STRUCTURAL EFFECTS OF MONETARY ARRANGEMENTS OF ARGENTINA AND BRAZIL

Maria Luiza Falcão Silva [*]
Joaquim Pinto de Andrade
Universidade de Brasília
Hans-Michael Trautwein
Universität Oldenburg

ABSTRACT

The coexistence of a fixed-exchange-rate regime within a currency-board arrangement in Argentina and a more flexible exchange-rate system with strong sterilisation policy in Brazil has challenged the sustainability of MERCOSUR regional integration. Through the interaction between the different regimes, the impact of common external shocks to the region has been dampened in Brazil, whereas it has been amplified in Argentina. The monetary policy asymmetry is likely to have produced adverse long-run effects on the trade pattern and other target variables of economic integration in the MERCOSUR.

Introduction

In recent years, the international economy has shifted from a bipolar world, dominated by the United States and the former Soviet Union, to a multipolar structure with three great economic powers - the European Union, Japan, and the United States – and numerous other countries converging to regional economic blocs. In this new environment, Latin American countries are trying to strengthen relations among themselves. The most visible outcome of such efforts is MERCOSUR, the Common Market of the South created by an agreement between Argentina, Brazil, Uruguay and Paraguay, signed in 1991.

Processes of economic and monetary integration are never without problems. However, the problems are strongly magnified when member countries pursue different disinflationary stabilisation programmes against a background of trade liberalisation and financial market

[*] The authors aknowledge CNPq and PROBRAL/CAPES for financial support.

globalisation, as has been the case in South America since the 1980s. The economic integration process in the MERCOSUR is peculiar because its member countries have accepted a diversity of exchange-rate arrangements, through which their currencies are linked to an outside currency in different ways. In particular, Argentina had its currency strictly fixed at a one-to-one parity with the US dollar between 1991 and early 2002, whereas Brazil ran more flexible exchange-rate policies with several regime shifts in the same period. Given that Argentina and Brazil are by far the biggest member countries of MERCOSUR (and that the two, moreover, differ significantly in the size of their internal markets), trade integration and other aspects are likely to be obstructed by perverse effects of macroeconomic stabilisation programmes under divergent monetary regimes.

This paper explores the transmission of shocks in various constellations of exchange-rate regimes that are described as alternative scenarios. Our main point is to show how the differences in monetary policies have contributed to the asynchronisation and asymmetries in the cyclical fluctuations of economic activity in Argentina and Brazil. As Frankel and Rose (1997) have pointed out, positive correlations of sub-regional business-cycles may be an outcome of monetary integration - and not necessarily an indispensable initial condition, as postulated by the 'optimal currency area'-literature in the tradition of Mundell (1961). In other word, monetary integration may tend to make shocks more symmetric. Conversely, incompatible monetary policies may contribute to economic disintegration through the asynchronisation of business cycles in the region. Along these lines, we show that symmetric shocks lead to uneven cycles due to asymmetries in the adjustment mechanisms of Argentina and Brazil. This leads to the conclusion that monetary policy is not neutral in the long run, since its repercussions affect the trade pattern and other real target variables of economic integration in the MERCOSUR.

Following this introduction, the paper is organised in four further sections. In the next two sections, we present empirical evidence of the relevant differences in the monetary and exchange-rate policies of Argentina and Brazil. With hindsight, pointing out the inconsistency of monetary policies in the two countries may seem trivial, given the intra-MERCOSUR tensions in the period between spring 1999, when Brazil went on a floating exchange-rate, and winter 2001/02, when Argentina had to abandon its quasi-currency-board arrangements. However, we show that the critical differences between the monetary regimes existed even at a time, when both countries had the exchange rates of their currencies pegged to the dollar. After presenting the evidence, we examine different scenarios of policy interaction by making use of a general framework *à la Mundell/Fleming.* In the last section we sum up our main conclusions.

Argentina's recent experience with a quasi-currency-board arrangement[1]

On 1st April 1991, Argentina's Congress approved a convertibility law (Law no. 23.929), institutionalising a quasi-currency-board rule for monetary base creation. This law embodied the basic aspects of a currency board:

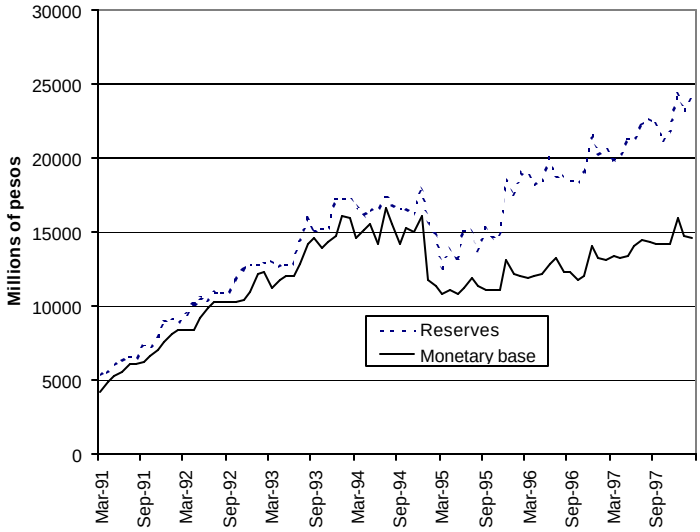
- it forced the central bank to confine its issue of the new domestic currency, the *peso*, almost exclusively to its holdings of foreign reserves in terms of US dollars;
- the official exchange rate established between the peso and the US dollar, the anchor currency, was fixed at the parity of one-to-one;
- the Central Bank of Argentina committed itself to guarantee the convertibility of "peso notes and coins" into the anchor currency at the official rate.

Figure 1 indicates the strict adherence of Argentina's monetary policy to these rules in the "fat seven years", when the currency-board experiment was widely considered a great success, because inflation was killed and the economy grew at an annual average of 6.07 per cent (Figure 7).

FIGURE 1 - ARGENTINA: MONETARY BASE AND FOREIGN RESERVES

March 1991 - February 1998

(in millions of pesos)



Source: Banco Central de la Republica Argentina, *Bulletins*, several issues.

We have investigated the long-run properties of the relevant time series, foreign reserves and monetary base, by making use of cointegration analysis. For estimation purposes, the variables are measured by their end-of-period balances and are taken on a monthly basis from reports of the Argentinean Central Bank. Monetary base *(m)* and foreign reserves *(r)* are considered in logarithmic form. Estimation is carried out for the period 1991:M3 to 1998:M2.

From Table 1, all variables apparently yield an *I(1)* process under both the ADF and the Phillips-Perron tests.

Table 1: Unit Roots Tests, Argentina

	M	R
I(0)		
DF	-0.056	0.524
ADF	0.051	0.559
I(1)		
DF	-3.703	-6.393
ADF	-3.434	-3.559

The critical values for 5% and 1% levels of significance are -1.951 and -2.634, respectively.

Estimation of an autoregressive distributed lag (ADL) yielded the following solved static long-run equation (number in parentheses are standard errors):

$$m_t = \underset{(0.085335)}{+0.9628}\, r_t - \underset{(9.258)}{0.74878}\, seasonal \qquad (1)$$

Autoregressive distributed lags have error-correction representations and our next step is to investigate the dynamic properties of our initial model using information from the preceding cointegration analysis. The Engle-Granger (1987) theorem establishes that if a group of variables forms a valid cointegration vector, it is possible to obtain a valid error correction representation, which is not liable to the problem of spurious regression. Following the general-to-specific modelling strategy, our estimates of a parsimonious version of the ECM (error correction model) have yielded the following equation:

$$\Delta m_t = \underset{(0.022)}{0.111} + \underset{(0.0916)}{0.4295}\Delta r_t - \underset{(0.0837)}{0.3065}\Delta m_{t-2} + S_t - \underset{(0.0195)}{0.0841} sD_{95:1} - \underset{(0.0465)}{0.1965} iD_{95:1} - \underset{(0.0669)}{0.2789}\, ECM_{t-1} \qquad (2)$$

AR 1-5F(5, 59) = 1.7961 [0.1276] ARCH 5 F(5, 54) = 0.592611 [0.7056]

Normality $c^2(2)$ = 0.802838 [0.6694] c_i^2 F(19, 44) = 1.1371 [0.3511]

RESET F(1, 63) = 1.5989 [0.2107] R^2 = 0.750 RSS = 0.0869 F(16, 64) = 12.021 DW = 2.40

where S_t are 11 monthly seasonal dummies and ECM is the error correction term, which is obtained from the ADL solution above. In the short run, changes in monetary base balances respond to past months' excess demand (supply) increasing (decreasing) by 28%, implying that short-run deviations from long-run *equilibria* were completely recovered after about three months. Note the importance of the step and impulse dummies for January 1995. It confirms the impression (from Figure 1) that monetary policy became even tighter after the contagious effects of the Mexican currency crisis at the end of 1994. The coefficient for the error correction term indicates remarkable stability.

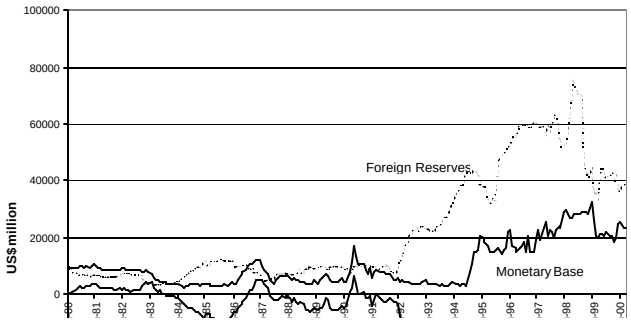
The equation also presents numerous desirable statistical properties with favourable diagnostic tests: standard errors are in parentheses; AR F(q, T - K - q) is the LM statistic for qth-order autocorrelation; ARCH F(q, T - K - 2q) is the LM statistic qth-order ARCH; RESET is Ramsey's statistic for misspecification; and NORM $c^2(2)$ is Jarque and Bera's statistic.

It should be noticed that the long-run relationship is preserved, regardless of the changes in the short-run behaviour of the monetary basis *vis-à-vis* the foreign reserves (which are captured by the dummies added to the error correction model). The results of our cointegration analysis strongly support the notion that Argentina closely followed the quasi-currency-board rules during the period examined.

Brazil's Sterilisation Policy[2]

The *Real Plan*, officially introduced on 1st July 1994, has been considered by several analysts as the most successful stabilisation plan in Brazil's history. The main goal of the plan was the achievement of price stability and one of its principal elements was the nominal exchange-rate anchor for the newly created currency unit, the *real*. Like the Argentinean *peso*, the parity between the real and the US dollar was established at a one-to-one exchange rate. According to Law no. 9.069 (approved in 29 June1994), monetary policy was designed to keep the money supply in line with the US dollar reserves. However, the relationship between changes in monetary base and movements in foreign reserves was not explicitly stated, and the exchange rate was permitted to move within a target band. The Real Plan thus allowed of some degree of discretion.

Figure 2 - Brazil: Monetary Base, Domestic Credit and Foreign Reserves, 1980-2000
(in millions of US dollar)



Source: Authors' elaboration based on data published in *Boletim do Banco Central*

Figure 2 shows clearly that the monetary base and domestic credit in Brazil rarely followed the foreign reserves pattern during the 1980s and 1990s. In comparison with Argentina, it is worth noting that the monetary base was kept almost constant during the critical period after the Mexican crisis (January - April 1995). Analysing the conditioning components of the monetary base - domestic credit *(cre)* and foreign reserves *(r)* –, one cannot avoid the conclusion that open-market operations were carried out to offset the negative pressure of the decline in the foreign reserves. When, on the other hand, the foreign reserves position was improved in the second half of 1996, the monetary base was kept more or less constant. The insulation of the monetary base from the movements of the foreign reserves, illustrated by Figure 2, is remarkable. The absence of co-movements between the two series confirms the *discretionary* character of the Brazilian monetary policy.[3] Even though such discretion is frequently considered to be detrimental to the credibility of the central bank, it was apparently consistent with a strategy to finance imports by attracting high inflows of foreign capital.

Table 2: Unit Roots Tests, Brazil

	cre	*r*	*Residuals*
I(0)			
PP	-0.8637	0.4667	-9.6239
ADF	-1.0626	0.2495	-5.7732
I(1)			
PP	-8.8155	-6.7343	

ADF	-4.1249	-4.1610

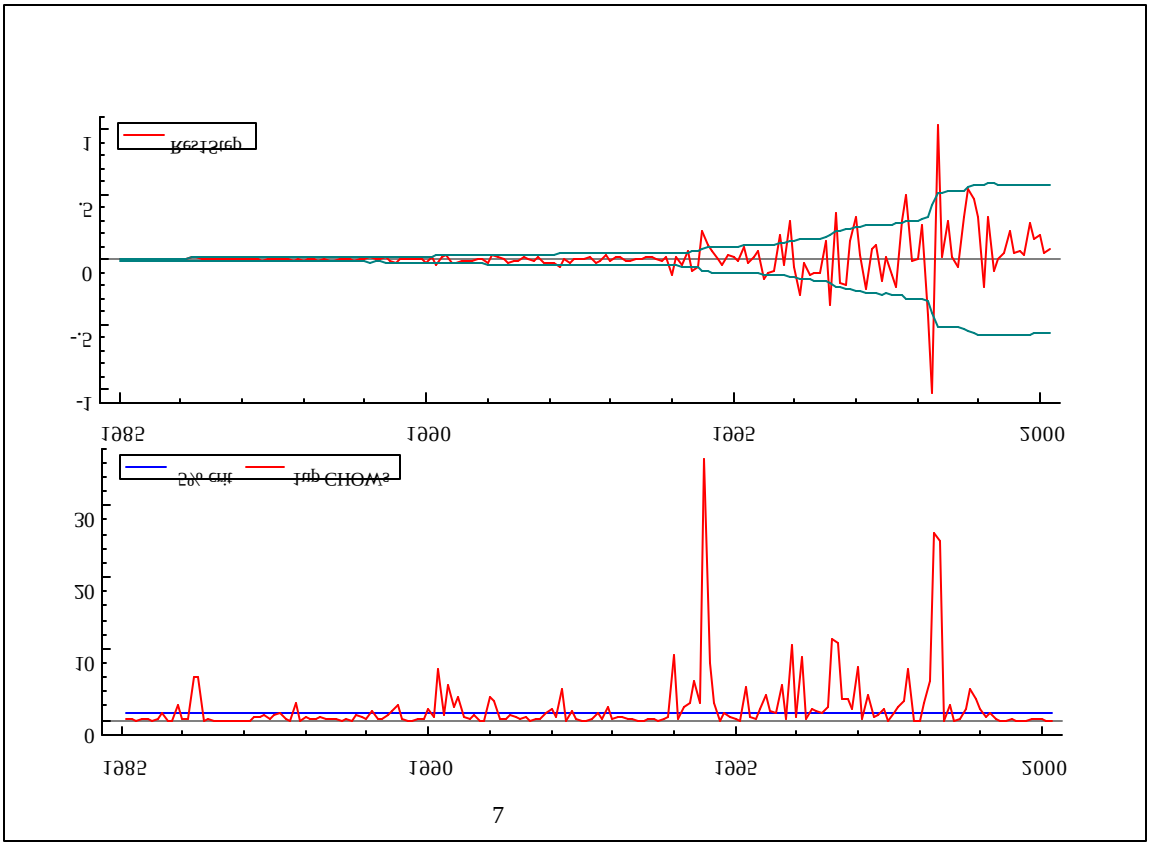
The critical values for 5% and 1% levels of significance are –2.88 and –3.49, respectively.

Here, as in the Argentine experiment, it is worth investigating the long-run properties of these time series, proceeding to a cointegration analysis of domestic credit and foreign reserves. For estimation purposes, the variables are measured in current US dollars by their end-of-period balances and are taken on a monthly basis from reports of the Brazilian Central Bank.

From Table 2, all variables apparently yield an I(1) process under both the ADF and the Phillips-Perron tests.

Estimation is carried out for three different periods: (a) the whole sample, 1980:M1 to 2000:M3; (b) a first sub-sample, 1980:M1 to 1990:M2; and (c) a third sub-sample, 1990:M3 to 2000:M3. The definitions of the two sub-samples is based on the analysis of the residuals and the Chow test of an ADL that reveals that there is a significant structural change in 1990, as can be seen in Figure 3 below. The assumption is that there was a significant change in monetary policy that started with the emergency measures against hyperinflation and the *Collor II Plan* in 1990, and that was reinforced by the implementation of the Real Plan in 1994.

Figure 3: Analysis of the residuals for the period 1980-2000



The model for the whole sample yielded the following results:

$$cre = +17.33 - 0.7202\, r + 0.3237\, sD_{98:1} + Seasonals \quad (3)$$
$$(SE) \quad (1.186) \quad (0.1252) \quad (0.3528)$$

Nevertheless, observation of Figure 3 suggests a strong change of regime around 1990. For that reason we estimated the same model for two different samples as related above.

A long-run *equilibrium* relationship between credit and foreign reserves defines the monetary policy of the first period: 1980:M1 to 1990:M2 according to the following results:

$$cre = +11.95 - 0.1158\, r - 0.002862\, Trend + 0.172\, sD_{86:2} + Seasonals \quad (4)$$
$$(0.1183) \quad (0.01338) \quad (0.0002271) \quad (0.01455)$$

The short-run relationship with the error correction mechanism is estimated and confirms the existence of the long-run *equilibrium* . The error correction mechanism shows that the adjustment towards a long-run equilibrium takes about one year.

$$Dcre = 0.006 + 0.358\, Dcre_{-1} - 0.182\, Dr + 0.049\, Dr_{-1} + 0.023\, Dr_{-2} + Seasonals$$
$$(0.004) \quad (0.08) \quad (0.015) \quad (0.02) \quad (0.015)$$

$$+ 0.002\, sD_{86:2} - 0.212\, ECM \quad (5)$$
$$(0.002) \quad (0.04)$$

AR 1- 7F(7, 94) = 0.70593 [0.6670] ARCH 7 F(7, 87) = 1.0442 [0.4066]

Normality c^2 (2)= 0.03133 [0.9845] c_i^2 F(22, 78) = 1.6797 [0.0501]

RESET F(1,100) = 0.73061 [0.3947]

The statistical properties of the model present the desired properties.

The short-run relationship can be understood as a *policy reaction function* pursued by the monetary authorities. The short-run coefficient of change of credits on change of reserves indicates that about 17 per cent of the inflow of reserves is sterilised. The existence of the long-run relationship in equation (4) may express the effectiveness of the sterilisation policy.[4]

The period that started with the Collor disinflation measures in March 1990, indicates a change in the long-run relationship between domestic credit and foreign reserves. The long-run coefficient of credit on reserves that was around (- 0.12) jumps to (– 0.9), as can be read from the equation below.

$$cre = +18.98 \underset{(1.553)}{} - 0.8636\, r \underset{(0.1497)}{} + 0.2293\, iD_{98:1} \underset{(0.236)}{} + Seasonals \quad (6)$$

The error correction mechanism of the short-run relationship confirms the existence of the long-run relationship of equation (6) and denotes a substantial change of the *credit policy reaction function*. The short-run sterilisation coefficient reaches (-1.6).

$$Dcre = 0.126 + \underset{(0.068)}{0.191} Dcre_{-3} \underset{(0.067)}{} - 1.589\, Dr \underset{(0.244)}{} - 1.319\, iD_{98:4} \underset{(0.193)}{} - 0.518\, iD_{98:3} \underset{(0.194)}{}$$

$$+ \underset{(0.195)}{0.385}\, iD_{96:9} \underset{(0.192)}{} - 0.758\, iD_{96:10} \underset{(0.052)}{} - 0.295\, ECM + Seasonals \quad (7)$$

AR 1- 7 F(7, 73) = 2.7446 [0.0138] * ARCH 7 F(7, 66) = 1.5478 [0.1668]

Normality c^2 (2)= 1.5258 [0.4663] c_i^2F(21, 58) = 1.0529 [0.4211]

RESET F(1, 79) = 8.0106 [0.0059] **

In the short run the Monetary Authorities tend to overshoot: on top of the 100% of the inflow of foreign reserves that is sterilised an additional amount of domestic assets is sold, corresponding to about 60% of the original inflow. Nevertheless, the adjustment to the long-run sterilisation coefficient however is very rapid and it takes only four months.

These results confirm that Brazilian monetary policy has tended to insulate the development of domestic monetary aggregates from changes in foreign reserves. They also show that there was a significant structural change in the sterilisation policy pursued by the monetary authorities. The existence of a negative long-run relationship between credit and foreign reserves suggests that there was some scope for independent monetary policy even with a moving target band.[5]

Exchange-Rate Regimes within MERCOSUR

This section introduces a general framework *à la Mundell/Fleming* which serves to examine the transmission of various types of shocks under alternative scenarios of exchange-rate arrangements within and among countries. Despite its well-known limitations, this kind of framework is useful for shedding some light on the inconsistency problems that may arise when countries engaged in trade integration pursue different monetary policies in various constellations of exchange-rate regimes.

Let us consider three scenarios (or "thought experiments") with three hypothetical economies (we can imagine A to be Argentina , B Brazil, and C the United States or the Rest of the World):[6]

scenario 1: fixed exchange rates A/B, A/C and B/C,

scenario 2: fixed exchange rate A/C, floating exchange rates B/A and B/C,

scenario 3: a target zone for exchange rates A/B, fixed exchange rates A/C.

Before discussing the scenarios, we follow Krugman and Obstfeld (1994) and Argy (1994) in sketching a simple model that we use to develop our analysis of the transmission of shocks. Different cases will be explored related to alternative exchange-rate arrangements amongst the countries involved. The model is based on the following equations:

$$Y_A = D_A(Y_B, r_A, Y_C^*, e, f_A) \tag{8}$$

$$Y_B = D_B(Y_A, r_B, Y_C^*, e, f_B) \tag{9}$$

$$M_A = L(Y_A, r_A) \tag{10}$$

$$M_B = L(Y_B, r_B) \tag{11}$$

$$M_B = \overline{M}_B \tag{12}$$

$$r_A = r_B \tag{13}$$

$$0 = BP_B\,(Y_B, Y_A, Y_C^*, e, r_B - r_c) \tag{14}$$

$$e = \overline{e} \tag{15}$$

Y denotes output and M is real money supply, r denotes interest rate, f is the fiscal variable and e is the real exchange rate. The subscripts stand for Argentina (A) and Brazil (B) and USA or the rest of the world (C). Equations (8) and (9) represent *equilibrium* in the goods markets (IS). Equations (10), (11) and (12) represent *equilibrium* in the money markets (LM). Equation (12) indicates that country B controls the money supply either by sterilisation, when the exchange rate is fixed, or by permitting it to float. Equation (13) represents the *equilibrium* condition for the foreign-exchange market. Equations (14) and (15) stand, respectively, for the balance-of-payments *equilibrium* condition under a floating exchange-rate, conventionally taken to be necessary for determining the latter's value, and for the target level of the exchange rate under a fixed exchange-rate system. The assumption is that perfect capital mobility prevails between countries A and B, and that domestic prices in both countries are fixed or sticky in the short run.

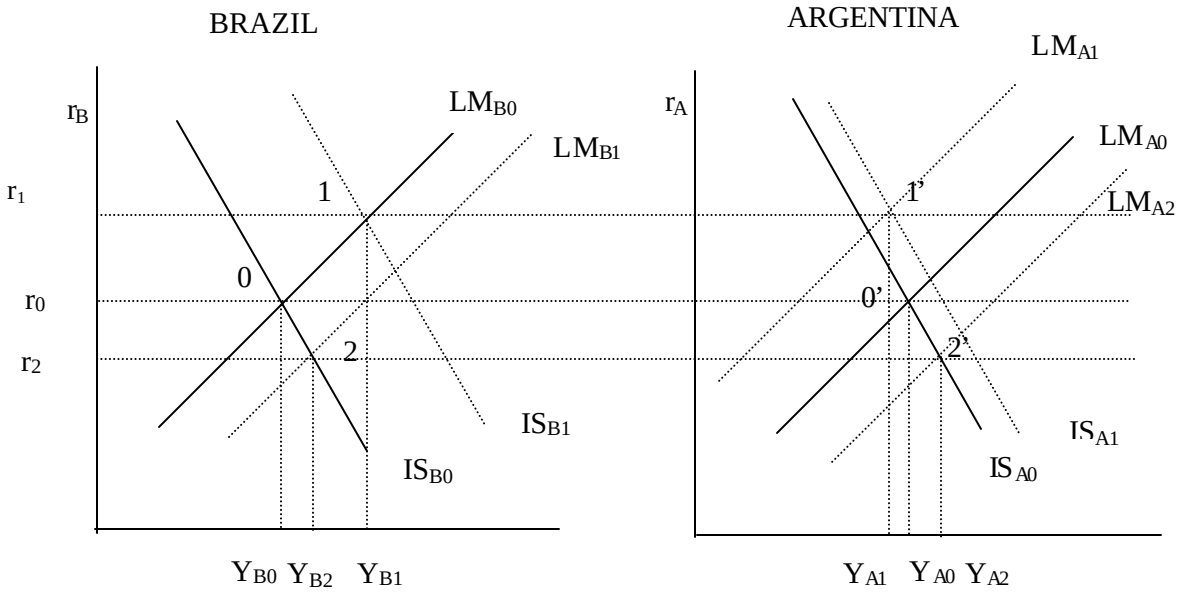
Scenario 1 Assume that a credible fixed exchange-rate arrangement prevails among the three countries. Consider the integration area *(A+B)*. The effects of monetary and fiscal policies will be more important from B to A than from A to B, if A depends more on B than B does on A. This is due to the lack of symmetry (in size and/or structure) between the two economies.

Assume now that B makes use of sterilisation practices (open-market operations by which B tries to offset the impacts of foreign-reserves changes on the monetary base), while economy A does not sterilise. Take C's position as given (*ceteris paribus*). Consider that perfect capital mobility prevails between A and B, but that it is less than perfect in relation to C. These assumptions enable us to set the focus on the relationship between A and B.

If the scenario is the one described above, economy B starts to play the dominant role in terms of controlling monetary policy. Changes in monetary policy in A affects B's level of reserves, but not its money supply. The question is: will country A accept a monetary policy dictated by country B? (Keep in mind that, in this example, B stands for Brazil and A for Argentina!). The loss of autonomy on the part of A seems to be the main problem of this relationship.

Domestic policies originating in Brazil Monetary shocks originating in Brazil will increase the money supply in both countries, as illustrated by the rightward shifts of the LM curves in Figure 4. The result is a decline of the region's interest rate followed by an expansion of output in both economies (points 2 and 2'). On the other hand, monetary shocks originating in Argentina will be dampened in Brazil and therefore in Argentina as well. The sterilisation policy implemented by Brazil creates an important asymmetry in this relationship.

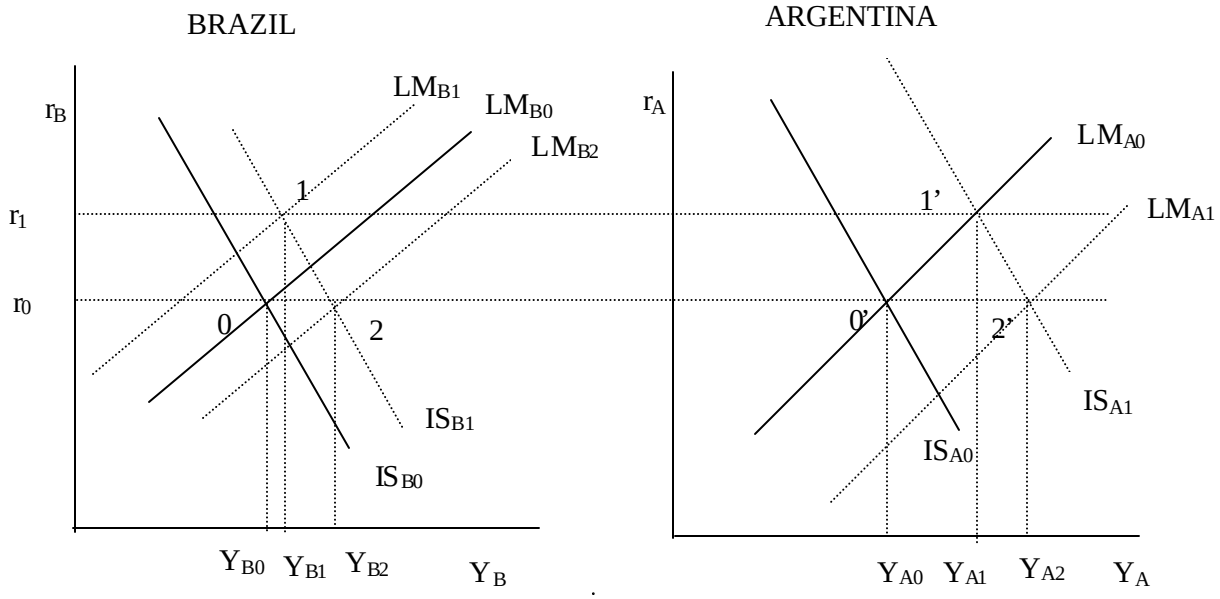
Figure 4 – Monetary and fiscal expansion in Brazil



Within the same thought experiment it is interesting to recall the effects of sterilisation upon the transmission of fiscal shocks. Fiscal shocks originating in Brazil will be expansionary in Brazil and contractionary in Argentina. Figure 4 illustrates this case. Points 0 and 0' mark the initial *equilibria* in the output and foreign-exchange markets of both economies. The fiscal shock originating in *B* shifts the IS curve to the right and determines a new *equilibrium* (point 1) in which *B's* output (Y_{B1}) and interest rate (r_1) are higher. Due to rising demand for *A's* exports, IS_A will also shift to the right. However, interest arbitrage in the foreign exchange market will lead to an outflow

of reserves from *A* to *B* until equation (13) holds. Open-market-sterilisation policy assures that the Brazilian money supply does not change. As a result the interest rate in the region will remain at r_1, leading to a fall in Argentina's output (Y_{A1}) as LM contracts to the new *equilibrium* (in point 1').

Figure 5 – Fiscal expansion in Argentina



Domestic policies originating in Argentina By adopting a fixed-exchange-rate regime without sterilisation, *A* loses its capacity to conduct an independent monetary policy. In this case, fiscal policy becomes more powerful. Suppose that Argentina undertakes a fiscal expansion, as illustrated by Figure 5. The outcome in *A* will be an expansion in the aggregate demand (IS_A shifts to the right). As a result the output in *A* will increase (Y_{A1}-Y_{A0}), followed by a rise in the interest rate to r_1. This will have positive effects on Brazil through trade (IS_B shifts to the right) and negative effects through capital outflows to *A* (LM_B shifts to the left). The *equilibria* in points 1 and 1' are not stable, however, because the monetary leakage in *B* is neutralised by the Central Bank. Together with capital flows from *C* to *A*, those leakages will further enhance the positive effect of *A's* fiscal expansion. In the final *equilibrium* (points 2 and 2'), the interest rate will return to its initial level r_0. In other words, fiscal shocks coming from Argentina do not lead to a crowding out of private investment. Due to the fixed-exchange-rate

arrangement, there is no exchange-rate crowding out, and the interest-rate crowding out disappears due to the sterilisation policy in *B*. In this way, the fiscal shock coming from *A* is amplified.

The main result is the existence of a trade off in Argentinean stabilisation policy: the loss of the monetary policy instrument is compensated by the gain in the effectiveness of fiscal policy, since there is no interest-rate crowding out.

Shocks originating in the Rest of the World This analysis has to contemplate the response of the region to external shocks. Fixed- exchange-rate systems translate any change in foreign demand into internal shocks. For instance, a reduction of exports will have effects very similar to those of a reduction in government expenditures. In the same way, any change in net capital flows between *C* and the *A+B* region corresponds to changes in the money supply of the countries in the region. In the case of Argentina and Brazil, however, it may be argued that, in the period between 1994 and 1999, the different monetary policies should have had a symmetric positive effect on the stability of aggregate demand in the region. Consider, for example, the reserve shock in the wake of the Mexican crisis 1994-95: both Argentina and Brazil lost nearly one third of their foreign reserves within a few weeks (see Figures 1 and 2). It is conceivable that Argentina would have lost far more reserves and would not have regained them so quickly, if the country had not enjoyed the credibility bonus of the currency-board system. Brazil, on the other hand, could not exploit such a bonus, as the Mexican crisis came only a few months after the Real Plan – time was too short to establish credibility. But the Brazilian Central Bank mitigated the reserve shock by keeping the money supply stable. In this process, the Brazilian monetary policy may even have helped to dampen the effects of the reserve shock on Argentina, insofar as arbitrage-related capital flows from Brazil to Argentina compensated for some of the capital flight from Argentina to the rest of the world.

Our analysis in the preceding sections has shown that both Argentina and Brazil pursued tight money policies when large capital inflows to the region led to strong increases in reserve holdings 1995-96. This restrictive stance may be explained as attempts to gain and preserve credibility, but it is hard to avoid the conclusion that it has contributed to the recession that befell the region in the late 1990s. A new and even stronger type of monetary asymmetry developed, when Brazil could no longer neutralise the capital outflows that it suffered after the Asian and Russian crises 1997-98, in a period of intra-Brazilian haggling over the stance of fiscal policy. Brazil switched to a floating exchange rate, whereas Argentina preferred to stick to the currency board. This brings us to the next scenario.

Scenario 2 Suppose the region were to shift from a fixed-exchange-rate arrangement to a floating-exchange-rate regime. Assume, however, that a fixed-exchange-rate arrangement prevails between

A and *C* (as it did occur in reality between the Argentine peso and the US dollar from 1991 to January 2002), while *B's* currency floats in relation to *C's* and *A's* currencies (as in Brazil after January 1999).

Shock amplification mechanism An interesting aspect to be pointed out has to do with the vulnerability to external shocks. As the analysis of Scenario 1 suggests, *A* becomes more vulnerable to external shocks than *B*, given its commitment to a fixed exchange rate a. In the case of *B*, floating exchange rates insulate, partly, the effects of foreign shocks in the same way that sterilisation policy does. On the other hand, demand shocks that affect *B* will be transmitted to *A* through movements of the exchange rate. Floating thus modifies the interaction between Brazil's independent monetary policy and the currency-board system in Argentina to the extent that the basic asymmetry is extended to the effects of external shocks. Figure 6 illustrates these effects, showing the impact of a shock that affects both Argentina and Brazil. It shows that Argentina ends up being hit twice: first directly and then indirectly through the devaluation of Brazil's currency.

Shocks that hit Argentina Assume a situation in which an external shock is represented by an increase in commodity prices in the world market (ε). As its terms of trade are worsened, Argentina will face external *disequilibria* with a current-account deficit and a decline in foreign reserves. The adjustment mechanism designed by a currency-board arrangement will lead to a reduction of the monetary base, with a consequent rise of the interest rate. Two main effects should follow from that: one is the stagnation of GDP in *A*; the other, less important, is the inflow of capital from *C* (the rest of the world) and, particularly, from *B*. The first one corresponds to the direct translation of a foreign shock into an internal shock and is likely to have serious consequences in terms of unemployment. The second is of small order but may add to the direct effect on *A*, because the outflow of capital from *B* could lead to a devaluation of *B's* currency which, in turn, could increase the current-account deficit of *A*.

Figure 6 – The double impact of external shocks on Argentina

Suppose that : ε and ν are external shocks

E: nominal exchange rate

R: international reserves

Shocks that hit Argentina and Brazil Consider that the same shock also hits Brazil leading to an external imbalance. Nonetheless, in this case, the adjustment mechanism of the Brazilian exchange-rate regime will smooth the external shock through devaluation. This procedure translates itself into an external shock to Argentina's economy (v) leading to the same consequences as described above. In other words, external shocks that hit *B* will generate secondary external shocks to *A*.

The transmission of the shocks among the countries becomes asymmetrical. The shocks are smoothed in Brazil and amplified in Argentina. As indicated before this mechanism may generate a vicious circle that precludes convergence.

Credibility shocks affecting Argentina It is interesting to understand the effects of credibility shocks in Argentina. When investors lose confidence in *A's* sustainability of the currency-board regime the model suggests that capital will flow out of *A*. This may have contagious effects on *B* in the sense that investors' imperfect information will lead them to reduce their engagements in *B* too. This credibility shock may set a cumulative process in motion that goes from *A* to *B* and back to *A*. Capital outflows from Argentina will be followed by capital outflows from Brazil and, as a consequence, the Brazilian currency will be devaluated.

Differences in monetary and exchange-rate policies The differences in monetary and exchange-rate policies correspond to different mechanisms of adjustment to negative external shocks. Currency-board arrangements rely mainly on monetary adjustments that tend to produce output changes, at least in the short run. On the other hand, floating regimes adjust through the currency market, that is through price adjustments. While price mechanisms may, to some extent, insulate the economies from external shocks, monetary mechanisms lead to considerable quantity adjustments. The interrelationship between price and quantity adjustments may create an unstable system.

Any non co-ordinated change in *A* or *B* can thus affect the degree of their trade integration through the channel of monetary policy. Assume, for example, that a monetary contraction in *A* leads to a devaluation of *B's* currency in relation to *A's*. The effect will take the form of a trade shift. *A* will import more from and export less to *B*. But the level of trade may also be affected, if a contraction in *A's* income leads to lower imports from *B*. This may induce further devaluations of *B's* currency, if not a downward spiral of trade in the region.

Scenario 3 The last scenario to be explored represents an extension of the last possibility of scenario 2 and considers the implementation of a target-zone exchange-rate arrangement in *B* and also between *A* and *B*. Assume that the fixed-exchange-rate regime between *A* and C is maintained.

Target zones impose constraints on the fiscal and monetary policies of country *B* (especially if they are combined with a fixed exchange rate of *A* with some external currency). Consider the case in which *B* has a fiscal deficit that is permanently higher than that of *A* and/or *C*. In our simple *Mundell/Fleming* framework that would translate into a rate of interest that tends to be too high, and an exchange rate that is too low. *B* will be pushed to the lower limit of the exchange-rate band and to the upper limit of the (implicit) interest-rate band. Monetary policy is tight, in the sense that it is not used to finance the fiscal deficit, and capital inflows are mostly sterilised, but in the meantime *B* would accumulate a trade-balance deficit in relation to both *A* and the rest of the world. If financial market investors begin to doubt the sustainability of the exchange rate, a speculative attack *à la* Krugman (1979) on the foreign reserves of *B* is likely to occur - with

consequences that bring us back to the integration problems of Scenario 2. Note that this kind of exercise is slightly different from the traditional one in which the speculative attack is due to the expansion of internal credit. Here fiscal imbalances point to an overvaluation of the domestic exchange rate, and to a trade-balance *disequilibrium*. Its sustainability would depend on the confidence that financial markets have in the country's economic policies. It is well worth noting that Scenario 3 bears some resemblance to the situation of Brazil before and in the currency crisis of 1999 that forced the country to switch to floating exchange rates.

Conclusion

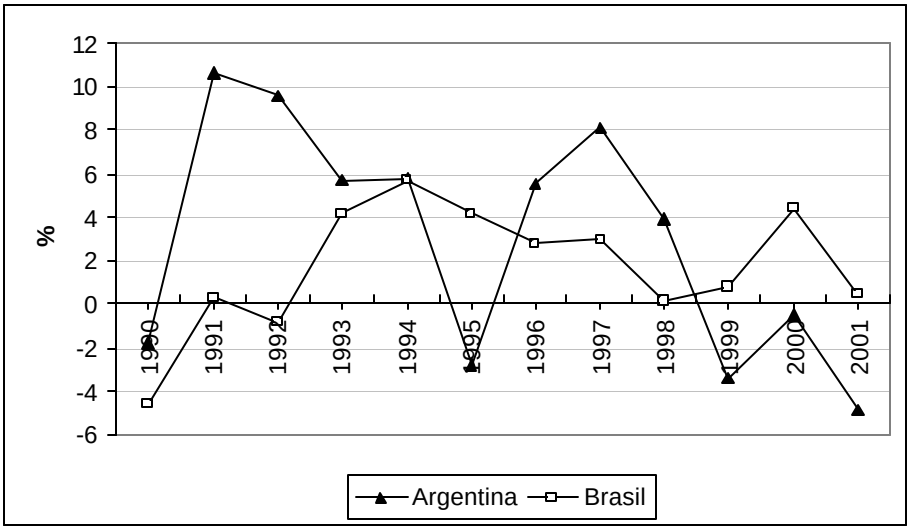
Our scenarios of alternative exchange-rate arrangements for MERCOSUR countries suggest that the coexistence of Argentina's fixed-exchange-rate regime based on currency-board rules and Brazil's more independent policies has created obstacles to economic integration in the MERCOSUR region. When both countries had fixed their exchange rates in terms of the US dollar, domestic policy shocks tended to produce asymmetric adjustments, because Brazil largely neutralised the impact of intra-regional capital flows, whereas Argentina did not. In this constellation, trade integration would be favoured only by monetary expansion in Brazil or by fiscal expansion in Argentina; the difference in the monetary policy regimes may nevertheless have helped to buffer external shocks, as in the case of the Mexican crisis. However, the underlying asymmetry was exacerbated, when Brazil switched to floating in 1999. Now even external shocks had clearly adverse effects on trade integration and the synchronisation of economic development in the region. They worked their way through the two economies in a fashion that made Argentina being hit twice – first by the original shock and thereafter by its repercussions through devaluations of the Brazilian currency. The asymmetries following from the different monetary and exchange-rate arrangements have generated an increasing divergence in the patterns of output fluctuation that is illustrated by Figure 7.

The lack of macroeconomic policy co-ordination in the MERCOSUR has led to serious setbacks in the process of trade integration. The devaluation of the Brazilian real and the severe contraction of aggregate demand in Argentina has produced strong negative effects on the productive capacity of the Argentinean economy – an experience that hardly makes a good base for further economic integration. On the contrary, monetary disintegration has spurred conflicts over remaining trade barriers in the region that might otherwise have been eliminated long ago. Argentina has accused Brazil of pursuing a "beggar thy neighbour" policy, but it has finally had to accept that its own policy of "beggar the IMF by sticking to the currency board" was unsustainable. In January 2002, the peso was officially devaluated by 30 per cent and the convertibility law was suspended.

At the time of writing this article (January 2002), the situation was too unstable to allow any predictions about the future course of monetary policies in the MERCOSUR. Macroeconomic

policy co-ordination between the member countries is certainly a must in the longer run. An arrangement with target zones for exchange rates in the MERCOSUR is probably one of the few remaining options. Yet this is not without problems either, as Scenario 3 of our analysis indicates. How to switch from the vicious circle of monetary disintegration to a virtuous circle of macroeconomic convergence and trade integration that is both required for and sustained by target-zone arrangements is a puzzle to be solved among the two major MERCOSUR countries.

Figure 7 – GDP growth in Argentina and Brazil, 1991 – 2001



Source: INDEC and IBGE

Notes

[1] This sub-section follows closely Silva (1999) and Andrade, Silva and Carneiro (2000).

[2] For a detailed analysis see Andrade, Silva and Carneiro (2000).

[3] It should be noted, however, that hyperinflation was eliminated in the second half of 1994. Not surprisingly this period was marked by a strong process of monetization of portfolios, in which case the portfolio changes tend to bear very little direct relation to foreign reserves.

[4] On sterilisation policy and its effects on exchange rates and monetary aggregates see Edison (1993)

[5] It has been suggested that the exchange-rate regime adopted by Brazil in the first stages of the *Real Plan* was a crawling peg and not target bands as officially announced, see Pastore and Pinotti (1999).

[6] These exercises are applications of Mundell-Fleming type models for two and three countries. See Argy (1994), pp. 150-193.

References

Andrade, J.P., F.G.Carneiro and M.L. Falcão Silva (2000), 'Contrasting Monetary Policies within the MERCOSUR experiment', Economia Aplicada, 4 (2), 223-251.

Argy, Vitor. (1994), International Macroeconomics: Theory and Policy, London, UK and New York, US: Routlege.

Banco Central de La República Argentina, Bulletins, several issues.

Banco Central do Brasil, Boletim do Banco Central do Brasil, several issues.

Edison, H.J. (1993), 'The Effectiveness of Central-Bank Intervention: A Survey of the Literature After 1982', Princeton Special Papers in International Economics,18 .

Frankel, J.A and A.K.Rose (1997), 'The Endogeneity of the Optimum Currency-Area Criteria', Swedish Economic Policy Review, 4, 487-512.

Engle, R.F. and Granger, C.W.J. (1987), 'Co-integration and error correction: representation, estimation and testing'. Econometrica, 55, 251-276.

International Monetary Fund, International Financial Statistics, several issues.

Krugman, P. (1979), 'A Model of Balance of Payments Crises', Journal of Money, Credit, and Banking, 11, 311-325.

Krugman, Paul and Maurice Obstfeld (1994), International Economics: Theory and Practice 3rd. Edition, New York, US: Haper Collins College Publishers.

Mundell, R.A. (1961), 'A Theory of Optimum Currency Areas', The American Economic Review, 51, 657-65.

Pastore, A. and M.C. Pinotti (1999), 'Inflação e Estabilização: Algumas lições da Experiência Brasileira', Revista Brasileira de Economia, 53, (1), 3-40.

Silva, Maria Luiza Falcão (1999), Modern Exchange-Rate Regimes, Stabilisation Programmes and Co-ordination of Macroeconomic Policies, Aldershot, UK and Vermont, US: Ashgate Publishing Company, pp. 186-198.