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por
Juan Antonio Morales

Inflation Stabilization and External Shocks: a Case Study of Bolivia*

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1. Introduction

Many inflation stabilization programmers are based on exchange rate stabilization. Under most circumstances the stock of net foreign reserves (NFR) plays a crucial role in the credibility and success of exchange rate stabilization, as has been stressed by Dornbusch (1991). A rapid depletion of NFR caused by an exogenous shock may severely imperil a programmed otherwise well designed.

In the mid 1980s, many Latin American countries, that were in the midst of a stabilization effort, suffered abrupt and strong losses in their terms-of-trade (TOT) and their export incomes (table 1). The cumulated losses over the selected years in the table are impressive. Only Brazil could sustain its exports, despite the TOT loss.

Table 1. Terms-of-trade deterioration and export compression, selected years

	Period between:	Terms-of-trade Fall (%)	Export Reduction (%)
Argentina	1984-1987	34.5	33.8
Bolivia	1984-1988	24.7	24.7
Brazil	1986-1987	10.8	-17.3
Mexico	1984-1988	26.7	33.3
Peru	1985-1986	14.1	23.3

Source: ECLA, Statistical Yearbook for Latin America and the Caribbean 1989, 1991 Editions

The Argentinean, Brazilian and Peruvian stabilization plans failed, while Mexico's and Bolivia's programmers survived.[1] The trade shocks increased the probability of programmed

failure. To neutralize this, stronger action than initially planed was necessary. Cooper's remark (Cooper, 1991) that, while the size of the negative shocks defines the size of the adjustment effort, it does not necessarily decide the economic growth outcome seems extensible to stabilization. There are also buffers that dampen the economy's response to the trade shock. Some of those buffers are created by policy. Their identification may add to our understanding of the failures or successes of the different stabilization programmers.

The effects of trade and TOT shocks (both positive and negative) for a small open economy have received extensive attention in the literature since the 1950s. They have been generally assessed in terms of their effects on savings, on growth, and welfare. On the other hand, their impact on nominal variables seems to have received less attention. Yet, many policy issues that the shocks raise involve monetary aspects. Also, the consequences of trade shocks have been somewhat overlooked in the many reviews of the stabilization efforts of the last decade in Latin America.[2]

Our context of analysis is of a small open economy. The discussion of the specific case of Bolivia will support some more theoretical reflections. The simplicity of the Bolivian case is very pedagogical, yet some lessons drawn from its experience can be easily extended to economies with more complex structures.

Bolivia's two main exports, tin and natural gas, suffered very adverse shocks in the second half of the 1980s. They occurred a few weeks after the launching of a drastic stabilization programmed, in August 1985, to tame a devastating hyperinflation (unrelated to the trade shocks but associated to the external debt shock).

The analysis of the (official) NFR management in the aftermath of the trade shock and when an inflation stabilization programmed, characterized by sharp limits to domestic credit expansion, was being carried on is in the core of our paper. We claim that a main effect of the trade shock was to increase the monetary authority's uncertainty on the parameters of the money demand. The shock produced money demand shifts in ways that the central bank could not predict. When there is uncertainty, the tendency of the policy-makers is to be on the side of greater force, opting for a very tight policy. A main conjecture that emerges from the analysis

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1 Mexico's inflation never deteriorated to the extent of the inflations of the other countries; hence stabilization proceeded in several stages with none of them requiring overly dramatic changes.

is that the surprisingly slow remonetization in Bolivia, after the hyperinflation, may have resulted of monetary policy itself, rather than from lack of confidence in the stabilization policy.

As a background to the analysis, we review the nature of the TOT movements and of their implications on domestic income, the fiscal accounts, and the creation of domestic credit. The paper is completed by pinpointing the role played by the elastic features in the exchange rate regime and by price flexibility in the avoidance of a persistent inflation, after the once-and-for all upwards adjustment in the price level on impact of the trade shock.

The paper proceeds as follows. Section 2 introduces a discussion on the stochastic processes that govern commodity prices, with emphasis on tin and natural gas. There is also a discussion on the formation of expectations. Section 3 surveys the fiscal responses to the shocks, while section 4 covers the monetary responses. Section 5 documents the strengths in the Bolivian stabilization programmed to cope with the shocks. Section 6 contains concluding remarks and outlines some possible extensions.

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[2] There are some brief references to the trade shocks in the articles in Bruno et al. (1991).

2. The Nature of the Shocks

2.1 The significance of tin and natural gas in the Bolivian economy

Tin and natural gas exports represented 74 per cent of total legal merchandise export revenues of Bolivia in the five years preceding the trade shocks, and their prices were a major determinant of Bolivia's TOT.[3] As important, the price variations of these commodities traditionally have an important informational content on Bolivia's short and medium term economic prospects.

Since the most important exporters, at the time of the shocks, were state-owned enterprises tin and natural gas exports also were a very significant direct source of income for the public sector. (Gross sales of these commodities represented 12.1 per cent of GDP in the five years before the crisis). Also, the indirect income, produced from taxes collected from the private tin mines, was non negligible (0.4 per cent of GDP).

In some previous work (Morales 1992) I estimated that income losses caused by the shock, cumulated over 1986-89 amounted in present values to 10 per cent of the Gross Domestic Product (GDP) of 1985. The estimated average annual loss over that period was 2.9 per cent of 1985's GDP. The estimated shortfall export revenue was over U$ 500 million in the period 1986-89. The output losses were especially important in the first two years after the shock; only in 1988, the production indicators started to show a modest recovery.

Unfortunately, these results are not as sharp as we would like them to be. The significant but illegal cocaine traffic blurs somewhat the picture. The very nature of this trade impedes a sensible opinion of its impact on national income and exports. Yet, neglect of the cocaine factor may lead us to overestimate the negative consequences of the external trade shock.

2.2 Expectations and permanent income

The effects of a trade shock in the economy will depend whether the shock is perceived as permanent or transitory, and whether it can be anticipated. To narrow the discussion, we limit ourselves to the shocks originated in the prices of commodity exports. Price instability is obviously undesirable, but the problem goes beyond: the difficulties in policy management stem not only from instability but more importantly from the unpredictability of the shocks.

The (un)predictability of price changes depends on the stochastic process that generates the prices. A frequent benchmark for gauging the persistence and unpredictability of a shock is given by the random walk hypothesis. Acceptation of the random walk hypothesis lead to the conclusion that all price changes are permanent.

Since the paper largely focuses on Bolivia, we deal mainly with the processes that govern tin and natural gas prices. The econometric analyses of Morales et al. (1992), with annual data from 1900 to 1989, reject the hypothesis that the logarithm of the real price level of tin follows a random walk. While rejecting the limiting hypothesis of a random walk, they find however high persistence of the shocks as measured by the two first autoregressive coefficients of the series (AR1 = 0.88 and AR2 = 0.74). Also, Cochrane's (1988) quotient of variances, which is a usual measure of persistence, gives that 12 per cent of a shock persists (with a window of 40 years). With quarterly and monthly series it is always impossible to reject the random walk hypothesis.[4]

Argentina has been the sole buyer of the Bolivian natural gas since 1972. The formation of the price of natural gas is very different from the one of tin since exchange is dominated by bilateral considerations. There is no "true" market for this fuel. Sales have taken place under several contracts. The initial contract fixed the quantities to be supplied, while most of the following contracts included a revision of prices.[5] Natural gas prices were not formally indexed to petroleum prices until 1987, although the latter frequently served as reference in the negotiations on the former. But the tests of Morales et al. (1992) reject the hypothesis of co-integration between the price series of natural gas and petroleum.

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[3] The illegal cocaine exports, considered to be important, are not included in the computation of the export figures because of the very doubtful quality of the data.

[4] Note, however, that the power of the available tests on the random walk hypothesis is weak (Kletzer et al., 1990).

[5] As is usual in natural gas contracts, the long-term agreement on volumes was one of "take or pay", with some flexibility.

The most important policy problems arise from changes in permanent income. Therefore, whether the shocks led to a revision of permanent income or not is a key question. In the Bolivian case it seems that neither the producers, nor the government, nor the public, had included in their prior expectations an export crisis of such magnitude and duration. Prices, for a long period before the shocks, for tin more than for natural gas, were thought to be unsustainable high, but there was, of course, uncertainty on the time and magnitude of the shocks. After the shocks, expectations were: (a) that the situation of very low prices would not last; but, (b) that the recovery will not lead to their previous levels for a very long time. This suggests that a (partial) revision downwards of permanent income occurred.[6]

[6] Expectations were exclusive in the terminology of Bevan et al. (1989). Morales (1992) give a detailed justification of this conclusion.

3. The Transmission of the Shocks to the Fiscal Budget

3.1 Changes in fiscal aggregates

The trade shocks affect the public and the private sectors in different ways and degrees. If the public sector owns the largest proportion of exports or foreign trade taxes are very important, the income losses for the public sector will be on impact of the adverse shock proportionally larger than for the private sector. Afterward, the shocks are transmitted to the private sector through several mechanisms: changes in the structure of taxation, cuts in expenditure, induced changes in relative prices, and not the least, inflation.

The trade bust strongly de-stabilized the fiscal budget on impact in Bolivia. In Morales (1992) I found, using counterfactual arguments, that the fall in the public sector total revenues that could be attributed to the trade slump was surprisingly large, averaging 68.2 per cent of the economy's shortfall revenue over the period 1986-1989.

The government, however, swiftly reacted to redress the situation after the shocks. Current expenditures, especially exhaustible expenditures, were savagely cut. In addition a sweeping reform to broaden the tax base was announced. Table 2 shows the main changes that occurred in the non-financial public sector accounts in the 1980s. The comparison of the figures for 1986-1990 with those of the average 1980-81, very clearly illustrate the magnitude of the effort.

The shock was transmitted from the public sector to the private sector through two main mechanisms: first, major changes in the tax structure -- that shifted the burden from trade taxes to domestic taxes -- and, second, through expenditure, with major cuts in the public payroll and in Non- Tradable (NT) consumer goods. This situation of fiscal distress was untenable. Thanks to a large inflow of foreign aid after 1987, public sector expenditure on NT-capital goods significantly increased. By its nature, this type of expenditure simultaneously became the main transfer mechanism of compensation to the private sector.

3.2 Financing the budget deficit

Despite the strong adjustments described above, the fiscal deficits were still large between 1987 and 1989. The deficits were mainly financed with foreign credits. There was little recourse to money expansion.

Table 2. Non-financial public sector operations (per cent of GDP)

	Average 1980-81	1986	1987	1988	1989[p]	1990[p]
A. Total revenue	37.9	27.5	24.5	26.8	24.7	26.1
1. Tax revenue	9.4	9.4	11.1	11.0	13.2	14.0
2. Other revenues	28.5	18.1	13.4	15.8	11.5	12.1
B. Total expenditure	34.8	21.5	21.7	25.2	24.4	25.1
1. Current expenditures (excluding Interest and unrequited transfers)	28.4	16.5	15.9	17.2	17.2	17.8
2. Capital expenditures	6.4	5.0	5.9	8.0	7.2	7.3
C. Primary surplus (line A minus line B)	3.0	6.0	2.8	1.6	0.3	1.0
D. Interest	4.5	6.7	4.9	4.4	3.1	2.7
1. Domestic interest	1.6	1.3	0.8	0.2	0.1	0.1
2. Foreign interest	2.9	5.4	4.1	4.2	3.1	2.6
E. Unrequited transfers	5.5	1.9	5.3	3.2	1.5	1.7
F. Total transfers (line D + line E)	10.1	8.5	10.2	7.6	4.7	4.4
G. Other expenditures	0.6	0.0	0.0	0.5	0.0	0.0
H. Overall surplus/deficit (line C - line F - line G)	-7.7	-2.5	-7.4	-6.5	-4.4	-3.4
I. Net domestic borrowing	3.1	-3.4	5.0	1.7	2.6	1.2
J. Net foreign borrowing	4.6	6.0	2.4	4.8	1.7	2.2

Source: Otálora (1990) for 1980-88 and author's computations for 1989-90 with data of UDAPE (1992)
Notes: p. Preliminary

Even the credits of the Central Bank of Bolivia (from now on BCB, its Spanish initials) to the public sector mainly implied a direct reduction of its holdings of foreign reserves.

We can assume, albeit with no strong base, that the financing of the deficit caused by the shock was almost completely foreign. The limited domestic financing of the overall deficit, and the even more limited financing of the induced deficit with monetary emission, largely explain the inflation outcome.

4. Monetary Accommodations to the Shocks

4.1 Equilibrium with uncertainty on the demand for money

One main effect just after an external shock is the uncertainty on the parameters of the demand for money, and on the revisions of permanent income that the public may have made. Any adverse external shock had to reduce the demand for domestic assets, as pointed out by Damil et al. (1992), but it was difficult to forecast the extent of the reduction. If the monetary authorities assume that the demand for money is larger than actually is, a loss of reserves or higher than desired nominal devaluation would follow. Given this, the central bank authorities normally will have a conservative estimate of the demand for money and maintain a tight money stance, even if this means the risk of aggravating the recessionary impact of the shock.

A formal treatment of the problem should include the interactions between the real and monetary sectors. A useful approximation is given by the interaction between the NT-goods market and the money market, as in Neary (1985).

Let P_N and E be the NT-goods price and of the nominal exchange rate, respectively. Note that E is the price of Traded-goods, if constancy of the international price is assumed and is set equal to one (after an appropriate selection of units). Income will be measured in terms of tradables and is the sum $Y_t = Y_{Tt} + \upsilon_t \ddot{Y}_N$, where $\upsilon_t = P_{Nt}/E_t$ is the reciprocal of the real exchange rate. It will be assumed throughout that $\ddot{Y}_N$ is in fixed supply.

The real money demand depends on (permanent) income and the nominal interest rate. The nominal interest rate in turn depends on the international interest rate and expected devaluation. The money supply is given by the sum of reserves, valued in domestic currency, and of domestic credit. The latter will be assumed entirely dependent on the behaviour of the public sector. There are no commercial banks in the model and thus all domestic money is currency. Money grows at a constant rate within fixed time intervals; however, we will allow for variations between intervals.

The formal model is:

$$m_t - p_t = \alpha y_t - \gamma i_t \qquad \alpha > 0 \quad \gamma > 0 \qquad (1)$$

$$m_t = \lambda D_t + (1-\lambda) R_t \qquad 0 < \lambda < 1 \qquad (2)$$

$$\dot{D}_t = \mu \qquad (3)$$

$$p_t = \beta p_{Nt} + (1-\beta) e_t \qquad 0 < \beta < 1 \qquad (4)$$

$$\dot{p}_{Nt} = k\left[\delta(e_t - p_{Nt}) + \phi y_t - \ddot{y}_N\right] \quad \kappa > 0 \quad \delta > 0 \qquad (5)$$

$$i_t = i^*_t + E_t \dot{e}_t \qquad (6)$$

In the model above m, p, p_N, e and y are the logarithms of the quantity of money, the price level, the price of NT-goods, and the nominal exchange rate. The lowercase letters y and $\ddot{Y}_N$ denote real income and non-tradable output, respectively, i is the nominal interest rate in domestic currency, while i^* is the international interest rate. D is the logarithm of domestic credit, and R is the logarithm of the book value of the central bank NFR in domestic currency.[7] Both R and D will be constrained to be non-negative. Rational expectations will be assumed, so that $E_t \dot{e}_t = \dot{e}_t$.

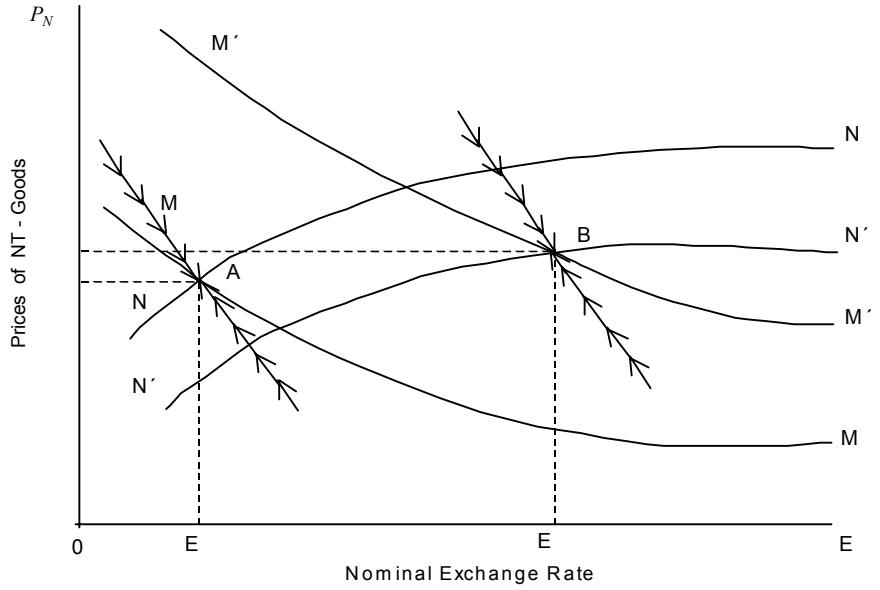
P_N and E are positively related to clear the NT-goods market (NN in figure 1). Observe that equation (5) allows for possibility of sluggish adjustment in this market. The NN schedule corresponds to the $\dot{p}_{Nt} = 0$ schedule. To the left of NN there is excess supply of NT-goods; to the right there is excess demand.

Inserting (4) in (1), assuming that the money market clears, and that $E_t \dot{e}_t = \dot{e}_t = 0$ we have curve MM. Remark that this is equivalent to the assumption that i is equal to the international interest rate (or alternatively, that there are no capital movements).

Curves NN and MM determine P_N y E. The real exchange rate E/P_N is then given by the reciprocal of the slope of OA (not drawn) in figure 1.

[7] Equation (2) is the log-linear approximation to the identity equating the money stock with reserves and domestic credit. This equation is taken of Agénor et al (1992).

Figure 1



More formally, from (1), (4) and (6), using the assumption of rational expectations, and with equation (5) we obtain the two simultaneous differential equations:

$$\dot{p} = k\left[\delta(e_t - p_{Nt}) + \phi y_t - \ddot{y}_N\right] \qquad (5)$$

$$\dot{e}_t = (1/y)\left[(1-\beta)e_t + \beta p_{Nt} + \alpha y_t - m_t\right] - i^*_t \qquad (7)$$

For given levels of y_t, m_t and γi^*_t, say y, m, and i^*, the equilibrium solutions are:

$$\ddot{e} = \alpha + \beta\phi/\delta)y + m + yi^* + (\beta/\delta)\,\ddot{y}_N \qquad (7)$$

$$\ddot{p}_N = (\alpha - (1-\beta)\phi/\delta)\,y + m + \gamma i^* - ((1-\beta)/\delta)\,\ddot{y}_N \qquad (9)$$

The coefficient of y in (8) is unambiguously negative, while the same coefficient in (9) could be either positive or negative. An in figure 1 gives the equilibrium solution.

It can be shown that the system formed by (5) and (7) is saddle point stable.[8] If D (and hence m) varies, there is a continuum of stationary values $\ddot{e}$, $\ddot{p}_N$ for which the system given

[8] Let ρ be the negative eigenroot in the system formed by (5) and (7). The particular solutions are:
$e_t = -(\alpha+\beta\varphi/\delta)y + m + \gamma i^* + (\beta/\delta)y_N + A\exp(\rho t)$
$p_{Nt} = -(\alpha-(1-\beta)\varphi/\delta)y + m + \gamma i^* - ((1-\beta)/\delta)y_N + aA\exp(\rho t)$,

by (5) and (7) has a unique and saddle-point stable equilibrium. The motion of p_{Nt} and e_t in the plane, for given y, D, and i^*, is indicated by the direction of the arrows.

Suppose an unanticipated negative external shock that, however, produces a downwards revision of permanent income. Assume further that the central bank does not want to loose additional reserves following the losses just after the shock, and so lets the exchange rate float. On impact of the shock two things happen: (a) The NN schedule shifts downwards to N'N'. (b) The fall in permanent income produces also a fall in the demand for money, and the MM schedule shifts outwards to M'M'.

In equilibrium, from (8) follows that a fall in income ceteris paribus depreciates the nominal exchange rate (E goes from E_0 to E_1), while from (9) the effect on the price of NT-goods depends on the sign of the coefficient of y. A situation can be visualized where the fall in the demand for money is so important, that if the money supply is constant; the only way to clear the market is with increases in both E and P_N. There is however always a real devaluation. Given the assumption of no further change in reserves, for m to remain constant D also needs to be constant, a likely situation in the aftermath of a stabilization programmed.

If there is a strong fall in the demand for money in the aftermath of the shock, and m is constant, E and P_N need to increase in the new equilibrium (point B in figure 1). Assume further that the adjustment in P_N is slow. On impact of the shock, there will be an overshooting of the exchange rate. Then the exchange rate gradually will return to the new equilibrium exchange rate and P_{Nt} will increase towards its new equilibrium value. If the fall in the demand for money is not overly strong, and therefore P_N has to decrease, there will be a discrete devaluation on impact of the shock. Afterwards the exchange rate will continue towards its higher equilibrium value, while P_{Nt} will move towards its lower equilibrium value. Along the saddle-path there are changes in the demand for money. The increases in the demand for money may be enhanced by the public's perception of the strength of the anti-inflationary policy.

In a second phase, things become more complicated. Let us assume that in this phase the exchange rate will be fixed. Let us add that there will not be further alterations in the NT-goods market, because there are not changes in income. The N'N' schedule remains constant. Changes in P_{Nt} (and in monetization) will depend on the position of the fixed exchange rate.

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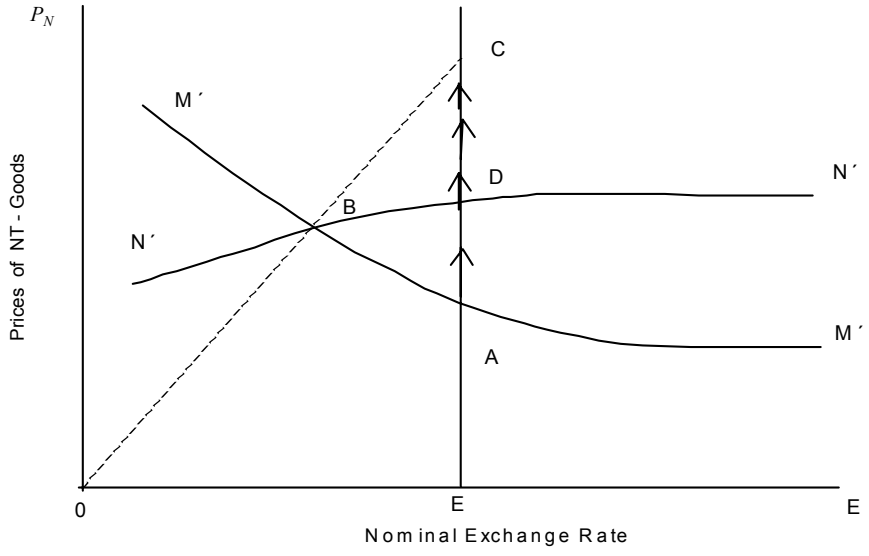
where A is an arbitrary constant, and $a=-(1/2\beta\gamma)\{(1-\beta)+\kappa\delta\gamma+\sqrt{[((1-\beta)+\kappa\delta\gamma)^2+4\kappa\delta\beta\gamma^2]}\}$.

Suppose that the exchange rate is fixed at E* in figure 2. The NT-goods market clears then at J, but at J there is excess demand for money. The excess demand for money will translate into a gradual, continuous, accumulation of NFR by the central bank. The M'M' schedule should then move upwards following the arrows until J. Later, real balance effects and revisions in permanent income also should shift upwards the N'N' schedule until final equilibrium is reached at C, with the same real exchange rate that would have prevailed in a floating exchange regime. A similar analysis, but in a different context, was proposed by Neary (1985).

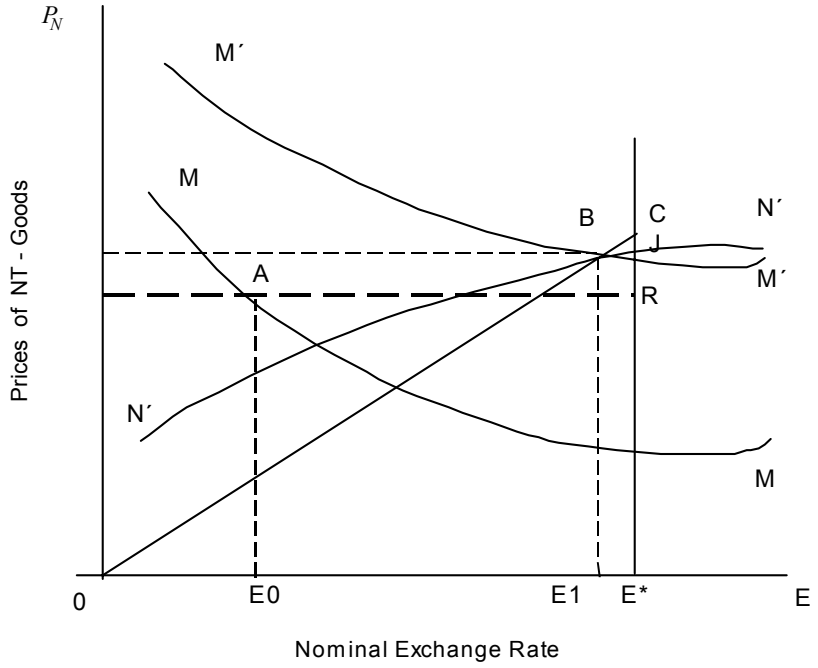
Suppose now the case of a strong fall in the demand for money. If the central bank fixes the exchange rate at the exchange rate that results in the floating regime immediately after the shock, say a point like E* in figure 3. Given the tendency of the monetary authority to use great force, E* is a likely value. The NT-goods market will clear at J, where there is excess demand for money. Restoration of equilibrium requires increases in the money supply. This shifts the money market equilibrium curve towards J (and beyond, since J cannot be permanently sustained).

Figure 2



If the central bank, because of uncertainty on the money demand, decides not to expand the monetary base, even if there is reserve accumulation, a situation of persistent disequilibrium in the money market arises. (The central bank can always do this by making μ negative.) The excess demand for money will put a downward pressure on P_{Nt}, thus controlling the inflation rate. The ex-post real rate of interest will tend to augment, as well as the interest rate for dollar deposits.[9] There is also the possibility that the excess transactions demand for money be, at least partly, sponged by the supply of dollars circulating in the economy. This is to say that the public dis-hoards its dollars to use them as medium of exchange.

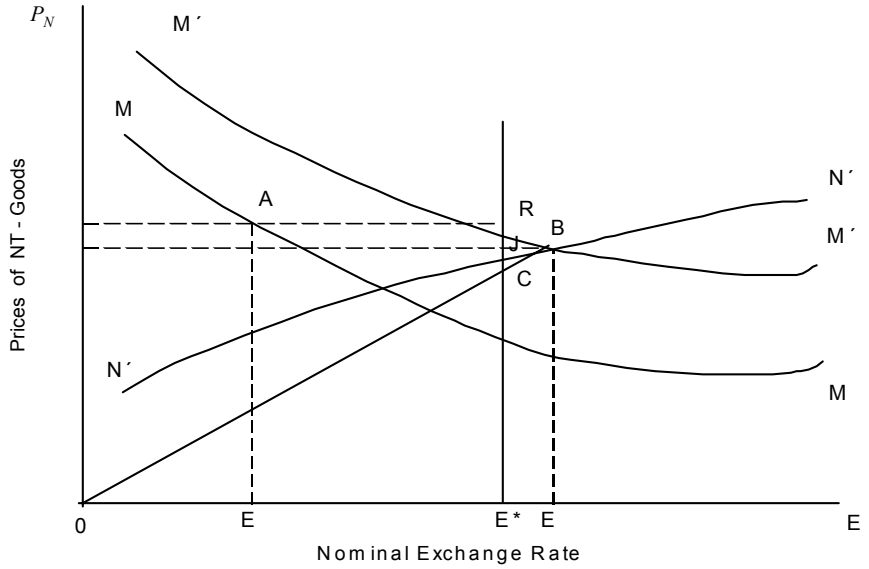
Figure 3



Suppose now the case of a moderate fall in the demand for money, that implies a fall in the equilibrium value of P_N. If the central bank fixes the exchange rate at a point like E* in figure 4, the NT-goods market will clear at J, where there is excess supply for money. The public will reduce its holdings of domestic currency and a moderate loss of reserves will ensue.

[9] If the exchange rate is not too overvalued, the interest rate for operations in dollars is close to the real exchange rate in Bs.

Figure 4



4.2 The Bolivian experience

The Bolivian experience fits, with some shades of difference, many facts given above. We require, before continuing, a description of some institutional features. A key element in Bolivia's stabilization programmed was exchange rate unification. This was achieved with an almost complete liberalization of the market for foreign exchange, coupled with an imaginative mechanism of intervention and signaling by the BCB.

The BCB intervention mechanism works as follows. The BCB sells its foreign exchange in a Dutch auction, called the "bolsín". For each auction the BCB announces its reserve price and its supply of foreign exchange. The BCB buys at the average rate set in the most recent auction, which then becomes the "official" rate.

The BCB's policy unified the parallel market and the official rates, although the main burden of stabilizing the exchange rate fell on fiscal and monetary restraint.[10] We underscore that the BCB accumulates and de-accumulates assets to maintain a targeted path for the exchange rate. The BCB's stock of NFR is closely monitored by the authorities and the public.

[10] Remark that the exchange rate unification had in itself important positive fiscal effects, since the public sector was (and is) a net supplier of foreign exchange to the rest of the economy.

Regarding the monetary aggregates, at the risk of some simplification, we can assimilate the demand for currency and demand deposits in the banking system, i.e., M1, with the transactions component of demand, whereas the asset demand for money is satisfied by time deposits and certificates of deposit (CD) issued by the BCB. Little of the money stock in domestic currency can be considered as responding to the asset demand for money, since dollars are used as store of value instead of Bolivianos.[11]

It can be observed in the upper panel in figure 5, that immediately after the stabilization programmed (end of the third quarter of 1985), there was a significant reconstitution of official NFR. The reconstitution of reserves de-accelerated in November and December of 1985, after the tin price crash, but resumed in early 1986 reaching a peak in the third quarter of that year. The accumulation of reserves was accompanied by a tightening of domestic credit, especially of credit to the public sector (lower panel of figure 5).

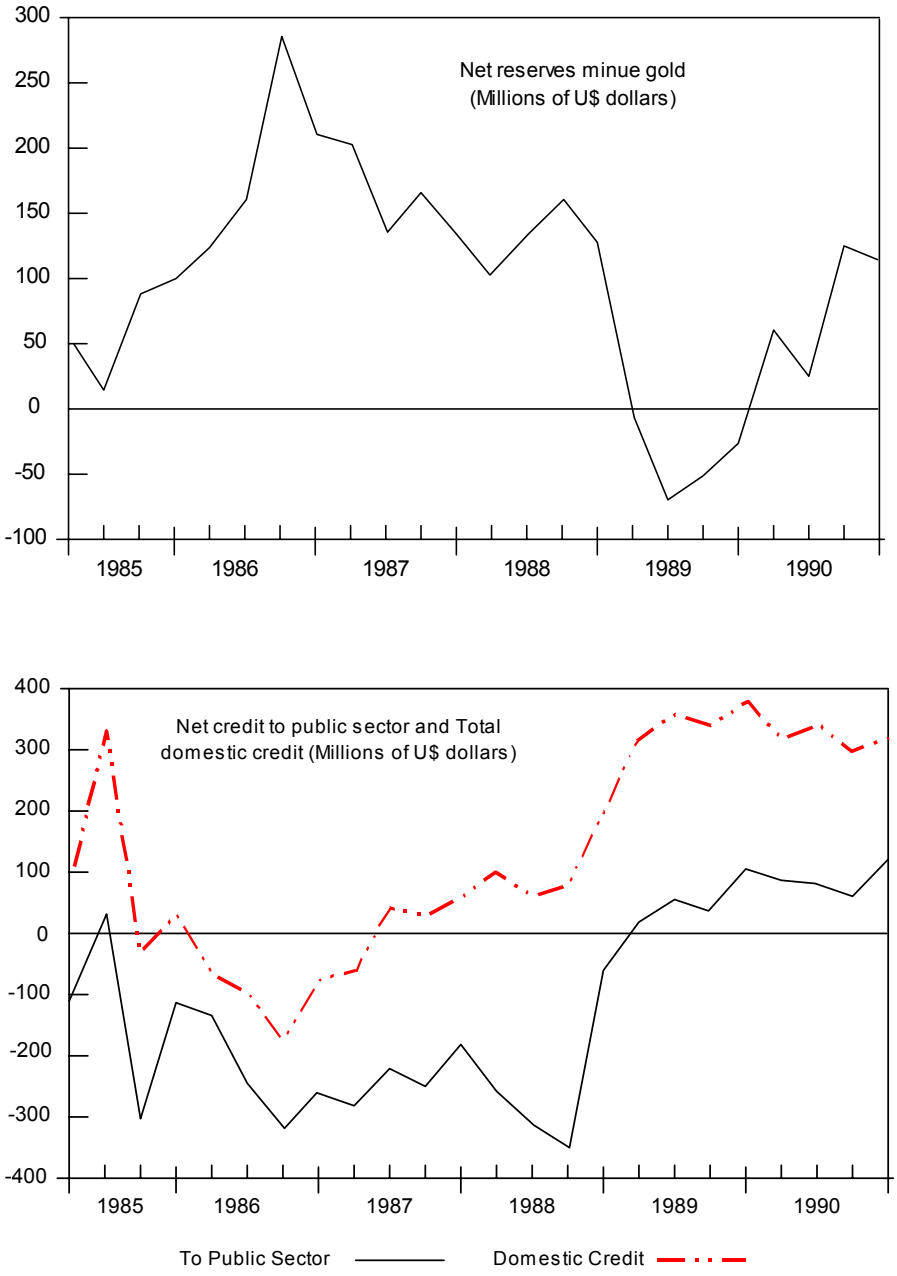
During the fourth quarter of 1985, the BCB reduced the supply of foreign exchange to its auctions (the November and December data in table 3 clearly show this). This reduction caused a speculative movement against the peso. The BCB so strongly limited its supply of foreign exchange to the market, that the system became almost of clean floating. Notice that the official NFR position did not justify this prudence.

Consequently to the BCB's behavior, big jump devaluations of the exchange rate followed. Also, altered expectations increased the parallel market premium (upper panel of figure 6). The exchange rate depreciated beyond what the reserve position justified and the monetary authorities expected.

It appears ex-post, that the monetary authorities underestimated the reconstitution of reserves brought about by the stabilization programmed, just before the trade shock. Remark that it was not excessive expansion of domestic credit, or the loss in confidence in the stabilization programmed, but the fear that the reserve position could be unsustainable after the trade shock, that created the turbulence.

[11] Note that following Bevan et al. (1989), we are distinguishing between the transactions demand for money and the asset demand for money. As they do, we assume that the transactions demand for money is related to permanent income,

FIgure 5



whereas the asset demand for money is determined by the transient component of income.

Table 3. Foreign exchange auctions in the Central Bank, September 1985- June 1986. (Millions of US$)

		BCB's Supply (1)	Public's Demand (2)	Excess Demand (3)
1985	Sep	41.1	9.0	-32.1
	Oct	27.0	17.8	-9.2
	Nov	29.5	38.7	9.2
	Dic	16.0	25.6	9.6
1986	Jan	61.0	49.8	-11.2
	Feb	68.0	26.5	-41.5
	Mar	97.5	51.3	-46.2
	Apr	98.0	44.5	-70.2
	May	123.0	27.8	-78.5
	Jun	87.0	34.5	-52.5

Sources: Author's computations with unpublished data of the Central Bank of Bolivia
Notes: Col. (1), BCB's supply of foreign exchange to the auctions during the month
Col. (2), public's demand as shown in the sealed envelope bids during the month
Col. (3), col. (2) minus col. (2)

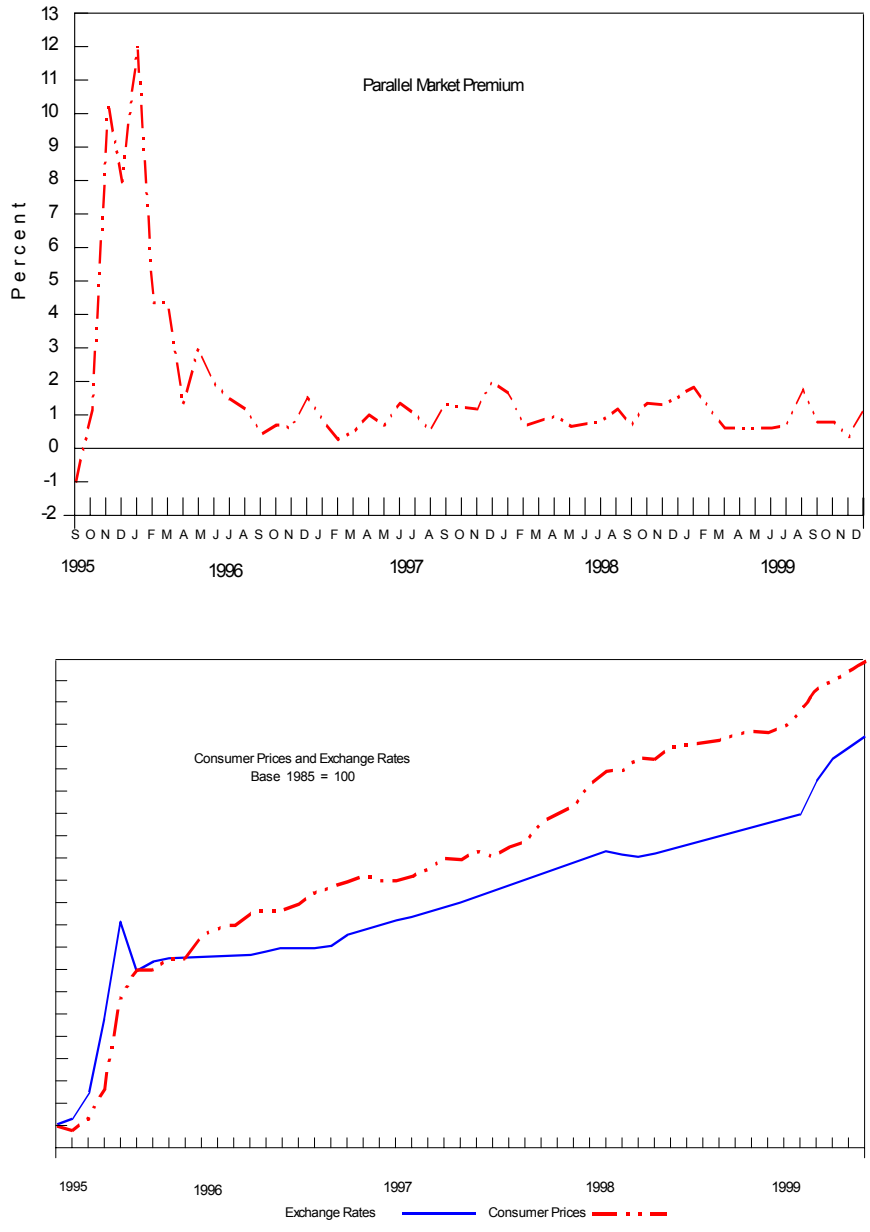
To be complete, it is true that there was an expansion of the net credit to the public sector in November and December 1985, but this was faced reducing its deposits in the BCB. The stock of net credit continued, however, to be negative. The November and December expansion has a seasonal character, fully predictable, tied to the payment of a Christmas bonus to the government's employees.

The exchange rate was stabilized again in February 1986, but with appreciation of the real exchange rate (see the lower panel in figure 6). It is then that the exchange rate was more clearly used as an anchor for inflation. There is, however, some controversy on the moment of the shift from a true auction system to a fixed exchange rate. Dominguez (1991) concludes, based on her econometric work, that the system worked as a true auction for about seven months after the stabilization programmed of 1985. Afterwards, the auction system evolved towards a crawling peg system, with a very slow rate of crawl.[12]

[12] Dominguez (1991) reports, based on Granger-causality tests and with daily data, that during the first seven months after stabilization, the history of auctions and parallel market movements predicted the reserve price and the supply decisions of the BCB. This indicates that the system was truly an auction. Afterwards, especially after mid 1987, the reserve price became exogenous with respect to past auctions bids and the parallel market rates. Bids converged to the reserve price, which in turn was determined by its own past values. It can be inferred therefore that the system became less of an auction and more of fixed exchange rate system.

By the end of 1986, problems with the smallness of the stock of NFR surged again. Between 1987 and 1990, the stocks of NFR of the BCB were very small (table 4).[13] The precariousness of the official NFR obligated the non-financial public sector to continue as net creditor of the BCB.

Figure 6



[13] The negative NFR of 1989 were transitory and mostly related to the political cycle.

Table 4. Composition of foreign exchange reserves (millions of US$)[a]

Años	Gross Reserves	Gold	Natural gas retentions	Gross resserves Excluding gold and retentions	Short-term liabilities	Net reserves	Net un-restricted reserves
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1985	268.9	37.8	47.2	183.9	132.7	136.2	51.2
1986	505.3	37.8	186.2	281.3	258.7	246.6	22.6
1987	413.5	37.9	210.0	165.6	245.1	168.4	-79.5
1988	404.4	38.0	128.6	237.8	243.5	160.9	-5.7
1989	373.3	38.0	18.6	316.7	354.7	18.6	-38.0
1990	375.7	37.9	15.0	322.8	243.4	132.3	79.4

Source: Central Bank of Bolivia (1990)
Notes: a. Stocks at end of year
Col (3), reserves held at the Central Bank of the Argentinean Republic earmarked for imports of Argentinean goods and services
Col (4), col (1) minus col. (2) minus col. (3)
Col (6), col. (1) minus col. (5)
Col (7), col. (4) minus col. (5)

The mandatory deposits of the public enterprises in the BCB of Bolivia constituted, between 1986 and 1988, the main tool, although not the only of this policy. The BCB started selling to the public Certificates of Deposit (CDs), in dollars and in domestic currency. This operation obviously reabsorbs liquidity. Also, it is worth noting that the private banks did not support either the recovery of liquidity in domestic currency.

l The tight monetary policy preserved the Bank's foreign exchange reserves. In addition, the policy, working through the interest rates, induced a very significant repatriation of private capital that further lessened the pressure on the reserves. As a point of information, interest rates for dollar deposits in the banking system were almost 100 per cent higher than the six-months LIBOR rate between end-1986 and end-1989. Since 1988 the high interest rates probably reflect more micro-economic behavior of the banks than the effects of monetary policy.

Last, dollarization did not recede with stabilization, as could be expected. On the contrary, there are strong indications that it augmented. During the hyperinflation, dollars were primarily used as unit of account and to maintain value over time. They were also a medium of exchange for large items. After the stabilization dollars became a medium of exchange for many transactions. Dollars are now widely used in the domestic economy. It appears that dollarization did not arise from expectations of the public, but was motivated, at least initially, by monetary policy itself.

It should be noted that the illegal cocaine exports are weighty contributors to the domestic supply of dollar notes. By its very nature the cocaine traffic is a cash operation. Even more important, only a small amount of the dollars generated by the cocaine exports is converted to domestic currency. These features favor dollarization.

4.3 Some policy implications

The model in section 4.1 and the lessons drawn from the Bolivian experience have several policy implications. The main one being that in an economy with no exchange controls, where domestic operations in dollars bear little transaction costs, and domestic credit is not growing, changes in NFR do not reflect one-for-one changes in money demand. Besides, NFR may change without changes in the demand for money or in domestic credit, simply because of the effects of exogenous shocks to the public sector accounts. In particular, adverse external shocks, that directly affect the public enterprises, produce on impact a reduction of the NFR. This happens without a previous expansion in domestic credit or a previous reduction in the demand for money of the private sector. Symmetrically, expansions in money demand may not lead to an increase in reserves, since much of the money demand is satisfied by dollars. But this does not preclude speculations against the domestic currency, if the public perceives the NFR position of the central bank as too precarious.[14]

It follows from the discussion above that the usual analysis of causes and effects of monetary expansion needs important modifications. In particular, the traditional obsession of the monetary authorities with their NFR, may lead to an unwarranted tight monetary policy.

[14] Along the lines of the analysis of Agénor et al (1991).

5. Resilience of the Bolivian Stabilization Programmed

5.1 Price flexibility and the reduction of inertia

The stabilization programmed of August 1985 included an almost complete liberalization of markets for goods and factors. All price controls on products of private producers, except public utilities, were lifted. Foreign trade was almost completely liberalized, as was the foreign exchange market. Bolivian residents can transact, with no limitations, in foreign exchange.

The rapid exchange rate depreciations of the last quarter of 1985 translated rapidly in a jump in the inflation rate. But once the exchange rate was stabilized, the stabilization of inflation followed. In the first weeks of February 1986 inflation was again under control. The return to inflation control can be explained by remarking that the jump devaluations of the exchange rate, after the trade shock, produced a jump increase in the price level. As emphasized by Kiguel and Liviatan (1988), with flexible prices in most of the markets and, therefore, little potential for inertial inflation, the initial price level adjustment was not followed by other price increases.

5.2 The role of capital flows

Bolivia, not only received substantial debt alleviation from its creditors, but also was able to obtain new loans from multilateral agencies, as well as from foreign governments willing to cooperate with the stabilization effort. It is very difficult to figure out the proportion of those loans aimed at smoothing the effects of the trade shock. Even if they were not intended for that purpose, other loans and donations had similar effects. Still, it is reasonable to think that the shift in the direction of the net resource transfers from 1985 to 1988 was produced by the foreign support to the stabilization programmed more than by the trade shock.

The large positive balance in Errors and Omissions account exhibited by the Balances of Payments of 1986 and 1987 financed a share of the current account deficit and contributed to the accumulation of NFR. The positive balance in Errors and Omissions reflected a portfolio shift. Prompted in part by the exchange rate appreciation, the private sector dis-hoarded a

portion of its dollar-holdings. Also, it reflected the capture by the BCB of cocaine dollars after the stabilization of August 1985. Private, short-term capital flows; especially repatriations were also very significant. Foreign assets held abroad by the private sector were changed for foreign assets in the domestic banking system. The momentum in capital repatriation could be sustained with only very high real spreads of the domestic interest rates over the international rate. This change in the portfolio of the private sector lessened the pressures on the BCB's NFR, as the private sector could finance now its imports (and partially service its foreign debt) in private markets. Also, the reserve requirement on the dollarized deposits of the private banks, although not formally considered NFR, through fungibility served the same purpose.

6. Final Comments

Stabilization, when facing external shocks, requires a whole spectrum of policy measures. In the paper, we have emphasized macroeconomic and general policy measures, leaving aside commodity market- specific measures.

We have mostly dealt with how Bolivia's stabilization programmed coped with the adverse external shocks. Uncertainty was treated with obliquity. It would be fruitful to bring to the fore the stochastic analysis in the terms of trade, as in Turnovsky (1991).

Another way to treat uncertainty more explicitly is to focus on commodity price and income stabilizations. Research on insurance mechanisms to smooth income consumption and, possibly, the effects on nominal variables; offer challenging avenues (see e.g. Newbery and Stiglitz 1981, and the articles included in Engel and Meller 1992). However, full implementation of the recommendations of these studies is yet to come.

When the task of inflation stabilization is made more difficult by unexpected external shocks, the political economy problems that emerge may be formidable. In that particular context, the domestic smoothing of the external shocks will be unfeasible with commodity price and income stabilization mechanisms. The economy has to fall back on monetary and fiscal restrain. They must carry the onus of insuring credibility.