) should be relatively small. This means that the import demand (the "import boom" which also exerts pressure on domestic producer prices) should not react too heavily on real appreciations, and that rising income (during the stabilisation) should not cause too high a

rise in money demand, counteracting the restrictive monetary measures taken for the purpose of stabilisation. The smaller  $\gamma$  and  $\eta$  the bigger can be the degree of openness  $1 - \kappa$  without leaving the stability region.

- The condition  $\beta\rho > \psi$  indicates that expectations should adjust "rather rapidly" (or other nominal rigidities should not be "too large", large  $\beta$ ), and that real interest elasticity of demand ( $\rho$ ) should be "high enough", with, at the same time, a "rather low" real wage elasticity of production ( $\psi$ ). So with a low  $\beta$  a big inertia in inflationary expectations can keep the real interest low for a while (as can be seen in (13)), but too much of this inertia will counteract a stable adjustment as it hampers positive supply side effects of wage flexibility.
- All arguments brought forward so far are restricted by the condition  $\delta + \psi + \gamma > \beta\rho(1 - \kappa)$ . This means that the adjustment in inflationary expectations ( $\beta$ ), real interest elasticity of demand ( $\rho$ ), and autarky ( $1 - \kappa$ ) should not be so high as to exceed the sum of real exchange rate elasticity of supply ( $\delta$ ) and demand ( $\gamma$ ), and the real wage elasticity of production ( $\psi$ ). In general this means that *the boom dynamics should be mainly supply-driven*, as too high a demand would put upward pressure on prices and impede inflation stabilisation. Of all the parameters in the restrictions (20) only two have one-sided restrictions (besides the one that they are all positive): the real exchange rate elasticity of supply ( $\delta$ ) is not restricted upwards and the income elasticity of real money demand ( $\eta$ ) not downwards (but above zero). So to ensure stability of an exchange rate-based anti-inflation programme
  - production should show a strong reaction on real appreciation and
  - real money demand should rise very little with an increase in income.

It seems as the success of an exchange rate-based stabilisation programme lies within the very narrow bands of the parameter values guaranteeing stability, but such stability values seem to be compatible with respective parameter values from real world estimates. In fact some estimations with Brazilian data (1985-90) have shown that it is possible to have such a stable adjustment process (due to data specifications the results cannot be regarded as very significant and will not be documented in detail here). The *stable dynamics* can be analysed further with the help of figure 2. The equations for the loci where  $\dot{z} = 0$  and  $\dot{\pi} = 0$ , respectively, are given by (19) as

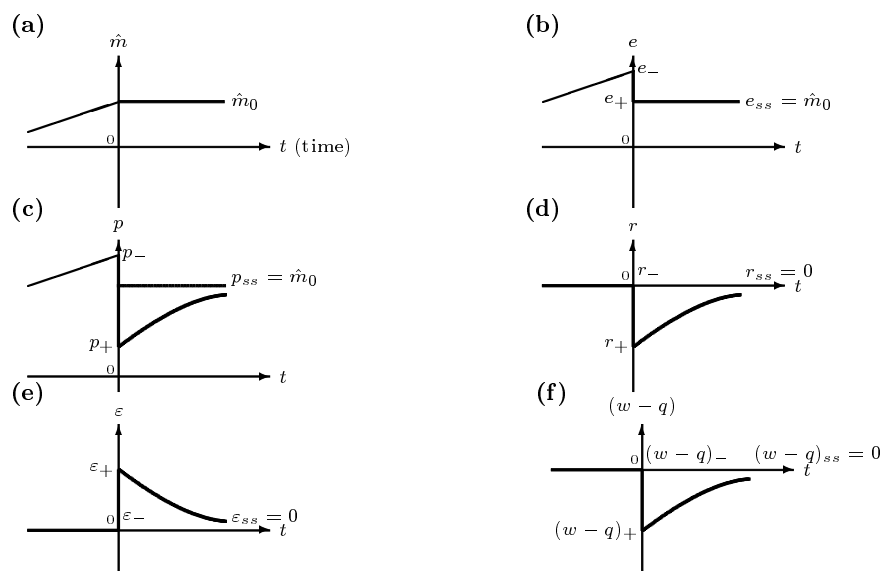
$$\dot{z} = 0 : \quad \pi = \frac{\psi [(1 - \kappa) - \gamma\eta]}{\rho(\delta + \psi)} z \quad (\dot{z} = 0 \text{ line}), \quad (21)$$

$$\dot{\pi} = 0 : \quad \pi = \frac{\psi [(1 - \kappa) - \gamma\eta]}{\rho(\delta + \psi + \gamma)} z \quad (\dot{\pi} = 0 \text{ line}). \quad (22)$$

As shown in the figure, the first line is steeper than the second. With the stability restriction (20) this will always be the case, with  $(1 - \kappa) < \gamma\eta$  it will be true for the absolute values of the respective slopes.

In points above (or left of) the  $\dot{z} = 0$  line output grows, and it falls in points below (or right of) the line, as indicated by the arrows in figure 2. This implies that the maximum output will be reached when the adjustment trajectory in the  $z$ - $\pi$  plane cuts this line. For all points above the  $\dot{\pi} = 0$  line inflation falls, below this line it increases, as indicated by the arrows.

Figure 3: Exchange Rate-Based Stabilisation in the AS/AD Model: Indicative Time Plots of Variables



The plots are shown for a case of exchange rate-based stabilisation with  $\dot{e}(t) = \dot{\mu}(t) = 0 \forall t \geq 0^+$ ,  $\hat{m}_0 \equiv \hat{m}_- = \hat{m}_+ = \hat{m}_{ss}$ . For further assumptions, variable and subindex definitions see Wehinger (1995, pp. 265ff and 400ff).

The *developments of the variables' levels* during the stabilisation are shown in figure 3 for a set of the most important aggregates. Starting with a positive inflation ( $\pi(0) > 0$ ) and full employment ( $z(0) = 0$ ) in a flexible exchange rate regime, at a certain point in time ( $t = 0$ ) stabilisation begins with fixing the

exchange rate and money supply (adjusted  $\hat{m}$ ), after the exchange rate has been brought in line with money supply through a once-and-for-all appreciation (at  $t = 0^-$ , the moment "exactly before" stabilisation begins).

The immediate nominal appreciation is accompanied by a singular real devaluation at  $t = 0^-$ , caused by a downward jump in domestic producer prices  $q$ . This leaves room for the following real appreciation taking place in the course of stabilisation.

An immediate downward jump can also be observed in nominal and real wages,  $w$  and  $w - q$  respectively, which will rise during the adjustment converging to their old levels. The same behaviour is observed for the path of the real interest rate. Thus demand is initially stimulated. This interest rate effect tapers off in the course of the adjustment.

In the process of stabilisation all variables adjust to their respective long-run (or steady-state) values (subindex "ss"). Monetary variables adjust with reference to the fixed level of money supply  $\hat{m}_0$ , real variables with reference to the goods market equilibrium  $z_{ss} = 0$ .

As opposed to other conventional models (with, e. g., a Phillips curve trade-off), here bringing down inflation by fixing the exchange rate leads to *stabilisation gains* instead of costs. As can be shown these gains are (c. p.) higher

- the higher is the degree of openness of the economy (the higher is  $\kappa$ ),
- the higher is the income elasticity of real money demand (the higher is  $\eta$ ),
- the higher is the real exchange rate elasticity of supply (the higher is  $\delta$ ) and
- the higher is the inertia in inflationary expectations (the lower is  $\beta$ ).

For the other parameters ( $\psi$ ,  $\rho$ ,  $\gamma$ ) the (directions of) effects are undefined (unless further restrictions are imposed). With the above statements one still has to take into account the stability restrictions (20). This is not the case for  $\delta$ , the real exchange rate elasticity of supply. This underlines the importance of supply side effects invoked by the real appreciation ( $\dot{\epsilon} < 0$ ) during stabilisation.

## 4 Brazil as an Example: Some Evidence from the "Plano Real", 1994

After a series of unsuccessful stabilisation plans in the eighties (described, e. g., in Baer, 1995) to bring down inflation which temporarily reached levels of 50 percent per month and above Brazil has implemented an exchange rate-based stabilisation programme in 1994, called the "Plano Real".

At the centre of this new plan, introduced by January 1994 by the then finance minister Fernando Henrique Cardoso (who later was elected president)

stood the *introduction of a new currency*. But prior to this changeover to the "Real" the programme set gradual steps in order to prepare for a smooth adjustment and to enhance the credibility of the stabilisation, and, as unknown before, the plan was also discussed in a political process (for more details on the plan cf. also Baer/Paiva, 1995, and Conjuntura Econômica; besides that much information used here is taken from Pesendorfer, 1995, pp. 112ff).

One area of adjustment was a *fiscal reform* which should reduce the 1993 deficit of 22.2 bill. US\$ to zero. Starting early in 1994, spending was cut for public investments, personnel, and state enterprises, and taxes were increased across the board by 5 percent. The effects of these restrictive measures should then be cushioned by the newly created "Social Emergency Fund" ("Fundo Social de Emergência"). As this fund was planned to exist only temporarily, some structural adjustments enhancing the responsibilities of local authorities (state governments and municipalities) for social affairs should provide the same transfers for the longer term.

To gradually prepare for the new currency, a *new index*, called the "Unit of Real Value" ("Unidade Real de Valor", URV) was introduced at the end of February 1994. The URV was tied to the US-dollar on a one-to-one-basis and, according to the prevailing inflation, its quotation in local currency (the "Cruzeiros Reais" at that time) rose steadily along with the exchange rate. The use of this index for private contracts was not only encouraged by the government, it was also widely accepted.

The *new currency*, the "Real" (R\$), was then introduced upon governments decision on July 1st, valued at 1 URV or 1 US\$ (or 2.750 old Cruzeiros Reais). As it happened with other stabilisations, many firms tried to lift their prices shortly before the new plan took effect, fearing a price freeze or some other severe measures not announced – as was their experience from former stabilisation packages. But the government abstained from price regulations and relied on competition, mainly coming from abroad, a stance that was also publicly announced. In fact, prices came down again as the public was in a position to bargain, also meaning that they could wait for price reductions trusting in the stability of the new currency.

This "hard currency policy" was backed by a *restrictive monetary policy*. Among the measures taken were the setting of limits on short-term export financing, a 100 percent reserve requirement on new deposits, and a limit of 9.5 mill. R\$ was decreed on the expansion of the monetary base for the period between July 1st, 1994 and March 31st, 1995. Within this period, a maximum expansion of 7.5 mill. R\$ was allowed until September 30th and of 8.5 mill. R\$ until December 31st, 1994. Only upon decision of the "Monetary Council" these limits could be exceeded, and only by up to 20%. In fact, the limits had to be raised to 9 mill. R\$ by September, but besides some short overshooting this did not cause inflation to rise essentially because the expansion had only to accommodate the higher demand for money holdings in the now stable environment.



High interest rates together with and the stable currency attracted foreign investment, and in order to discourage large capital inflows the authorities allowed the "parallel" Real to appreciate while the official rate was kept fixed to one US\$ initially. High interest rates could also not discourage consumption and investment, and a steady pressure on prices was thus coming from internal demand.

Nevertheless, such factors did not outweigh the stabilising forces and the *overall initial results* of the Real plan were very positive. Tables and graphs to illustrate the effects are provided in the appendix, here we will restrict ourselves to highlighting only some of the most important facts.

*Inflation* was brought down rapidly, from almost 50 percent a month to below 1 percent, as can be seen in figure A-2 and table A-1. *Output* was stimulated, as shown by the production indices in table A-4. So the theoretical boom-cycle adjustment presented above (see figure 2) finds its real world counterpart, graphed in figure A-1, at least for the short term between May and December 1994. Overall real growth rose from a yearly average of 4.3% in the first to 5.1% in the second quarter of 1994, still increasing in 1995, and along with this rose investment and sales.

The boom in *private consumption* (with a monthly average rise of 20% during the first 8 months of the plan) was mainly due to the increased real wages of the lower income groups. And indeed, some redistributive effects of the programme towards lower income groups could be observed, as these groups were normally the most heavily affected by high inflation. The overall *real wage* index provided in table A-3 and graphed in figure A-6 shows an initial decline, but it then rises steadily. This index is not the theoretically important one deflated by producer prices, but it gives an indication of what was discussed before.

Contrary to what could be expected from increased competition in a "rather oligopolistic" economy, corporate profits rose and the return on assets increased from 3.1% in 1993 to 9.8% in 1994, according to a sample survey cited in Baer/Paiva (1995, p. 21).

The *problematic aspects* of the Plano Real are mainly the *real appreciation* of the exchange rate, a problem common to most exchange rate-based stabilisations. Lost external competitiveness will result in lower exports, and increasing income in the strong currency will boost imports, facts that are shown in table A-1 and figure A-4. But the Brazilian authorities were very flexible in their exchange rate management, and – contrary to the Argentinean "Cavallo Plan" with a strictly locked-in exchange rate – the Real was first allowed to appreciate and by March 1995 it was devalued by 6 percent to counter the deterioration of the current account. Before this devaluation temporary trade restrictions were introduced to curb the surge in imports. But in general, the exchange rate moving within relatively small bands against the Dollar, the idea of using the exchange rate as an anchor was never abandoned.

According to opinion polls credibility of the Plano Real is still high, and thus the remaining high levels of interest rates should not indicate inflationary

expectations. The continuing high demand under such circumstances is still a puzzle not easily explained by theory. A crucial role will also be played by the development of the fiscal deficit, which, after a low of  $-0.5\%$  of GDP in 1994, is forecast to rise to  $1.5\%$  in 1995.

## 5 Conclusions

The analysis of exchange rate-based stabilisation has shown that even within a rather conventional AS/AD model it is possible to generate an adjustment to lower inflation with a concomitant output boom, uncommon to the usually recessionary stabilisation cycles. The structure of the model is quite simple, and further versions could include, for example, an uncovered interest parity (with expected instead of the actual rate of devaluation as presently specified) and a partial adjustment equation for devaluation expectations.

A recessionary response to stabilisation is usually caused by expectations' inertia or structural rigidities. Then quantities have to take the burden of adjustment before prices have reached their new equilibrium levels. If, as in the AS/AD model presented here, we allow for supply-side effects, supported by wage flexibility, a downward pressure from import prices, and lower real interest rates pushing demand, it seems to be possible to overcome the fate of stabilisation costs in terms of output (and thus employment) losses.

But there are some caveats to this argument. The model is of a short-run nature, and we do not model the balance of payments. As it effects the long-run equilibrium we have to be aware of the fact that with balance of payments disequilibria the stabilisation costs might have to be born in later periods. As during exchange rate-based stabilisation programmes the current account typically deteriorates – financed by capital inflows at least in the first periods – this might lead to unsustainable situations, especially if foreign investors lose their confidence in the long-term success of the programme.

Some experiences, especially in Latin America, show that due to the oligopolistic structure in some of the high inflation economies it was possible to bring down real appreciation by enhanced import competition, without heavily restricting demand, and thus the necessary stabilisation of the current account could be attained without too high a cost. Nevertheless, this needs not to be the case in general. And it will to a great extent depend on the possible speed of structural adjustments whether import competition will destroy domestic industries with long-term effects.

Not taking general time preferences into consideration, an exchange rate-based stabilisation might be preferred to pure money-based stabilisations (with higher initial costs) for political reasons if it is only able to shift the costs of adjustment towards later periods. This is the case if support for an immediately recessionary programme cannot be expected from the constituency. And then, still, as was argued, with structural adjustments these later costs need not be too

high, (partially or more than fully) compensated by long-term growth effects. The Brazilian case provides, at least up to now, a good example of how such an adjustment can work. It seems that a certain discretionary room to manoeuvre is needed for the policies accompanying the exchange rate-based stabilisation, but it is also important to communicate the measures taken. Furthermore it seems that tying the currency within a (rather narrow) band is preferable to anchoring it strictly for a long time (as in a currency board system). So the necessary initial fixed rate grip should be loosened after credibility has been attained. In this way some flexibility for very short term adjustments is allowed for, and if the set of policies is (and is perceived as) consistent with sustainably low inflation this will not undermine credibility.

With the further appraisal of the recent experiences of exchange rate-based stabilisations not only in Latin America but also in Eastern Europe, we should be able to gain further insights into the short and long-run dynamics of such programmes and the "optimal" policy mix around the exchange rate anchor.

## References

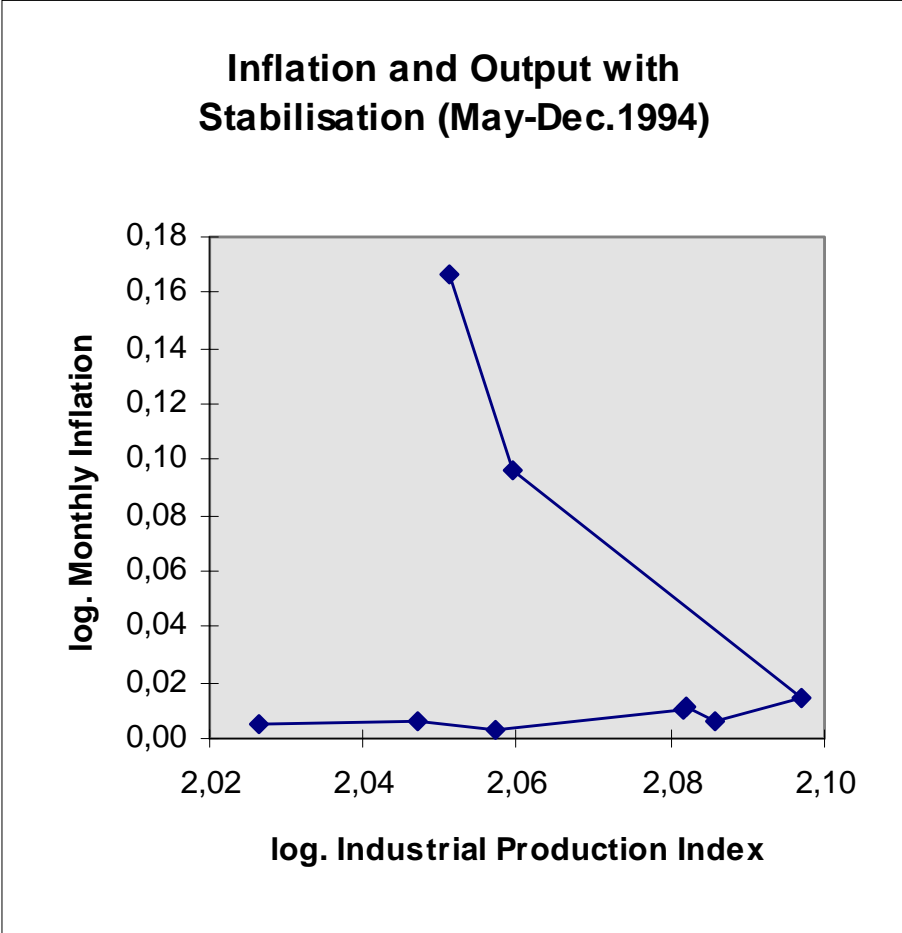
- Hannes E. **Andrecs** (1994). *Inflationsstabilisierung am Fallbeispiel Argentinien – der Konvertibilitätsplan, 1991*. Master's thesis. Wien: Wirtschaftsuniversität.
- Werner **Baer** (1995). *The Brazilian Economy: Growth and Development*. 4th Edition. Westport et al.: Praeger.
- Werner **Baer** and Claudio **Paiva** (1994). *Brazil's Drifting Economy: Stagnation and Inflation During 1987-93*. Paper prepared for the Montreal Conference on "Latin America and the International Economic System in the 1990s: Macro-Level Adjustment Policies and Their Alternatives". Urbana-Champaign (Illinois): University of Illinois at Urbana-Champaign. Unpubl. mimeograph.
- Werner **Baer** and Claudio **Paiva** (1995). *Brazil's Inflationary Legacy and the Plano Real*. Paper prepared for the Institut für Iberoamerika-Kunde as a contribution to its volume on "Inflação no Brasil. Estudos sobre a problemática da estabilização monetária numa economia em desenvolvimento". Urbana-Champaign (Illinois): University of Illinois at Urbana-Champaign. Unpubl. mimeograph.
- Fernando de Holanda **Barbosa** (1991). *A Dinâmica da Hiperinflação e a Inércia dos Preços*. Versão Preliminar. Rio de Janeiro: Fundação Getúlio Vargas. Unpubl. mimeograph.

- Michael **Bruno** and Stanley **Fischer** (1990). "Seigniorage, Operating Rules, and the High Inflation Trap". Quarterly Journal of Economics 105 (2); pp. 353–374.
- Guillermo A. **Calvo** and Carlos A. **Végh** (1991). *Exchange-Rate-Based Stabilization under Imperfect Credibility*. Paper prepared for the International Economic Association Conference on "Open Economy Macroeconomics" (May 30 – June 1, Vienna), Research Department, International Monetary Fund, Preliminary Discussion Paper (Draft: May 13). Washington, D.C.: International Monetary Fund. Unpubl. mimeograph.
- Conjuntura Econômica (1990-95). Various Issues. Fundação Getúlio Vargas, Rio de Janeiro.
- O Estado de S. Paulo (1991-95). Various Issues. São Paulo.
- J. L. **Evans** and G. K. **Yarrow** (1981). "Some Implications of Alternative Expectations Hypotheses in the Monetary Analysis of Hyperinflation". Oxford Economic Papers 33 (1); pp. 61–80.
- Stanley **Fischer** (1986). *Indexing, Inflation and Economic Policy*. Cambridge (Mass.) & London (Engl.): MIT Press.
- Stanley **Fischer** (1988). "Real Balances, the Exchange Rate, and Indexation: Real Variables in Disinflation". Quarterly Journal of Economics 103 (1); pp. 27–49.
- Folha de S. Paulo (1990-95). Various Issues. São Paulo.
- Jornal do Brasil (1990-95). Various Issues. Rio de Janeiro.
- Miguel A. **Kiguel** and Nissan **Liviatan** (1991). "The Inflation-Stabilization Cycles in Argentina and Brazil (and Comments)". In: Michael Bruno, Stanley Fischer, Elhanan Helpman, Nissan Liviatan, and Leora (Rubin) Meridor (eds.), *Lessons of Economic Stabilization and Its Aftermath*. Cambridge (Mass.) & London (Engl.): MIT Press; pp. 191–238.
- Miguel A. **Kiguel** and Nissan **Liviatan** (1992a). "The Business Cycle Associated with Exchange Rate-Based Stabilizations". World Bank Economic Review 6 (2); pp. 279–305.
- Miguel A. **Kiguel** and Nissan **Liviatan** (1992b). "When do Heterodox Stabilization Programs Work? – Lessons from Experience". The World Bank Research Observer 7 (1); pp. 35–57.
- Francis A. **Lees**, James M. **Botts**, and Rubens Penha **Cysne** (1990). *Banking and Financial Deepening in Brazil*. Houndmills et al.: MacMillan.

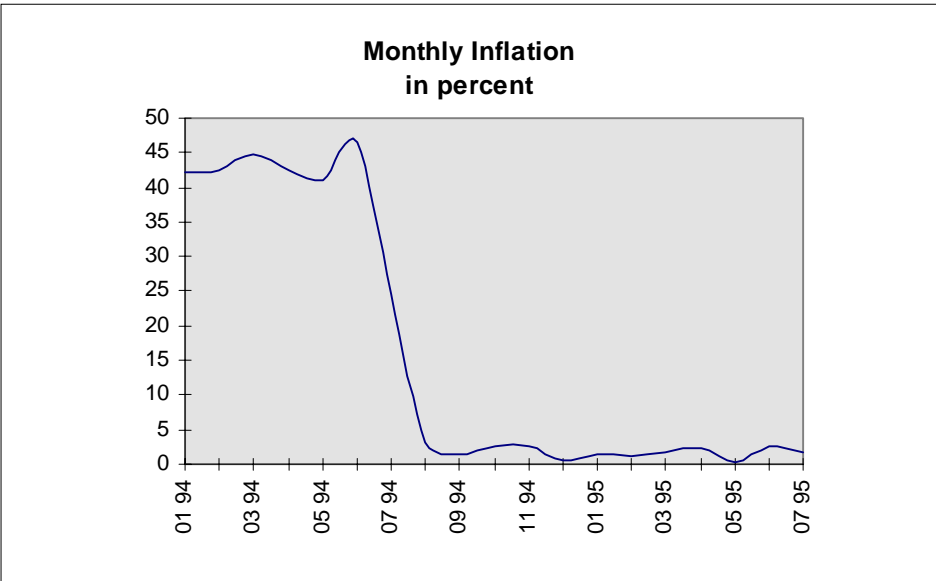
- Edmond **Malinvaud** (1977). *The Theory of Unemployment Reconsidered*. Yrjö Jahnsson Lectures. Oxford: Basil Blackwell.
- Konrad **Pesendorfer** (1995). *Inflation und Stabilisierung in Brasilien: Der Plano Real*. Master's thesis. Wien: Wirtschaftsuniversität.
- Martin **Rama** (1992). "Exchange Rate Preannouncement and Economic Activity: A Note on Southern Cone Stabilization Attempts". *Journal of Macroeconomics* 14 (3); pp. 509–524.
- Carlos A. **Rodriguez** (1982). "The Argentine Stabilization Plan of December 20th". *World Development* 10 (9); pp. 801–811.
- Thomas J. **Sargent** (1982). "The Ends of Four Big Inflations". In: Robert E. Hall (ed.), *Inflation, Causes and Effects*. Chicago & London: University of Chicago Press; pp. 41–97.
- Rainer **Schweickert** (1994). "Exchange Rate Based Stabilisation: Lessons from a Radical Implementation in Argentina". *The World Economy* 17 (2); pp. 171–189.
- Mario Henrique **Simonsen** and Rubens Penha **Cysne** (1989). *Macroeconomia*. Rio de Janeiro: Ao Livro Técnico S.A.
- Carlos A. **Végh** (1992). "Stopping High Inflation: An Analytical Overview". *IMF Staff Papers* 39 (3); pp. 626–695.
- Veja (1989-95). Various Issues. Editora Abril, São Paulo.
- Gert D. **Wehinger** (1995). *Hohe und chronische Inflation: Probleme, Entstehung und Stabilisierung in theoretischer Analyse*. Ph. D. dissertation. Wien: Wirtschaftsuniversität.

**Appendix: Tables and Graphs of the Brazilian Case Study**

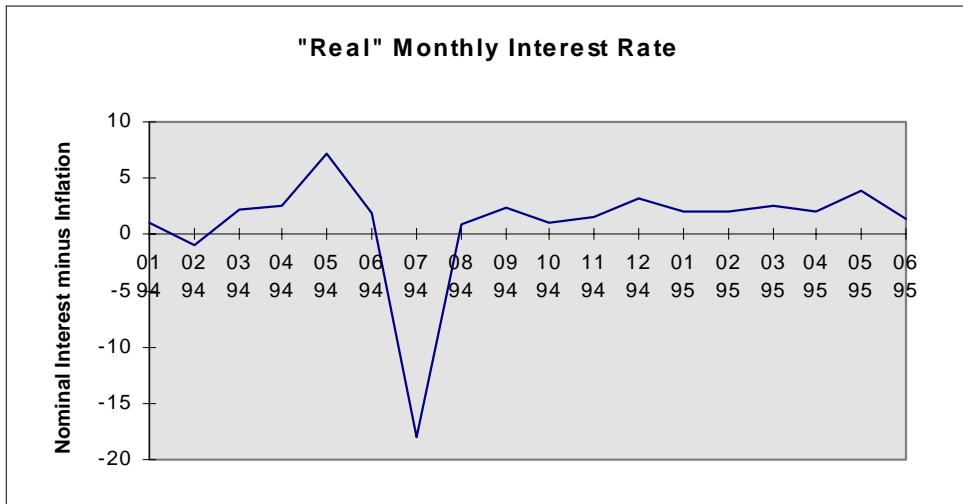
**Figure A-1**



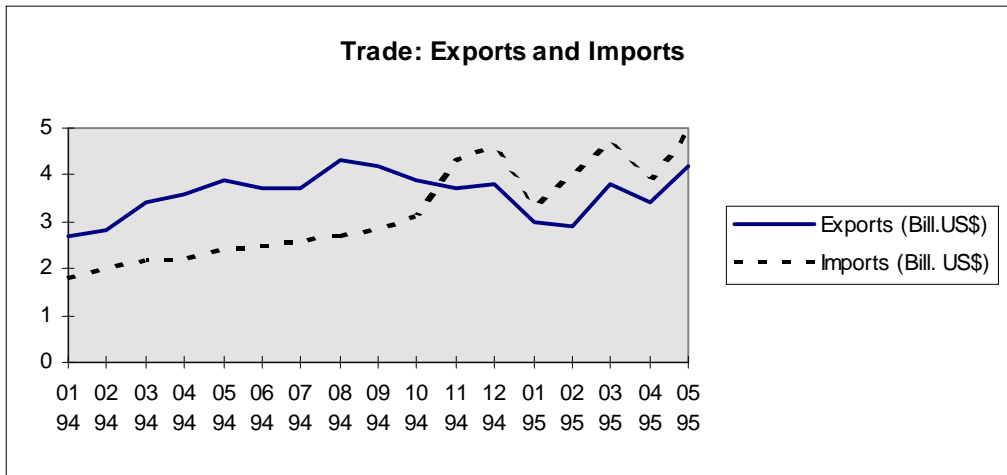
**Figure A-2**



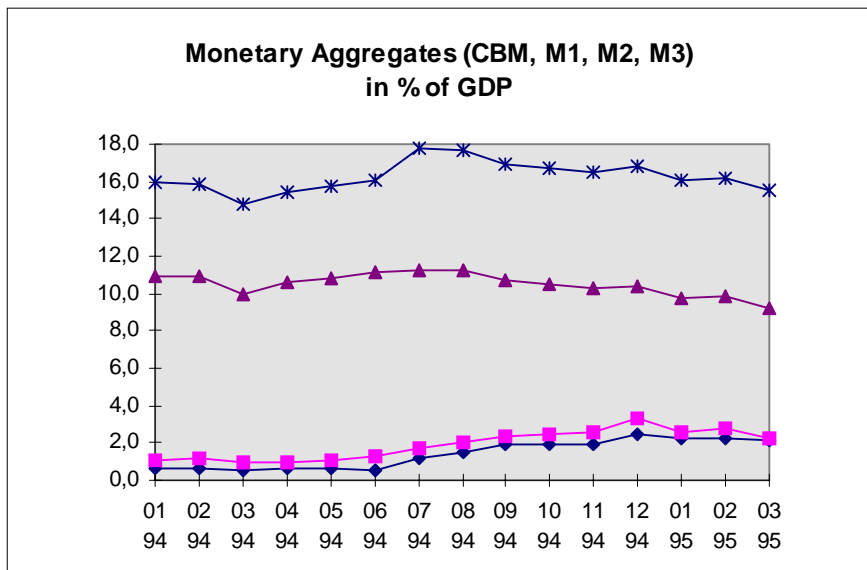
**Figure A-3**



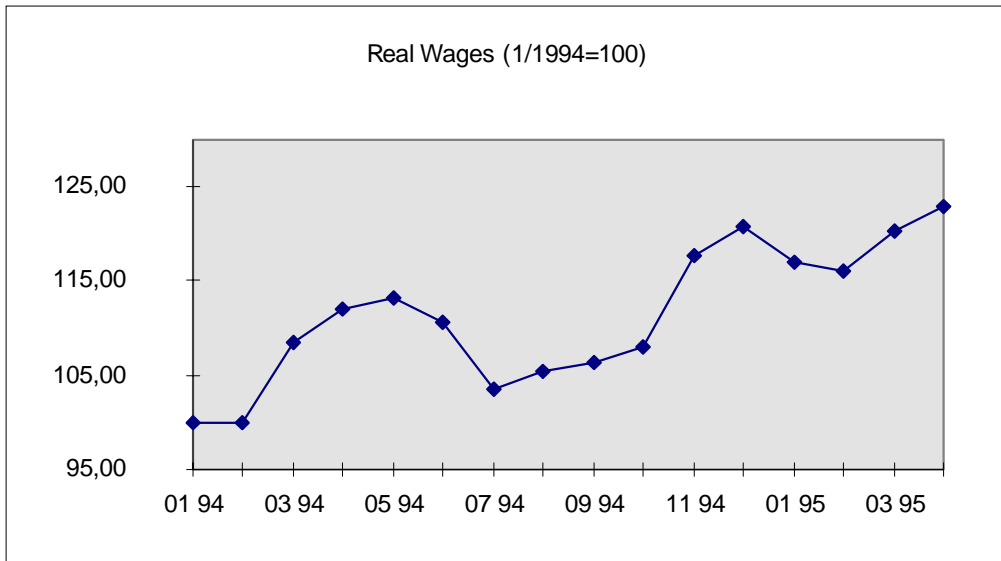
**Figure A-4**



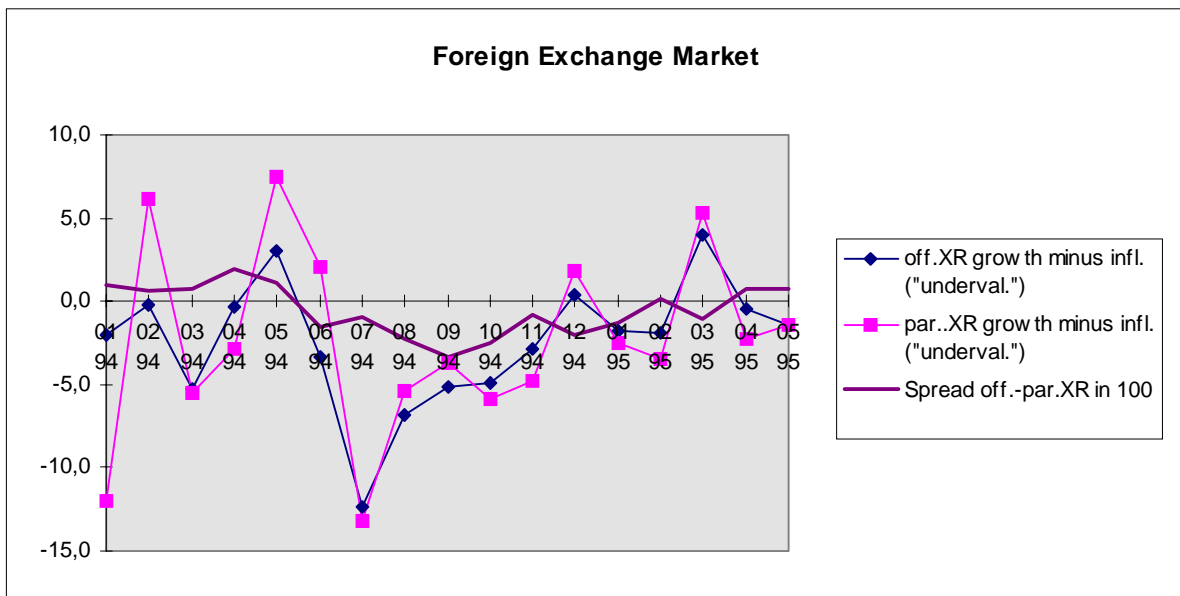
**Figure A-5**



**Figure A-6**



**Figure A-7**





**Table A-1: BRAZIL - General Monthly Data during "Plano Real"**

Period	Monthly Inflation ( $\pi$ )	Exchange Rate	Monthly Interest Rate (i)	"Real" Monthly Interest Rate (i- $\pi$ )	Exports (Bill.US\$)	Imports (Bill. US\$)	Trade Bal. (Bill US\$)
01 94	42,2	0,14	43,2	1	2,7	1,8	0,9
02 94	42,4	0,2	41,5	-0,9	2,8	2	0,8
03 94	44,8	0,28	47	2,2	3,4	2,2	1,2
04 94	42,5	0,4	45,1	2,6	3,6	2,2	1,4
05 94	41	0,58	48,1	7,1	3,9	2,4	1,5
06 94	46,6	0,83	48,4	1,8	3,7	2,5	1,2
07 94	24,7	0,93	6,7	-18	3,7	2,6	1,1
08 94	3,3	0,9	4,2	0,9	4,3	2,7	1,6
09 94	1,5	0,87	3,8	2,3	4,2	2,8	1,4
10 94	2,6	0,84	3,6	1	3,9	3,1	0,8
11 94	2,5	0,84	4,1	1,6	3,7	4,3	-0,6
12 94	0,6	0,85	3,8	3,2	3,8	4,6	-0,8
01 95	1,4	0,85	3,4	2	3	3,3	-0,3
02 95	1,2	0,84	3,2	2	2,9	4	-1,1
03 95	1,8	0,89	4,3	2,5	3,8	4,7	-0,9
04 95	2,3	0,91	4,3	2	3,4	3,9	-0,5
05 95	0,4	0,9	4,2	3,8	4,2	4,9	-0,7

Source: Conjuntura Econômica and Jornal do Brasil , June 15, 1995, p.12.; Baer/Paiva (1995).

**Table A-2: Monetary Aggregates**

Period	Central Bank Money		M1		M2		M3		M4	
	R\$ Mio.	% of GDP	R\$ Mio.	% of GDP	R\$ Mio.	% of GDP	R\$ Mio.	% of GDP	R\$ Mio.	% of GDP
01 94	568	0,6	1.014	1,1	10.044	10,9	14.661	16	21.461	23,4
02 94	774	0,6	1.554	1,2	14.422	10,9	21.000	15	30.400	23,0
03 94	1.035	0,5	1.927	1,0	19.107	10,0	28.276	14	42.166	22,1
04 94	1.562	0,6	2.812	1,0	28.836	10,6	41.795	15	61.857	22,8
05 94	2.284	0,6	4.383	1,1	42.135	10,8	61.431	15	91.526	23,4
06 94	3.177	0,5	7.466	1,3	65.517	11,1	95.109	16	136.661	23,2
07 94	7.533	1,2	10.687	1,7	70.093	11,3	110.205	17	152.003	24,5
08 94	9.414	1,5	12.902	2,0	71.623	11,2	112.774	17	158.242	24,7
09 94	12.789	1,9	15.844	2,4	69.882	10,7	111.055	16	158.760	24,2
10 94	12.999	1,9	16.735	2,5	70.874	10,5	112.927	16	165.851	24,5
11 94	13.256	1,9	17.825	2,6	70.727	10,3	113.619	16	170.168	24,7
12 94	17.685	2,5	23.081	3,3	72.846	10,4	117.791	16	175.445	25,0
01 95	16.737	2,3	18.608	2,6	68.801	9,7	114.405	16	182.134	25,5
02 95	15.821	2,2	20.100	2,8	72.125	9,9	118.270	16	188.120	25,8
03 95	15.582	2,1	17.523	2,3	68.463	9,2	115.600	15	188.585	25,3

M1 = Non-bank cash holdings and sight deposits, M2 = M1+ short term treasury bills, M3 = M2 + savings deposits, M4 = M3 + term deposits.

Source: Conjuntura Econômica, Banco Central do Brasil, Pesendorfer (1995).

**Table A-3: Wages and Employment, 1994-1995**

Period	Real Wage Index	Real Wage Average Index	Employment in Industry, S.Paulo	Unemployment in %
Jan 94	100,00	100,00	84,6	5,5
Feb 94	99,88	100,10	84,4	5,4
Mar 94	108,59	109,34	84,0	5,9
Apr 94	112,09	113,23	83,7	5,4
May 94	113,24	114,55	83,6	5,2
Jun 94	110,52	111,82	83,5	5,4
Jul 94	103,63	105,00	83,4	5,5
Aug 94	105,32	107,12	83,1	5,5
Sep 94	106,47	108,13	83,2	5,1
Oct 94	108,04	109,09	83,7	4,5
Nov 94	117,71	118,64	83,9	4,0
Dec 94	120,68	121,67	83,9	3,4
Jan 95	117,11	117,42	84,3	4,4
Feb 95	116,14	115,96	84,8	4,3
Mar 95	120,19	119,60	85,1	4,4
Apr 95	122,79	121,67	85,4	4,3

Source: Conjuntura Econômica, Gazeta Mercantil, Pesendorfer (1995).

**Table A-4: Monthly Industrial Production (1991=100)**

Period	Monthly Inflation	Industrial Production	Manufacturing	Capital Goods	Intermediate Goods	Consumer Durables	Non-Durables	Capacity Utilization (FIESP)	Capacity Utilization (IBRE/CET)
01 94	42,2	95,3	94,5	96,9	96,6	108,1	88,7	74,8	77
02 94	42,4	91,0	90,2	97,5	92,8	101,5	81,3	74,2	
03 94	44,8	109,8	110,0	123,4	110,2	135,0	97,5	76,8	
04 94	42,5	100,0	99,6	103,7	103,4	112,1	86,8	75,0	79
05 94	41	112,6	112,9	121,2	112,3	137,5	100,7	76,0	
06 94	46,6	112,5	113,1	120,9	110,4	122,2	106,8	76,1	
07 94	24,7	114,7	114,7	120,2	111,3	124,8	112,6	77,1	80
08 94	3,3	125,0	126,0	137,4	119,6	145,4	123,7	79,8	
09 94	1,5	121,8	123,4	136,1	115,8	140,2	120,6	79,8	
10 94	2,6	120,8	122,1	133,9	116,4	141,9	116,4	80,2	83
11 94	2,5	120,7	122,1	137,2	115,5	115,1	117,6	80,9	
12 94	0,6	114,1	114,1	134,9	112,0	130,1	106,2	78,6	
01 95	1,4	111,4	111,1	131,3	109,7	119,9	103,7	78,5	83
02 95	1,2	106,3	106,6	131,5	103,8	132,4	94,2	79,1	
03 95	1,8	124,3	125,0	154,5	120,4	161,4	110,6	81,8	
04 95	2,3	111,4	111,5	129,9	111,6	136,5	97,2	79,8	86
05 95	0,4	110,3	113,9	134,1	105,1	164,0	103,0	81,8	

Source: Conjuntura Econômica.; Baer/Paiva (1995).

**Table A-5: Exchange Rates R\$/US\$ and Inflation, 1994 - 1995**

Period	R\$/US\$ (official)	R\$/US\$ (official), monthly growth in %	off.XR growth minus infl. ("underval.")	R\$/US\$ (parallel)	R\$/US\$ (parallel), monthly growth in %	par. XR growth minus infl. ("underval.")	Spread off.-par.XR in 100	Monthly Inflation in %
01 94	0,142	40,2	-2,0	0,132	30,2	-12,0	1,00	42,20
02 94	0,202	42,2	-0,2	0,196	48,5	6,1	0,60	42,40
03 94	0,282	39,5	-5,3	0,274	39,3	-5,5	0,80	44,80
04 94	0,401	42,2	-0,3	0,382	39,6	-2,9	1,90	42,50
05 94	0,578	44,0	3,0	0,567	48,5	7,5	1,10	41,00
06 94	0,828	43,3	-3,3	0,843	48,7	2,1	-1,50	46,60
07 94	0,931	12,4	-12,3	0,940	11,5	-13,2	-0,90	24,70
08 94	0,898	-3,5	-6,8	0,920	-2,1	-5,4	-2,20	3,34
09 94	0,866	-3,6	-5,2	0,900	-2,2	-3,8	-3,40	1,55
10 94	0,845	-2,4	-5,0	0,870	-3,3	-5,9	-2,50	2,55
11 94	0,842	-0,4	-2,9	0,850	-2,3	-4,8	-0,80	2,47
12 94	0,850	1,0	0,4	0,870	2,4	1,8	-2,00	0,57
01 95	0,847	-0,4	-1,8	0,860	-1,1	-2,5	-1,30	1,36
02 95	0,841	-0,7	-1,9	0,840	-2,3	-3,5	0,10	1,15
03 95	0,890	5,8	4,0	0,900	7,1	5,3	-1,00	1,81
04 95	0,907	1,9	-0,4	0,900	0,0	-2,3	0,70	2,30
05 95	0,898	-1,0	-1,4	0,891	-1,0	-1,4	0,70	0,40

Source: Conjuntura Econômica, Pesendorfer (1995); own calculations.

**Table A-6: Brazil: Balance of Payments**

(in bill. US\$)

Year	1993	1994	1995
Trade balance	13307	10466	-3157
Services balance	-15585	-14743	-18600
<i>of which Interest</i>	<i>-8280</i>	<i>-6338</i>	<i>-8158</i>
Transfer balance	1686	2588	3973
<b>Current account balance</b>	<b>-592</b>	<b>-1689</b>	<b>-17784</b>
<b>Capital account balance</b>	<b>10115</b>	<b>8904</b>	<b>30703</b>

Source: Banco Central do Brasil.