UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

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G-24 Discussion Paper Series

Can Flexible Exchange Rates Still "Work" in Financially Open Economies?

Ilan Goldfajn and Gino Olivares

No. 8, January 2001

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TRADE AND DEVELOPMENT

CENTER FOR INTERNATIONAL DEVELOPMENT
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G-24 Discussion Paper Series

Research papers for the Intergovernmental Group of Twenty-Four on International Monetary Affairs

UNITED NATIONS
New York and Geneva, January 2001

Note

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UNITED NATIONS PUBLICATION

PREFACE

The *G-24 Discussion Paper Series* is a collection of research papers prepared under the UNCTAD Project of Technical Support to the Intergovernmental Group of Twenty-Four on International Monetary Affairs (G-24). The G-24 was established in 1971 with a view to increasing the analytical capacity and the negotiating strength of the developing countries in discussions and negotiations in the international financial institutions. The G-24 is the only formal developing-country grouping within the IMF and the World Bank. Its meetings are open to all developing countries.

The G-24 Project, which is administered by UNCTAD's Macroeconomic and Development Policies Branch, aims at enhancing the understanding of policy makers in developing countries of the complex issues in the international monetary and financial system, and at raising awareness outside developing countries of the need to introduce a development dimension into the discussion of international financial and institutional reform.

The research carried out under the project is coordinated by Professor Dani Rodrik, John F. Kennedy School of Government, Harvard University. The research papers are discussed among experts and policy makers at the meetings of the G-24 Technical Group, and provide inputs to the meetings of the G-24 Ministers and Deputies in their preparations for negotiations and discussions in the framework of the IMF's International Monetary and Financial Committee (formerly Interim Committee) and the Joint IMF/IBRD Development Committee, as well as in other forums. Previously, the research papers for the G-24 were published by UNCTAD in the collection *International Monetary and Financial Issues for the 1990s.* Between 1992 and 1999 more than 80 papers were published in 11 volumes of this collection, covering a wide range of monetary and financial issues of major interest to developing countries. Since the beginning of 2000 the studies are published jointly by UNCTAD and the Center for International Development at Harvard University in the *G-24 Discussion Paper Series.*

The Project of Technical Support to the G-24 receives generous financial support from the International Development Research Centre of Canada and the Governments of Denmark and the Netherlands, as well as contributions from the countries participating in the meetings of the G-24.

CAN FLEXIBLE EXCHANGE RATES STILL "WORK" IN FINANCIALLY OPEN ECONOMIES?

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G-24 Discussion Paper No. 8

January 2001

Abstract

Recent studies have shown that exchange rates in developing countries have limited flexibility. In this paper we review the existing explanations for this stylized fact, using a simple framework of monetary policy in a world where firms face balance sheet effects and the economy has a high pass-through from depreciation to inflation. We estimate a panel regression using quarterly data in the period 1990–1999 for a sample of 46 countries (19 industrial and 27 developing), and find that the use of the exchange rate to buffer external shocks depends crucially on (i) on the degree of integration with capital markets, and (ii) the quality of external financing. We conclude that flexible regimes are viable in financially open economies, provided external financing is not based on very volatile capital. This, of course, is dependent on the establishment of credible macroeconomic policies.

Table of contents

Page

CAN FLEXIBLE EXCHANGE RATES STILL "WORK" IN FINANCIALLY OPEN ECONOMIES?*

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I. Introduction

The recent failure of several emerging economies to sustain managed currencies has led, in general, to the support of extreme regimes, either hard pegs, such as currency boards or even full dollarization, or pure floating regimes. There is a rich debate on the relative advantages and costs of hard pegs, pure floating or intermediate regimes in the economic literature (Calvo, 2000; Chang and Velasco, 2000; Eichengreen and Hausmann, 1999; Mishkin, 1999; Rodrik, 2000; Velasco, 2000; Williamson, 1998).

In this paper we take a different angle on the choice of exchange regimes. We concentrate on the effect of high capital mobility on the usefulness of different exchange rate regimes, in particular on the relative benefits of exchange rate flexibility. Does a floating regime provide the necessary cushion to allow countries to buffer against external or internal shocks in this high capital mobility world? Does the high degree of dollarization of the financial systems of many developing countries in Latin America render currency depreciation an ineffective – at worst harmful – policy option?

We analyse these issues, observing the data and the relevant stylized facts. First, we document the degree of volatility of the exchange rate in floating regime economies. Second, we examine the sensitivity of interest rates to foreign interest rate shocks. Third, we report on the contractionary effects of devaluation in emerging economies. Finally, we briefly analyse two case studies in Latin America, Mexico and Brazil, and comment on the recent performance of these floating exchange economies.

The stylized facts seem to indicate that developing countries prefer to allow a higher volatility of reserves and interest rates in exchange for a lower volatility on their exchange rates, at least as compared with industrial economies. Second, the sensitivity of domestic interest rates to international interest rates is higher under fixed exchange regimes than under floating ones. Finally, devaluations seem to be more contractionary in developing countries, but this effect is limited to currency crisis periods and to the very short run. The Brazilian and Mexi-

* We wish to thank Dani Rodrik for suggesting the topic and for his helpful comments, Sergio Schmukler for sharing his data set, and Igor Barenboim and Rafael Melo for excellent research assistance. All errors are our own.

can cases support the notion that devaluations may be expansionary in the medium run without inflationary consequences, provided restrictive monetary and fiscal policy are adopted.

We investigate several alternative explanations of these facts. First, we present a simple model where balance sheet effects and high pass-through considerations are essential to monetary policy decision. Second, we discuss the explanation given by Calvo and Reinhart (2000a) of the "fear of floating" that exists, among other reasons, because of pervasive currency mismatches in the economy. Third, we offer another explanation, the "fear of inflation": that is, the high pass-through of the exchange rate to prices in developing countries that prevent policy makers using fully the exchange rate flexibility. Finally, we discuss when it is optimal to use a combination of exchange rate flexibility and interest rate changes to react to shocks, instead of reacting with only one instrument. In particular, we evaluate the effect of capital mobility on the choice of regime.

Our hypothesis is that the high degree of capital mobility has made these effects more binding (because both the currency mismatches and the degree of pass-through are higher). In the paper we offer a test where we control for both the degree of capital mobility and external financing, and check the sensitivity of domestic interest rates to foreign interest rates. We find that countries with more open capital accounts and less stable external financing seem to face difficulties in using the exchange rate to buffer external shocks. Therefore, successful floating regimes in financially open economies seem to require stable external financing.

The rest of the paper is structured as follows. In section II we give the main stylized facts characterizing the performance of exchange rate regimes in developing countries. In section III we discuss and develop explanations of the stylized facts presented in section II. In section IV we test more formally the effect of high capital mobility. Finally, section V contains our conclusions.

II. Stylized facts

In this section we review a few stylized facts regarding exchange rate flexibility. We begin by analysing the way countries float their exchange rates. Then we review the evidence on the sensitivity of domestic interest rates to international interest rate shocks in developing countries. Finally, we take a closer look at the recent experiences of Brazil and Mexico with floating exchange rate regimes.

A. How countries float

One important stylized fact is the recent argument in the literature that floating regimes do not provide a buffer against shocks. The reason is that countries with *de jure* floating regimes actually do not allow their exchange rates to float. Calvo and Reinhart (2000a and 2000b), Reinhart (2000) and Hausmann et al. (2000) document the reluctance of countries with seemingly floating regimes to allow the exchange rate to float.[1]

One would expect countries under floating exchange regimes to display higher exchange rate volatility and lower interest rate volatility than similar countries with exchange pegs. However, Calvo and Reinhart (2000a), in analysing the behaviour of exchange rates, reserves, monetary aggregates, interest rates and commodity prices across 154 exchange rate arrangements, find evidence of low nominal exchange rate volatility and high nominal interest rate volatility in countries with floating or less-than-extreme pegging regimes. They interpret this evidence as supporting the assertion that countries with floating or less-than-extreme pegging regimes maintain a bias towards reacting to shocks through adjustments in the nominal interest rate instead of through adjustments in the nominal exchange rate.

Table 1 summarizes their results. One can observe that, although floating exchange regimes have a smaller fluctuation than fixed regimes, it seems that the exchange flexibility is not overwhelming, at least compared to the flexibility of mature currencies, like the yen or the US dollar. In addition, nominal interest rates in floating regimes fluctuate more than in fixed exchange regimes. Calvo and Reinhart (2000a) have dubbed this phenomenon the "fear of floating".

Hausmann et al. (2000) have confirmed these stylized facts. They focus on three different aspects of exchange rate management: the stock of reserves, the relative volatility of exchange rates vis-à-vis reserves, and the relative volatility of exchange rates vis-à-vis interest rates. They give evidence that the ability to float freely is closely associated with the level of development: the two indices of relative volatility of exchange rates over reserves are smaller for emerging countries than for the industrialized

Table 1

VOLATILITY OF EXCHANGE RATE AND INTEREST RATE BY TYPE OF EXCHANGE RATE REGIME

(Percentage)

	Probability that the monthly change in nominal exchange rate falls within:		*Probability that the monthly change in nominal interest rate falls within:*	
Type of regime	*+/- 1.0 band*	*+/- 2.5 band*	*+/- 0.25 (25 basis points)*	*+/- 0.50 (50 basis points)*
Floating	51.67	79.27	33.33	46.68
Managed floating	60.05	87.54	36.25	49.44
Limited flexibility	64.64	92.02	47.53	68.65
Fixed	83.05	95.88	52.33	69.30
United States	26.80	58.70	59.70	80.70
Japan	33.80	61.20	67.90	86.40

Source: Calvo and Reinhart (2000a).
Note: Average of countries by regime, excluding the United States and Japan, which are shown individually.

economies. Latin American countries display the lowest relative volatilities in the sample. Table 2 summarizes their results. There is no subdivision by exchange regimes, so one may only conclude that emerging markets (especially in Latin America) have revealed a preference to either formally peg their exchange rate or informally not to allow too much fluctuation.

Mussa et al. (2000) also analyse this fact, and find that developing countries with floating regimes have placed greater importance on the stability of their exchange rates than G-3 and other industrial economies. They conclude that developing countries with relatively flexible exchange rate regimes use both interest rate adjustment and official intervention to influence the exchange rate.

In summary, recent studies have shown that developing countries (with fixed or floating regimes) tend to allow a higher volatility of reserves and interest rates in exchange for a lower volatility on their exchange rates, at least compared with industrial economies. One important caveat is that these studies do not take into account the degree of capital mobility of the countries in the sample. The existence of capital controls may pose difficulties for the initial assumption that floating regimes should have lower interest rate volatility than fixed exchange regimes. In the last section of this paper, we try to incorporate this missing link in our empirical exercise.

Table 2

RELATIVE VOLATILITY OF EXCHANGE RATES BY GROUPS OF COUNTRIES

	Volatility of currency depreciation divided by volatility of	
	international reserves	*interest rate*
G-3	17.55	201.60
Other industrialized countries	5.07	38.42
Emerging countries	1.76	15.65
Other developing countries	0.82	11.06
Latin American emerging countries	1.12	9.74
East Asia	2.63	22.23
All countries	4.18	40.57

Source: Hausmann et al. (2000).

B. *Sensitivity of domestic interest rates to foreign interest rate shocks*

One of the advantages of a floating exchange rate regime over a fixed one is the use of the exchange rate as a buffer to external shocks. In principle, in a floating exchange rate regime monetary policy is more independent. The flexibility in the exchange rate allows the domestic interest rate to decouple from international interest rates, thus reducing externally driven business cycles. One should observe countries with floating regimes having domestic interest rates with a smaller degree of sensitivity to international interest rates than countries with fixed exchange regimes.

Frankel et al. (2000) attempt to identify the main empirical regularities regarding the sensitivity of domestic interest rates to international interest rates under different exchange rate regimes. They use a panel data set including both industrial and developing economies from 1970 to late 1990. They estimate a simple reduced-form specification having the domestic interest rate as the dependent variable and the following list of explanatory variables: the international interest rate (the US rate), a set of dummies controlling for crisis periods, transition times, and hyperinflation periods, the differential between domestic and foreign inflation rates, and a country-specific factor (fixed-effects). This specification is estimated separately for each one of the three currency regimes considered (fixed, intermediate and flexible, using the IMF *de jure* classification). The focus is on the coefficient of the foreign interest rate (the measure of sensitivity) and the average of the country-specific factors (the average level of the local interest rate after controlling for other factors). The results show that domestic interest rates are more sensitive to international rates and, on average, are lower under fixed regimes than under flexible ones. These findings are obtained controlling for the effects of other factors. When the sample is divided across income groups (developing and industrialized countries), the sensitivity of domestic interest rates to foreign rates seems to be higher in industrial than in developing economies. This last result is consistent with a more limited financial integration of developing countries; table 3 summarizes their results.

Using a sample of emerging market economies, Borensztein and Zettelmeyer (2000) also study the degree of monetary independence under different exchange rate regimes. They use VAR models to study the effect on domestic interest rates of changes in US monetary policy (changes in the US three-month T-bill rate and constructed US monetary shocks). Their results also indicate that interest rates are less sensitive to US interest rate shocks in countries under floating regimes than in those under fixed regimes.

Table 3

SENSITIVITY OF DOMESTIC TO FOREIGN INTEREST RATES BY EXCHANGE-RATE REGIME

	All countries	*Developing countries*	*Industrialized countries*
Fixed	0.70[a]	0.62[a]	1.06[a]
Intermediate	0.55[a]	0.42[a]	0.60[a]
Free-floating	0.48[a]	-0.02	0.73[a]

Source: Frankel et al. (2000).
a Significantly different from zero at the 5 per cent level.

In essence, these studies are consistent with the proposition that domestic interest rates are less sensitive to foreign interest rates in floating regimes. This finding needs to be reconciled with the results of the previous that show a lack of exchange rate flexibility and relatively high interest rate volatility. We leave the analysis and empirical exercise to the following sections.

C. *The effects of depreciations in emerging economies*

There is a long-standing debate in the literature on the real effects of devaluations (Krugman and Taylor, 1978). The revamped debate on the benefits of exchange flexibility again questions the standard prescription that depreciations are expansionary through their effect on net exports.

Calvo and Reinhart (2000b) analyse the effect of devaluations in extreme cases during currency crises. Since the exit of a peg is always accompanied by devaluation, they analyse the performance in terms of GDP of both emerging and developed countries around currency crises (table 4 shows the results).

Table 4

REAL GDP GROWTH BEFORE, DURING AND AFTER CURRENCY CRISES

(Per cent)

Country group	*Year before currency crisis (t-1)*	*Year of currency crisis (t)*	*Year after currency crisis (t+1)*	*Change in growth rate from (t-1) to (t+1)*
Emerging market countries	3.61	1.27	1.62	-1.99
Developed countries	1.73	1.49	1.58	-0.15
Difference	1.88[a]	-0.22	0.04	-1.84[a]

Source: Calvo and Reinhart (2000b).
Note: A total of 96 currency crises, of which 25 in developed economies and the remainder in emerging markets.
a Denotes significance at the 5 per cent level.

First, there is no evidence of the expansionary effects of devaluations even in developed economies and, second, the fall in GDP growth is higher in emerging countries than in developed ones.

Of course, it is possible that this contractionary effect is restricted to crisis cases and, even then, only in the short run. Notwithstanding, these results suggest that the costs of abandoning soft pegs could be substantial and that extreme regimes (hard pegs or floating exchange rates) could minimize these costs.

On the other hand, Rodrik (2000) argues that the role played by real depreciation in setting off economic transformation and longer-term growth has been underestimated. He mentions the cases of Chile (mid-1980s), Turkey (early 1980s), India (early 1980s and since 1994), Uganda (since 1986), and Mauritius (mid-1980s) as examples of the fact that a significant real exchange rate depreciation presages or accompanies a growth transition. According to Rodrik (2000: 8–9):

> There is every reason to think that these real depreciations were an important boost to economic activity, particularly in tradeables, and not simply something that went alongside higher growth. They unleashed entrepreneurial energies and focused them on world markets, boosted exports, and set the stage for economic transformations.

D. The recent experiences of Mexico and Brazil

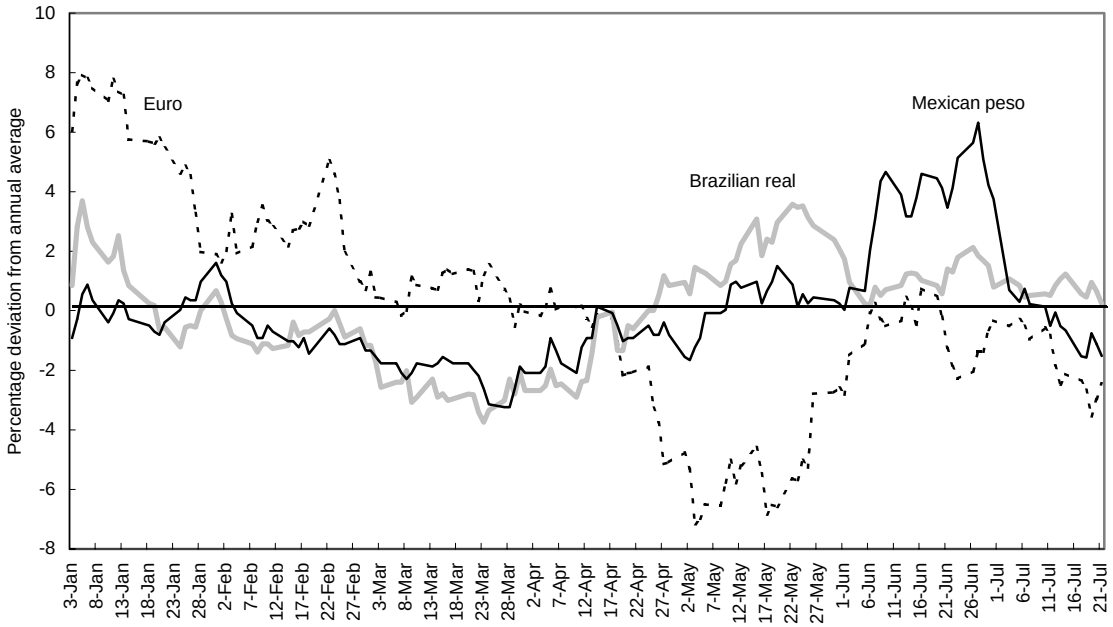
In evaluating the benefits of floating exchange regimes in Latin America it is useful to review the recent experiences of Mexico and Brazil. Both countries were forced to float their currencies after their respective exchange rate crisis (Mexico in 1994 and Brazil in 1999).

The first fact that deserves attention is the degree of flexibility of the exchange rate in these countries. The behaviour of the Brazilian real and Mexican peso seems to confirm the results encountered in section A above. For instance, during 2000 both currencies have floated, relative to the dollar, within an implicit band of approximately 4 per cent in each direction.[2] This is about one half of the dollar/euro rate fluctuation during the same period (figure 1). This fact is surprising, as one should expect emerging markets to suffer more pronounced shocks (either credibility or terms-of-trade shocks).

But, besides the low volatility of their exchange rates, what are the main features of these economies under floating regimes? In particular, did GDP growth recover and was inflation kept under control? We shall begin by reviewing in chronological order the case of Mexico, and then proceed with the Brazilian experience.

Figure 1

MEXICO AND BRAZIL: NOMINAL EXCHANGE RATE VOLATILITY, 2000



In Mexico, the adoption of a floating exchange rate was the only option available to the authorities, given the situation of low international reserves and enormous uncertainty in financial markets. In the aftermath of the crisis, the Mexican economy faced a recession and a rise in inflation, in line with the stylized facts presented in section C above. Surprisingly, given the past track record of Mexico and notwithstanding the devaluation, the inflation process was maintained under control and GDP returned to its growth path in 1996. Figure 2 shows the evolution of both the inflation rate and GDP growth. The recovery began one year after the crisis, with the inflation rate returning to its pre-crisis level and GDP growing strongly, faster than during the pre-crisis period (Carstens and Werner, 1999). The rapid recovery of GDP in Mexico was due basically to the strong response of exports to the devaluation. Exports grew by 30.6 per cent in 1995 and by 18.7 per cent in 1996, consolidating a growth process started in the earlier 1990s. Mexican exports answer for almost one third of GDP (Bank of Mexico, 1996).

With the monetary policy focused on attaining price stability, the fiscal policy played a crucial role on facilitating the recovery of the Mexican economy by absorbing some of the costs of the banking sector rescue package. In the words of Carstens and Werner (1999: 11):

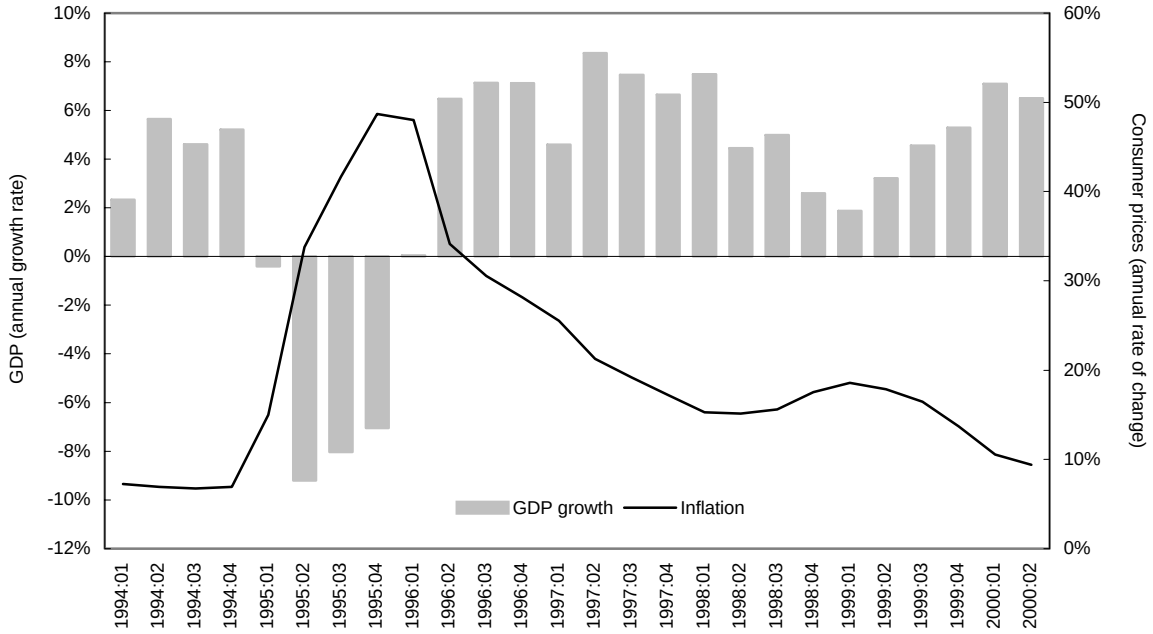
> It should be highlighted that the fiscal authority, by recognizing the fiscal costs of the banking sector restructuring and by showing its commitment to deal with this problem with fiscal resources, liberated monetary policy to pursue its primary goal of price stability. Thus, at this point it was clear that monetary policy would not face the dilemma of trying to comply with conflicting objectives and that it would concentrate in lowering inflation, becoming the required nominal anchor under a floating exchange rate regime.

The banking-sector rescue package implemented by the Mexican government was very important in mitigating the negative effects of the devaluation on the balance sheets of both banks and firms.

In Brazil, the adoption of the floating exchange rate was also a consequence of the crisis. In January 1999 a significant initial depreciation[3] and the country's history of inflation created a panic situation,

Figure 2

MEXICO: GDP GROWTH AND INFLATION, 1994–2000



with annual inflation expectations ranging from 30 per cent to 80 per cent and forecasts for GDP growth ranging from -3 per cent to -6 per cent for 1999 (Fraga, 1999).

After two months of much uncertainty concerning the direction to be given to the monetary policy, Brazil adopted an inflation-targeting framework in March 1999. The new Board announced that their goal was to bring inflation down to a single-digit annualized rate by the last quarter of 1999, and that they would have the full inflation-target system in place by the end of June. Fraga (1999: 150) argues that "the year-end target served as a temporary anchor, which contributed to the overall effort to contain the panic".

The negative expectations regarding GDP and inflation did not materialize. After suffering a mild recession, the Brazilian economy initiated a recovery; the inflation rate was kept under control. Figure 3 below shows the evolution of both the inflation rate and GDP growth.

The experiences of Mexico and Brazil seem not to support the evidence that the effect of devaluation is contractionary, at least in the medium and long run, and they are consistent with the argument of Rodrik (2000) mentioned above. In Brazil, even the short-run contractionary effect was mild and occurred before the crisis, during the defence of the previous exchange regime. Table 5 shows Brazil's macroeconomic performance. During the crisis year its macroeconomic performance was better than expected. Inflation did not explode, GDP did not collapse, the government was not forced to restructure its public debt, and slowly both nominal and real interest rates have been going down. Why were the consequences of the crisis in Brazil so mild?

The better-than-expected performance is partly due to the fact that the private sector was largely hedged at the moment of the crisis and was insulated from the immediate effects of the devaluation. The private sector hedged its dollar liabilities by purchasing dollar-denominated securities and dollars in the future markets, all provided by the government in its attempt to keep the peg. In fact, the government bore most of the costs of the devaluation in the form of an increase in its public debt by around 10 per cent of GDP. Since debts have eventually to be paid, or at least not allowed to explode, the better-than-expected

Figure 3

BRAZIL: GDP GROWTH AND INFLATION, 1996–2000

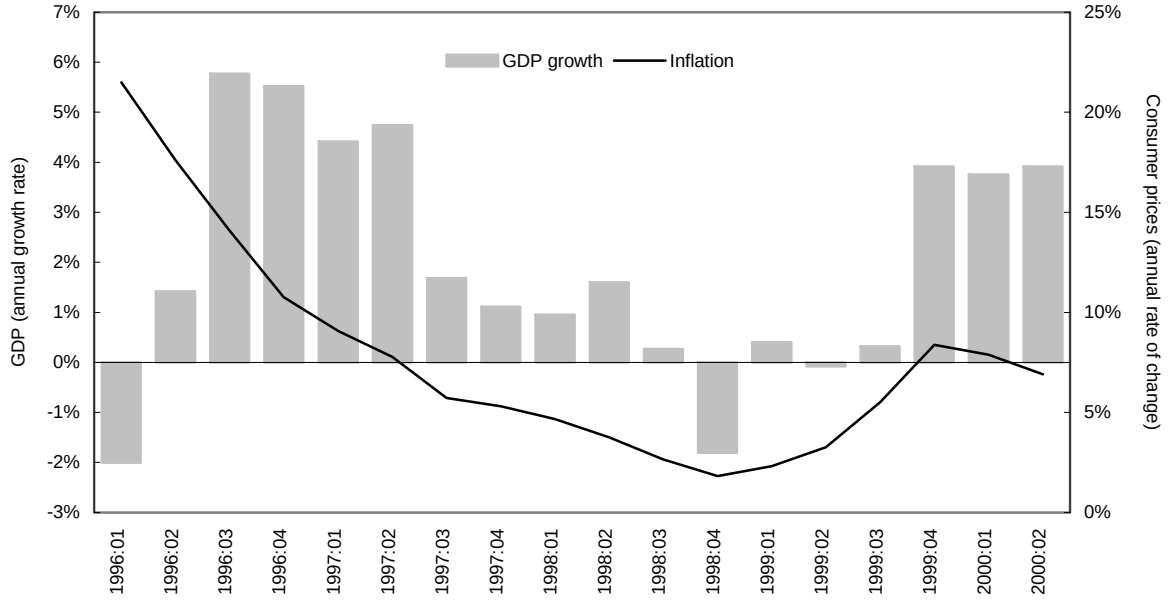


Table 5

BRAZIL: MAJOR MACROECONOMIC INDICATORS

(Per cent)

	1995	*1996*	*1997*	*1998*	*1999*	*2000[a]*
GDP *(per cent change over previous year)*	4.22	2.66	3.60	-0.12	0.82	4.00
Current account deficit *(per cent of GDP)*	2.55	2.98	3.85	4.34	4.39	3.50
Primary fiscal deficit *(per cent of GDP)*	-0.35	0.09	1.00	-0.02	-3.13	-3.20
Nominal fiscal deficit *(per cent of GDP)*	7.05	5.87	6.67	8.65	10.01	4.50
Consumer price index (IPCA) *(per cent change over previous year)*	22.41	9.56	5.22	1.66	8.94	6.30
Rate of unemployment *(average)*	4.64	5.42	5.66	7.60	7.55	7.00
Real interest rate *(accumulated)*	25.50	16.80	19.60	25.80	15.80	...
Nominal interest rates *(accumulated)*	53.08	27.41	24.78	28.92	25.54	...

Source: According to calculations of the Central Bank of Brazil and the Brazilian Institute of Geography and Statistics.
a Forecast.

performance has to be judged against the feasibility of generating current and future fiscal surpluses in a country where sustained growth is long overdue and fiscal consolidation a novelty (Goldfajn, 2000).

Brazil's better-than-expected macroeconomic performance has been achieved owing also partly to a more responsible fiscal policy. Previously Brazil had inflated its way out of past fiscal inconsistencies by using inflation as the means to finance deficits that otherwise could not be financed. The consequences were dear, as inflation reached more than 1000 per cent, growth stalled, and income distribution deteriorated substantially. This time Brazil has fulfilled the IMF-agreed target, as shown in table 6. Figure 4 shows that this effort could be successful in stabilizing the debt to GDP ratio, if sustained.

In contrast to the general expectation, inflation was extremely moderate in 1999, notwithstanding the large nominal depreciation that followed the floating of the exchange rate. The consumer price index (IPCA) increased only 9 per cent in 1999 and a 6 per cent inflation is expected in 2000. Of course, the exchange rate depreciation has a greater effect on wholesale prices, but even the general price index (IGP) did not exceed 20 per cent in 1999. The reasons for such a low pass-through of the exchange rate depreciation to inflation are related to: (i) a depressed level of demand after the crisis that discouraged the pass-through; (ii) a previous overvaluation of the exchange rate that was corrected by the nominal devaluation; and (iii) a low initial inflation at the end of 1998 (Goldfajn and Werlang, 2000).

The limited pass-through of depreciation to inflation during the crisis could, therefore, be justified by a combination of favourable factors (overvaluation, low demand and initial inflation). These factors do not reproduce themselves in general, which explains the relatively high pass-through in non-crisis periods.

It is useful to summarize the stylized facts give in this section. First, the results seem to indicate that developing countries prefer to allow a higher vola-

Table 6

BRAZIL: PRIMARY ACCUMULATED DEFICIT

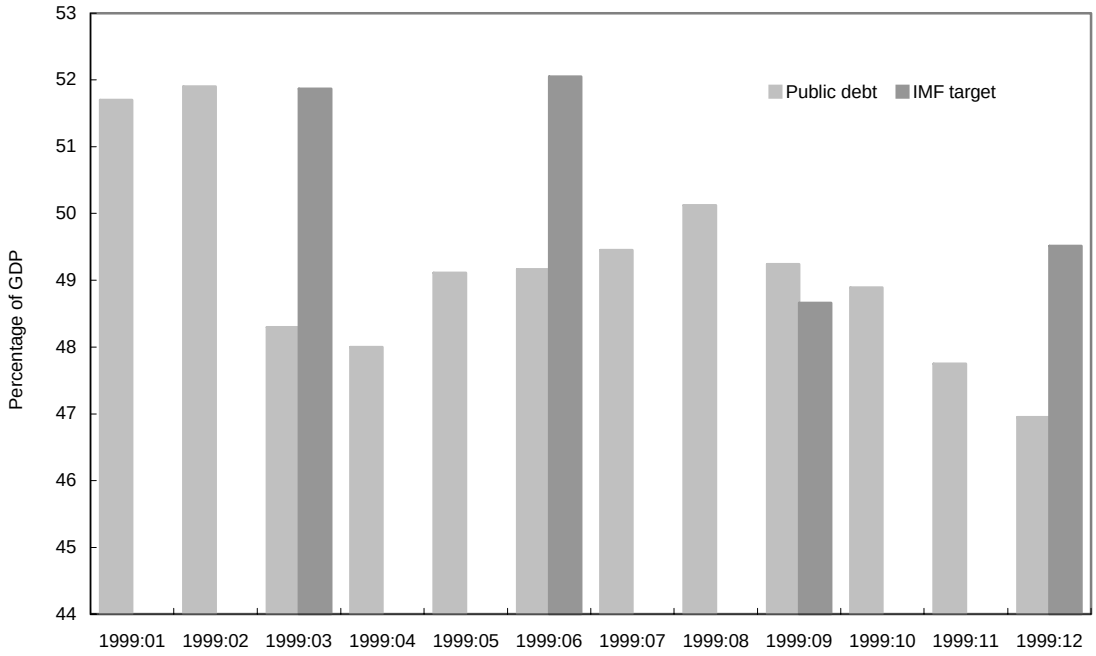
(Millions of Brazilian reais)

	Observed				*IMF targets*
	Federal Government and Central Bank	*Municipal and State Governments*	*Public enterprises*	*Total*	*Total*
1998					
Total	4.845	-1.562	-3.170	113	
1999					
January	2.155	304	78	2.537	
February	3.931	454	709	5.094	
March	7.315	902	1.478	9.694	
April	8.564	1.484	743	10.791	
May	8.622	1.839	1.266	11.726	
June	12.536	1.978	961	15.475	12.883
July	16.267	2.050	2.107	20.424	15.626
August	19.264	1.798	4.110	25.172	20.590
September	22.868	2.652	5.054	30.574	23.788
October	23.643	3.064	5.335	32.042	26.078
November	24.018	3.721	5.159	32.899	27.763
December	22.676	2.118	6.317	31.112	20.185

Source: Central Bank of Brazil.

Figure 4

BRAZIL: TOTAL NET DEBT, 1999



Source: Central Bank of Brazil.

tility of reserves and interest rates in exchange for a lower volatility on their exchange rates, at least compared with industrial economies. Second, the sensitivity of domestic interest rates to international interest rates is higher under fixed exchange regimes than under floating ones. Finally, devaluations seem to be more contractionary in developing countries. But this effect is limited to currency crisis periods and to the very short run. The Brazilian and Mexican cases support the notion that devaluations may be expansionary in the medium run without inflationary consequences, provided credible monetary and fiscal policies are adopted.

III. Explaining the stylized facts

In this section we analyse and expand upon the explanations of the stylized facts discussed in the previous section. We first introduce a formal and simple framework of monetary policy decisions in a world where firms face balance sheet effects and the economy a high pass-through from depreciation to inflation. Then we begin by analysing the existence of currency mismatches and the consequences to monetary policy management of having significant amounts of foreign-currency denominated debt. Next we introduce and discuss the arguments related to the "fear of inflation" of many developing countries. Finally, we argue that in some cases the best policy choice can be a mix of both interest rate and exchange rate adjustments, and we investigate the effects of capital mobility on this choice.

A. A simple model

It would be helpful to discuss the different explanations of the existing stylized facts, using a very simple model in the lines of that proposed by Hausmann et al. (2000).

The economy is described by three equations in a two-period model: Price setting, interest rate parity and the determination of product Y. Policy makers minimize inflation and output fluctuations, using the only instrument they have available, domestic interest rate.

Prices display a high degree of stickiness and are a function of changes in the exchange rate in the previous period. The price formation rule is the following, with γ representing the degree of pass-through:

$$P_t = P_{t-1}\left[1+\gamma\left(\frac{e_{t-1}-e_{t-2}}{e_{t-2}}\right)\right] \qquad (1)$$

The link between exchange rates and interest rates is obtained through the traditional uncovered interest parity condition, with ε_t representing a nominal shock.

$$1 + i_t = (1 + i^*)\frac{E(e_{t+1})}{e_t} + \varepsilon_t \qquad (2)$$

Policy makers choose i_t restricted to the equation (2) above, which is implicitly a decision regarding e_t.

The product Y_t is determined using a linear technology, with capital being the only factor. Capital is the sum of net wealth plus debt. Entrepreneurs can only borrow an amount μW_t proportional to their net wealth, with $\mu = \mu(i_{t-1})$. The model assumes also that firms must contract a fraction κ of their debt in foreign currency. The term ξ_t represents a real shock on the productivity of capital.

$$Y_t = (\sigma_t - \xi_t)(1 + \mu(i_{t-1}))\, W_t = S(i_{t-1})\, W_t \qquad (3)$$

Current wealth is equal to the real value of profits in the previous period.

$$W_{t+1} = Y_t - D_t\left[(1+i_{t-1})(1-\kappa)+(1+i^*)\kappa\frac{e_t}{e_{t-1}}\right] \qquad (4)$$

By setting $S(i_{t-1}) = (\sigma - \xi_t)(1 + \mu(i_{t-1}))$, with $S'(i_{t-1}) < 0$ and $S''(i_{t-1}) > 0$ we can write:

$$Y_t = S(i_{t-1})\left[Y_{t-1} - D_{t-1}\left[(1+i_{t-2})(1-\kappa)+(1+i^*)\kappa\frac{e_{t-1}}{e_{t-2}}\right]\right] \qquad (5)$$

The timing is as follows: at the beginning of period t, prices $P_1 = P_0 = e_0 = 1$ are preset and firms invest. Domestic debts are contracted at the domestic rate i_0 (because this is the best forecast of i_1) and foreign currency debt is contracted at the foreign interest rate i^*. After investment decisions are made and debt contracts are signed, an unanticipated shock occurs. This shock can be either real (ξ), nominal (ε), or a combination of both. After the shock is realized, the monetary authority implements an adjustment by setting the interest rate i_1 and the market responds by setting the exchange rate e_1.

The monetary authority determines the interest rate (or the exchange rate, according to equation 2) by minimizing the following loss function, where π_t is the inflation rate at period t and Y^c a target income:

$$L_t = \frac{\theta}{2}\pi_t^2 + \frac{\lambda}{2}\left(Y_t - Y^c\right)^2 \qquad (6)$$

Formally, the monetary authority has to solve the following problem:

$$\underset{e_1}{\text{Min}}\, L_2 = \underset{e_1}{\text{Min}}\left\{\frac{\theta}{2}\pi_2^2 + \frac{\lambda}{2}\left(Y_2 - Y^c\right)^2\right\} \qquad (7)$$

In the absence of shocks, equation 6 would be minimized by setting $i_t = i^*$ and $e_t = e_{t-1}$. Observe that we have set the minimization problem in terms of the exchange rate. Equation 2 implies that the two instruments are equivalent.

The first order condition of the minimization problem is:

$$\frac{\partial L_2}{\partial e_1} = \theta\pi_2\frac{\partial \pi_2}{\partial e_1} + \lambda\left(Y_2 - Y^c\right)\frac{\partial Y_2}{\partial e_1} = 0 \qquad (8)$$

Using equations 1, 2 and 5, it is possible to write equation 8 as a function of the main parameters of the model: the degree of pass-through (γ), the degree of liability dollarization (κ), and the magnitude of the shocks:

$$\frac{\partial L_2}{\partial e_1} = \theta\pi_2\gamma + \lambda\left(Y_2 - Y^c\right)\left(1+i^*\right)\left[\frac{\partial S_2}{\partial i_1}\frac{\gamma-1}{e_1^2}\frac{Y_2}{S_2-\xi_1} - \kappa D_1(S_2-\xi_1)\right] = 0 \qquad (9)$$

The first term of equation 9 represents the effect of devaluation on prices, and the second term represents the net effect of devaluation on output. This second term captures two different and opposite effects: the credit effect (expansionary) and the

balance sheet effect (contractionary). The net effect on output will depend on which effect is stronger.

The model is consistent with the stylized facts observed in the previous section. The low volatility of the exchange rate could be justified by a large balance sheet effect or a high pass-through term (see third and first effects in equation 9, respectively). We shall first concentrate below on the balance sheet effects, and then analyse the high pass-through effect.

B. Currency mismatches and the fear of floating

Calvo and Reinhart (2000a) argue that the reason one observes relatively low exchange rate fluctuation in developing countries is the "fear of floating" that occurs because governments apprehend the harmful effects of such fluctuation on domestic banks and corporate balance sheets with large foreign exchange denominated liabilities. In this situation, allowing large fluctuations in the exchange rate could be extremely harmful not just for these exposed agents, as for the entire domestic financial system, since abrupt depreciations could generate a situation of generalized insolvency. The Asian crisis was a case in point. Large depreciations led to insolvency that worsened the crises and weakened the financial systems (Radelet and Sachs, 1998a and 1998b).

The "fear of floating" explanation raises an important question. Why do developing countries find themselves with such a large currency mismatch that makes it virtually impossible to float their exchange rate?

It is important to note that the lack of exchange rate fluctuation reinforces itself. The absence of fluctuation provides incentives to keep assets and liabilities mismatched. Velasco (2000) and Mussa et al. (2000) stress this point. They argue that the insistence of fixing the exchange rate – accompanied by announcements that the exchange rates would never be changed – discourages prudent hedging.

In principle, this vicious circle could be broken if more exchange rate fluctuation were allowed. If there is a high probability of devaluation, in principle, domestic agents would have an incentive to hedge their position. But this has not been the case in several emerging markets, as Krugman (1999) explains:

> To a trained economist this view immediately sounds fishy: if there is a risk of future devaluation, why are domestic borrowers so willing to take on foreign-currency debt. But maybe there is some exchange rate illusion involved; certainly it is true that countries with quasi-fixed rates have tended to have more dollar debt than those without.

The recent literature has tried to explain why agents take unhedged positions. Most authors argue that both moral hazard (implicit guarantees) and underinsurance problems (Krugman, 1999; Mishkin, 1999; Bachetta, 2000; Caballero and Krishnamurthy, 2000; Burnside et al., 2000) induce economic agents in some emerging economies (especially in those with some type of pegged regimes) to have higher levels of foreign-currency-denominated debt. In particular, financial institutions – whose liabilities are perceived as having an implicit government guarantee – have provided credit in dollars to individuals and firms whose revenues are not linked to (or denominated in) dollars. Financial institutions either do not want to (Burnside et al., 2000) or cannot (Eichengreen and Hausmann, 1999) hedge their exchange rate risk.

Independent of the reason behind the existence of unhedged positions, the existence of foreign-currency-denominated debt imposes restrictions on the power of monetary policy, even in floating exchange regimes. Recent works (Krugman, 1999; Aghion et al., 2000; Bachetta, 2000) have stressed the role of foreign currency debt (the so-called "balance sheet" effect) as a binding constraint to monetary policy. The two main conclusions of this literature are, first, that an economy with a large proportion of foreign currency debt has a higher probability of self-fulfilling crisis and, second, that in such an economy monetary policy can be ineffective independently of the exchange rate regime. If investment depends on the balance sheets of firms (because firms face limits on their leverage) and there is substantial debt denominated in foreign currency, a loss of confidence by foreign investors can be self-justifying. Capital flight leads to a plunge in the currency that ruins the balance sheets and leads to a collapse in domestic investment. In addition, the normal response to recession becomes ineffective, even counter-productive, because loose money would reinforce the currency depreciation, and thereby worsen the balance sheet of firms.

The absence of exchange rate flexibility also has a more severe consequence. With high capital mobility, developing countries face the so-called "sudden stop" problem. An adverse external or do-

Table 7

THE PROBABILITY OF DOWNGRADES IN CREDIT RATING FOLLOWING CRISES – MOODY'S SOVEREIGN CREDIT RATINGS, 1979–1999

Country group	*A downgrade in 6 months following the crisis*	*A downgrade in 12 months following the crisis*	*More than one downgrade in the 12 months following the crisis*
Emerging market countries	20.0	26.7	6.7
Developed countries	10.0	10.0	0.0
Difference	10.0*a*	16.7*a*	6.7*b*

Source: Calvo and Reinhart (2000b).
a Denotes that the difference is significant at the 10 per cent level.
b Denotes a significant difference at the 5 per cent level.

mestic shock (for instance, a banking crisis) could mean the loss of access to international capital markets. Since emerging economies do not allow the exchange rate to float to minimize the crisis, the adjustment to an abrupt reversal of capital flows would require a large fall in the level of activity. Calvo and Reinhart (2000b) present evidence that emerging economies suffer more restrictions on their access to international markets and require larger adjustments in their current accounts than do developed economies. Table 7 shows that downgrades in sovereign ratings during currency crisis are more frequent in emerging economies than in developed ones. Table 8 shows the differences in current account adjustments between emerging and developed countries.

In summary, the existence of large currency mismatches could explain the revealed preference of emerging markets for lower exchange rate flexibility. However, two important caveats exist. First, in principle, if the large unhedged positions are motivated by implicit guarantees, policy makers could change the perverse incentives they provide. In particular, if high capital mobility leads to large, costly, current account adjustments, there are incentives to use the exchange rate as an additional instrument to buffer shocks. Second, one wonders why it is that countries with relatively low currency mismatch (such as Brazil) have the same degree of exchange flexibility as more exposed economies. In the next section we investigate alternative explanations.

Table 8

CURRENT ACCOUNT ADJUSTMENTS BEFORE, DURING AND AFTER CURRENCY CRISES

(Current account deficit as a percentage of GDP)

Country group	*Year before currency crisis (t-1)*	*Year of currency crisis (t)*	*Year after currency crisis (t+1)*	*Change in growth rate from (t-1) to (t+1)*
Emerging market countries	-4.46	-3.97	-1.39	3.47
Developed countries	-2.84	-3.06	-2.10	0.74
Difference	-1.62	-0.91	0.71	2.73*a*

Source: Calvo and Reinhart (2000b).
Note: A total of 96 currency crises, of which 25 are in developed economies and the remainder in emerging markets.
a Denotes a significant difference at the 5 per cent level.

C. *Fear of inflation and credibility*

Another explanation of the stylized facts we have presented in section II is the existence of a large pass-through from depreciation to prices. If developing countries present higher pass-through than industrial countries, for example due to their poor past record of inflation, one could justify their preference for lower exchange rate volatility because it minimizes inflation volatility (first term of equation 9). We call this the "fear of inflation".

Goldfajn and Werlang (2000) note that there is a higher degree of pass-through in emerging countries. They perform a panel data study using a sample of 71 countries for the period 1980–1998, and find that the main determinants of the extent of inflationary pass-through are the cyclical component of output, the extent of initial overvaluation of the real exchange rate, the initial rate of inflation, and the degree of openness of the economy. The study also finds that the pass-through coefficient in the American region is the highest; that Europe, Africa and Oceania have a substantially lower pass-through than Asia and America; and that the pass-through is substantially lower in OECD countries relative to emerging market economies (tables 9 and 10). In other words, prices in emerging economies are more sensitive to depreciations.

The high pass-through in emerging economies has important implications for policy-making. It is a stylized fact that in the aftermath of currency crises several economies have seen their exchange rates depreciate beyond what could be justified by fundamentals. When a depreciation occurs, there are two ways to reverse it: through nominal currency appreciation or through higher inflation at home than abroad (or a combination of the two). The existence of a high pass-through can serve to justify the preference for the former and, in this case, the best response would be the adoption of a tight monetary policy; such a policy, as documented by Goldfajn and Gupta (1999), increases the probability of the

Table 9

PASS-THROUGH COEFFICIENTS BY REGIONS, 1980–1998

Months	*Total*	*Europe*	*Africa*	*America*	*Oceania*	*Asia*
1	0.012	0.018	0.018	0.013	0.002	0.093
3	0.169	0.116	0.159	0.199	0.051	0.166
6	0.426	0.211	0.343	0.539	0.092	0.367
12	0.732	0.360	0.643	0.692	0.158	0.712
18	0.701	0.460	0.520	1.240	0.193	0.841

Source: Goldfajn and Werlang (2000).

Table 10

PASS-THROUGH COEFFICIENTS BY TYPE OF COUNTRY, 1980–1998

Months	*Developed countries*	*Emerging market countries*	*Other developing countries*	*OECD countries*	*Non-OECD countries*
6	0.245	0.394	0.340	0.113	0.471
12	0.605	0.912	0.506	0.188	0.754

Source: Goldfajn and Werlang (2000).

reversal occurring primarily through nominal appreciation rather than through higher inflation.

The recent experiences of Brazil, Mexico and Chile support the pass-through explanation. These countries have adopted (formally or not) an inflation-targeting framework to substitute the exchange rate in the role of nominal anchor. The combination of high pass-through with inflation targets calls for reduced fluctuations in the exchange rates. As long as targets have been set, the depreciation will be limited by the degree of pass-through and by the inflation rate's distance from the target level. For instance, in an economy with a 20 per cent pass-through, a 5 per cent permanent depreciation would raise inflation by 1 per cent in 12 months, while a 10 per cent depreciation would lead to a 2 per cent increase. It could happen that the inflation forecast is 1 per cent below the target level, but not 2 per cent. If there is a high probability of surpassing the inflation target, the central bank has to intervene either by raising the interest rate, or via direct or indirect intervention on the exchange market.

In sum, the higher pass-through in developing countries could also explain their lower volatility of the exchange rate. This effect is compounded if one takes into consideration that several developing country governments are still in a confidence-building process, trying to gain credibility for their monetary policy and inflation targets. In the absence of a long track record of stable macroeconomic policies that can anchor expectations, exchange rate volatility has an additional risk of destabilizing expectations. In this environment, policy makers will further avoid exchange rate fluctuation.

D. The optimal combination of instruments

Calvo and Reinhart (2000a and 2000b) and Hausmann et al. (1999) argue that the low volatility of the exchange rate in countries with declared floating regimes reveals the preference of these countries for less flexible exchange regimes. However, in their analysis (and also in the model presented above) there is no account for the use of international reserves as an additional adjustment variable. If reserve volatility is excluded as a possibility, the move towards floating regimes should imply that a reduction in the volatility of interest rates can only be obtained through an increase in the volatility of the exchange rate – a fact that is not observed in the data. However, the move towards floating regimes also implies the abandonment of the use of international reserves. Thus, we should assume that when moving from a fixed to a floating regime, a country changes its adjustment variables from international reserves and interest rates to the nominal exchange rate and interest rates. It is therefore not obvious that interest rate volatility should decline when a country adopts a floating exchange rate regime (both may increase to compensate for the loss of reserves as an instrument).

Another interpretation of the reduced volatility of the exchange rate is that it reveals the preference of these countries for a floating exchange rate regime that does not imply a policy of benign neglect vis-à-vis the exchange rate. For emerging market countries, that are generally quite open to international trade as well as to global finance, movements in exchange rates have important economic consequences (insolvencies, inflation, etc.), and it is often appropriate for economic policies, including monetary policies and official exchange market intervention, to take account of, and react to, exchange rate developments (Mussa et al., 2000). Consistent with this interpretation, Ball (2000), claims that monetary policy rules in open economies must give a role to the exchange rate.

In fact, the optimal response of the policy maker in the simplified model presented above is a mix between interest rate and exchange rate adjustments (see equation 9). Consider, for instance, the case of a shock that would lead to depreciation in the absence of interest changes. This depreciation has a cost both in terms of balance sheet effects as well as in terms of inflation. The monetary authority has an incentive to use the interest rate to carry out the adjustment. Thus, the optimal policy in this case would be to allow some depreciation but to increase the interest rate too.

Williamson (1998) defends this type of hybrid regime, arguing that the most prudent choice under current conditions of high capital mobility is a system of limited flexibility in the form of a "crawling band" or possibly a "monitoring band".[4] Rodrik (2000) also defends intermediate regimes by claiming that it is wrong to focus the debate on exchange rate policy on the pros and cons of currency board/dollarization versus floating regimes, since the evidence shows that neither corner solution works very well for developing countries for long periods of time. He adds that countries with successful experiences in terms of economic performance in the post-war period had intermediate exchange rate regimes.

Here it is worth mentioning briefly the possibility of a non-rational (or non-optimal) fear of floating behaviour. The fact that governments respond in one way or another to external shocks is no guarantee that they are actually behaving optimally. It could be, for example, that the fear of floating is simply not fully rational where governments could improve their monetary and exchange rate policies performance by allowing more fluctuation on their exchange rate.

IV. The effects of high capital mobility

A relevant issue is whether greater integration affects the choice of exchange regime. Here is a partial list of the effects:

- ***High capital mobility makes exchange rate pegs less sustainable and more costly.*** Sudden large outflows in a world of high capital mobility make the defence of exchange rate pegs extremely difficult. Few countries can avert a large, consistent, speculative attack. The collapse of the exchange rate regimes generates big declines in output for two reasons. First, large unhedged positions of financial institutions and corporations could generate a situation of generalized insolvency in the aftermath of the crisis. Second, large outflows of capital require abrupt reversals of current accounts, that are only possible in the short run with large declines in activity.
- ***Greater global integration increases the risks of pure floating regimes.*** High integration with capital markets holds the risk of eventual large capital outflows. These may induce exchange rate depreciations that, in the absence of a long track record of stable macroeconomic policies that can anchor expectations, may destabilize expectations and induce exchange rate overshooting. In addition, greater integration in goods and services increases the degree of pass-through, and closely links exchange rate fluctuations with undesirable inflation volatility. Both risks would induce a preference for lower exchange rate fluctuation.
- ***Developing countries with open markets face an unpleasant trade-off regarding the optimal degree of fluctuation.*** On one hand, large fluctuations have the risks of generating exchange rate overshooting and higher rates of inflation. On the other hand, excessively managed currencies may induce the same perverse effects of fixed exchange regimes: inviting speculation, inducing private agents to take unhedged positions, and giving up an important stabilizing instrument. It should be noted that high capital mobility also places restrictions on how to actually modify the degree of exchange rate fluctuation. Direct sterilized intervention on the foreign exchange market may not work in very open capital markets, thereby forcing governments to react through interest rates if they desire to stabilize the currency.

Given the limits that high capital mobility imposes on both fixed and floating regimes, the actual mix of exchange rate volatility versus interest rate volatility is therefore an empirical question. In the remainder of this section we shall perform an empirical exercise, expanding on the analysis of Frankel et al. (2000) by explicitly incorporating variables that measure capital mobility.

The emphasis is on the responsiveness of domestic interest rates to international interest rates and how they depend on capital controls. One presumes that the existence of capital controls could isolate domestic interest rates from movements in international rates, diminishing the effects of the latter on the former. We test this point by estimating the following panel regression, using quarterly data in the period 1990–1999 for a sample of 46 countries (19 industrial and 27 developing, listed in the Appendix).

$$r_{i,t} = f_t + ß_1 r_t^* + ß_2 KC_{i,t} + ß_3 (r_t^* KC_{i,t}) + ß_4 X_{i,t} + \varepsilon_{i,t} \quad (10)$$

Where $r_{i,t}$ is the domestic nominal interest rate in the local currency of country i at time t, f_t is a country-specific fixed effect, r_t^* is the international interest rate, $X_{i,t}$ is the inflation differential, and KC is a capital control dummy variable (equal to 1 if the country has some type of capital controls). As in Frankel et al. (2000), we expect the coefficient $ß_1$ to be positive, reflecting some sensitivity of the domestic interest rate to the international interest rate. The coefficients $ß_2$ and $ß_3$ capture the effect of capital controls on the level of the domestic interest rate and on its responsiveness to the international interest rate, respectively. We expect $ß_2$ to be positive and $ß_3$ to be negative, i.e. capital controls increase the level of the domestic interest rate but reduce its sensitivity to international interest rates.

The results are shown in table 11. As expected, domestic interest rates are sensitive to international interest rates, in particular in fixed exchange regimes.

Table 11

RESPONSIVENESS OF DOMESTIC TO UNITED STATES INTEREST RATE BY EXCHANGE RATE REGIME

	US interest rate	*K control*	*US interest rate x K control*	*Inflation differential*	*R-squared*	*Number of countries*	*Number of observations*
Complete sample	0.35 (0.12)[a]	0.04 (0.02)[a]	-0.14 (0.27)	1.44 (0.19)[a]	0.85	40	1245
Fixed regimes	1.10 (0.32)[a]	0.20 (0.12)	-3.21 (3.29)	0.10 (0.15)	0.78	34	68
Intermediate regimes	0.16 (0.15)	0.05 (0.02)[a]	-0.09 (0.36)	1.26 (0.28)[a]	0.88	40	771
Free-floating regimes	0.53 (0.20)[a]	0.01 (0.03)	-0.45 (0.48)	1.82 (0.18)[a]	0.82	40	406

Note: All the regressions contain country fixed effects which are not reported to save space. White heteroskedasticity-consistent standard errors are in parentheses.

a The estimate is statistically different from 0 at the 5 per cent significant level.

Inflation differential affects domestic interest rates significantly, in particular in more flexible regimes. These results are in line with previous studies described in section II. The inclusion of the capital control variable introduces interesting results. Capital controls tend to increase the average domestic interest rate, in particular in intermediate exchange regimes. Also, capital controls reduce the sensitivity of domestic interest rates to international interest rates, as shown by the negative sign on the $ß_3$ coefficient, albeit not significant.

An additional and relevant test is to verify if the quality of a country's external finance is relevant in determining the degree of monetary independence. Policy makers may allow greater exchange rate flexibility (and lower interest rate sensitivity) if a higher proportion of the current account deficit is financed by foreign direct investment (FDI).[5] In order to capture this effect, we estimate a simple reduced form of the type:

$$r_{i,t} = f_t + ß_1 r^*_t + ß_2 BP_{i,t} + ß_3 (r^*_t BP_{i,t}) + ß_4 X_{i,t} + \varepsilon_{i,t} \quad (11)$$

The variable BP represents the FDI as a proportion of the current account.[6] According to our hypothesis, the coefficient $ß_3$ should be negative. We estimate equation 11 for two subsamples: countries with and without capital controls, according the classification used in Alesina et al. (1993).

Table 12 shows the results of the estimation for countries with capital controls, and table 13 shows the equivalent estimation for countries without capital controls.[7] Interestingly, in the whole sample, the domestic interest rate is affected significantly by international interest rates only when there are no capital controls. When capital controls are in place, the coefficient is small and insignificant. The results on the FDI variable are also relevant. A better current account financing reduces the impact of international interest rates in both subsamples. However, the effect is only significant in intermediate regimes that do not have capital controls. In other words, countries that open their capital accounts and cannot (or would not) allow complete free floating of their exchange rates require a more stable external financing to reduce the impact of international interest rates on the domestic economy.

In sum, this section provides evidence that the decision on the optimal use of the exchange rate to buffer external shocks depends crucially (i) on the degree of integration with capital markets, and (ii) on the quality of external financing. Countries with more open capital accounts and less stable external financing seem to face difficulties in using the exchange rate to weather external shocks.

Table 12

RESPONSIVENESS OF DOMESTIC TO UNITED STATES INTEREST RATE IN COUNTRIES WITH CAPITAL CONTROLS

	US interest rate	*BP*[a]	*US interest rate x BP*	*Inflation differential*	*R-squared*	*Number of countries*	*Number of observations*
Complete sample	0.15	0.00	-0.05	1.21	0.94	40	223
	(0.33)	(0.00)	(0.03)	(0.46)[b]			
Intermediate regimes	-0.00	0.01	-0.18	1.18	0.93	39	148
	(0.38)	(0.01)	(0.12)	(0.50)[b]			
Free-floating regimes	1.57	-0.00	0.05	1.36	0.88	36	75
	(0.35)[b]	(0.00)	(0.04)	(0.36)[b]			

Note: All the regressions contain country fixed effects which are not reported to save space. White heteroskedasticity-consistent stardard errors are in parentheses.

a FDI as a proportion of the current account.

b The estimate is statistically different from 0 at the 5 per cent significant level.

Table 13

RESPONSIVENESS OF DOMESTIC TO UNITED STATES INTEREST RATE IN COUNTRIES WITHOUT CAPITAL CONTROLS

	US interest rate	*BP*[a]	*US interest rate x BP*	*Inflation differential*	*R-squared*	*Number of countries*	*Number of observations*
Complete sample	0.45	0.00	-0.01	1.07	0.20	40	481
	(0.13)[b]	(0.00)	(0.01)	(0.20)[b]			
Intermediate regimes	0.05	0.00	-0.05	1.17	0.21	40	260
	(0.19)	(0.00)[b]	(0.02)[b]	(0.38)[b]			
Free-floating regimes	0.91	-0.00	0.00	0.59	0.37	40	193
	(0.18)[b]	(0.00)	(0.01)	(0.30)[b]			

Note: All the regressions contain country fixed effects which are not reported to save space. White heteroskedasticity-consistent stardard errors are in parentheses.

a FDI as a proportion of the current account.

b The estimate is statistically different from 0 at the 5 per cent significant level.

V. Conclusions

Recent studies have shown that developing countries limit the fluctuations of their exchange rate. The lower volatility of the exchange rate implies a larger volatility of reserves or/and interest rates.

In order to explain this fact, in this paper we use a simple framework of monetary policy decisions in a world where firms face balance sheet effects and the economy a high pass-through from depreciation to inflation. The model is consistent with the observed stylized fact. The low volatility of the exchange rate

could be justified by two separate explanations: the "fear of floating" emphasizes the balance sheet effects, while the "fear of inflation" explains the effect of high pass-through coefficients.

We argue in this paper that in some cases the best policy choice can be a mix of both interest rate and exchange rate adjustments, but that the existence of high capital mobility may limit the available options. We investigate empirically what are the effects of a greater integration with the rest of the world on the choice of exchange regime. The results suggest that the optimal use of the exchange rate to buffer external shocks depends crucially on (i) the degree of integration with capital markets, and (ii) the quality of external financing. Countries with more open capital accounts and less stable external financing seem to face difficulties in using the exchange rate to weather external shocks.

Therefore, returning to the question "Can flexible exchange regimes still work in financially open economies?", we conclude that flexible regimes are viable in financially open economies provided external financing is not based on very volatile capital. This, of course, depends on the establishment of credible macroeconomic policies.

Appendix – Data

We use in this paper quarterly data during the period 1990–1999 for a sample of 46 countries (19 industrial and 27 developing, listed below). The source of the data is the International Financial Statistics of the IMF. The domestic interest rates are the local money market rates, and we use the 90-day US T-bill rate as the international interest rate. The inflation differential for each country is the difference between domestic and US inflation. To construct the balance-of-payments variables BP, we consider as FDI the sum of direct investment abroad (code 78BDDZF) and direct investment in represented countries (code 78BEDZF).

The exchange rate regime classification is the same as that used by Frankel et al. (2000), which is taken from IMF. The classification is condensed in three broader categories: fixed (pegs), intermediate (limited flexibility, crawls, bands, managed floating), and flexible (free-floating). For capital controls, we use the definition of Alesina et al. (1993) and Grilli and Milesi-Ferreti (1995).

Appendix I

List of countries in the sample

Industrialized countries	Developing countries
Australia	Argentina
Austria	Bolivia
Belgium	Chile
Canada	Colombia
Denmark	Costa Rica
Finland	Dominican Republic
Germany	Ecuador
Greece	Egypt
Ireland	El Salvador
Italy	Guatemala
Japan	Hong Kong (China)
Netherlands	Indonesia
New Zealand	Israel
Norway	Korea, Republic of
Portugal	Kuwait
Spain	Lebanon
Sweden	Malaysia
Switzerland	Mauritius
United Kingdom	Mexico
	Paraguay
	Philippines
	Singapore
	South Africa
	Thailand
	Turkey
	Uruguay
	Venezuela

Notes

1 Levy-Yeyati and Sturzenegger (1999) use information on international reserves and on both levels and changes of nominal exchanges rates to construct a de facto classification of exchange rate regimes.

2 The Mexican peso has floated during 2000 within an implicit band of about 4 per cent, discounting the dates around the Presidential election.

3 The exchange rate started the year quoted at 1.20 reais per dollar, averaged 1.52 reais per dollar in January and 1.91 reais per dollar in February, with a peak at 2.25 reais per dollar in February.

4 According to Williamson (1998): "A 'crawling band' involves a central bank undertaking a public obligation to maintain its country's exchange rate within a wide, publicly announced, band around a parity that is periodically adjusted in relatively small steps in a way intended to keep

the band in line with the fundamentals". A "monitoring band" has the same features, but it will be defended only when the rate goes beyond the band. The key difference between these two kinds of bands is that the latter does not involve an obligation to defend the edge of the band. The obligation is, instead, to avoid intervening within the band. Williamson argues that the cases of Chile, Colombia and Israel (all of them previous to the adoption of an inflation-targeting framework) are examples of the success of the "monitoring band" regime.

5 Rodrik and Velasco (1999) present evidence suggesting that countries financing their current account deficits with short-term debt have a higher probability of suffering a financial crisis.

6 We replicated the exercise using, instead, the proportion of direct investment over the total financial account. The results are qualitatively identical.

7 Unfortunately we omit in the tables the information regarding fixed regimes, since the sample contains only one country with a fixed exchange economy (Argentina) with data on capital controls.

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