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INFLATION TARGETING IN BRAZIL

by

Philip Arestis
The Levy Economics Institute of Bard College
University of Cambridge

Luiz Fernando de Paula
University of the State of Rio de Janeiro and The National Council for Scientific and
Technological Development, Brazil

Fernando Ferrari-Filho
Federal University of Rio Grande do Sul and The National Council for Scientific and
Technological Development, Brazil

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ABSTRACT

The purpose of this paper is to examine inflation targeting (IT) in emerging countries by concentrating essentially on the case of Brazil. The IT monetary policy regime has been adopted by a significant number of countries. While the focus of this paper is on Brazil, which began inflation targeting in 1999, we also examine the experience of other countries, both for comparative purposes and for evidence of the extent of this "new" economic policy's success. In addition, we compare the experience of Brazil with that of non-IT countries, and ask the question of whether adopting IT makes a difference in the fight against inflation.

Keywords: Monetary Policy; Inflation Targeting; Brazil; Emerging Economies

JEL Classifications: E31, E52

1. INTRODUCTION

The purpose of this paper is to examine the inflation targeting (IT) framework and the experience with it in the case of Brazil. IT as a new monetary policy framework has been adopted by a significant number of countries (see, for example, Angeriz and Arestis [2007a, 2007b, 2008]). Brazil adopted this economic policy framework in June 1999. While the focus of this paper is on Brazil, we also examine the experience of other countries, both for comparative purposes and for evidence of the extent of the success of this "new" economic policy pursued by other IT countries. In addition, we compare Brazil's experience with IT with that of non-IT countries and ask the question of whether it makes a difference in the fight against inflation whether a country has adopted IT or not.

We proceed as follows. Section 2 deals with the more theoretical aspects of the IT framework. This is followed in section 3 by an examination of recent stabilization policies in Brazil; this enables us to demonstrate how Brazil came to implementing the IT strategy. Section 4 concentrates on the Brazilian experience with IT, while section 5 is concerned with a comparison of the Brazilian IT experience with that of other "similar" IT-emerging countries. The latter group includes both countries within Latin America and other countries outside Latin America. The experience of non-IT countries is also examined. Finally, section 6 summarizes and concludes.

2. THEORETICAL ASPECTS OF INFLATION TARGETING

There are a number of theoretical aspects that are the backbone of IT. We examine both the main theoretical elements of IT and certain key operational aspects.

2.1 Main Theoretical Elements
This subsection summarizes the main theoretical elements of IT. There are six such elements as follows:

(**i**) IT is a monetary policy framework whereby public announcement of official inflation targets (or target ranges) is undertaken along with explicit acknowledgement that price stability (meaning low and stable inflation) is monetary policy's primary long-term

objective (King 2002). The price stability goal may be accompanied by output stabilization so long as price stability is not violated. An explicit numerical target for inflation is published (either as a point or a range), as well as a time horizon for reaching the inflation target. Such a monetary policy framework improves communication between the public, businesses, and markets on the one hand, and policy-makers on the other hand, as well as providing discipline, accountability, transparency, and flexibility in monetary policy. The focus is on price stability, along with three objectives: credibility (the framework should command trust); flexibility (the framework should allow monetary policy to react optimally to unanticipated shocks); and legitimacy (the framework should attract public and parliamentary support). In fact, credibility is recognized as paramount in the conduct of monetary policy to avoid problems associated with time inconsistency (Barro and Gordon 1983). It is argued that a policy that lacks credibility because of time inconsistency is neither optimal nor feasible (Kydland and Prescott 1977; Calvo 1978; Barro and Gordon 1983).

(ii) A further role of IT is to "lock in" the gains from "taming" inflation. Bernanke, Gertler, and Gilchrist (1999: 288) are explicit on this issue when they argue that "one of the main benefits of inflation targets is that they may help to 'lock in' earlier disinflationary gains, particularly in the face of one-time inflationary shocks." In an important contribution, though, Johnson (2003) finds rather mixed results for this contention; he compares actual forecasts with predicted forecasts undertaken by professional forecasters for five consecutive twelve-month periods after the announcement of inflation targets. The study isolates the additional effect of the announcement of inflation targets on the level of expected inflation in the case of Australia, Canada, New Zealand, Sweden, and the UK. Immediate reduction in expected inflation is registered in New Zealand and Sweden, with a smaller effect and slower impact in Australia and Canada; inflation targets do not appear to have a significant impact in the UK.

(iii) In this framework, monetary policy is taken as the main instrument of macroeconomic policy. Fiscal policy is no longer viewed as a powerful macroeconomic instrument (in any case, it is hostage to the slow and uncertain legislative processes); in this way, "monetary

policy moves first and dominates, forcing fiscal policy to align with monetary policy" (Mishkin 2000: 4). Monetary policy is a flexible instrument for achieving medium-term stabilization objectives in that it can be adjusted quickly in response to macroeconomic developments. Indeed, monetary policy is viewed as the most direct determinant of inflation, so much so that in the long run the inflation rate is the only macroeconomic variable that monetary policy can affect. Monetary policy cannot affect economic activity (for example, output, employment, etc.) in the long run.

(iv) Monetary policy should not be operated by politicians, but by experts (whether banks, economists, or others) in the form of an "independent" central bank. Politicians would be tempted to use monetary policy for short-term gain (lower unemployment) at the expense of long-term loss (higher inflation)—the time-inconsistency problem (Kydland and Prescott 1977). An "independent" central bank would also have greater credibility in the financial markets and be seen to have a stronger commitment to low inflation than politicians do. There is also the question of instrument independence when the monetary policy instrument is under the control of the independent central bank, as well as goal independence when the independent central bank sets the goal of monetary policy (Debelle and Fischer 1994; Fischer 1994). It is argued that instrument independence is preferable to insulate the independent central bank from time-inconsistent policies. However, in terms of the goals of monetary policy, it is thought that an independent central bank should be goal dependent so that its long-run preferences coincide with society's preferences (Bernanke, Gertler, and Gilchrist 1999), in other words, the independent central bank's preferences coincide with those of the elected government.

(v) A mechanism for openness, transparency, and accountability should be in place with respect to monetary policy formulation. Openness and transparency in the conduct of monetary policy improve credibility. IT central banks publish inflation reports that might include not only an outlook for inflation, but also output and other macroeconomic variables, along with an assessment of economic conditions. There should also be some accountability mechanism. If the inflation target is not met, there should be specific steps in place for the central bank to follow; this may include publishing an explanation or

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submitting a letter to the government explaining the reasons for missing the target and how to return to it. Furthermore, transparency reduces uncertainty about the central bank's preferences, which is expected to lead to lower expected rate of inflation.

(vi) In the case of inflation targeting in an open economy, exchange rate considerations are of crucial importance, and we highlight this aspect in the case of emerging countries (Brazil in particular) in what follows in this paper. They transmit the effects of changes in the policy instrument, interest rates, and various foreign shocks. Given this critical role of the exchange rate in the transmission process of monetary policy, excessive fluctuations in interest rates can produce excessive variability in output by inducing significant changes in exchange rates. This may suggest exchange rate targeting. However, the experience of a number of developing countries that pursued exchange rate targeting (but experienced financial crises because their policies were not perceived as credible) is relevant to the argument. The adoption of IT, by contrast, may lead to a more stable currency since it signals a clear commitment to price stability in a freely floating exchange rate system. This, of course, does not mean that monitoring exchange rate developments should not be undertaken. Indeed, weighting them into decisions on setting monetary policy instruments is thought desirable. Such an approach is thought to make undesirable exchange rate fluctuations less likely, thereby promoting the objective of financial and price stability (Bernanke and Gertler 1999).

2.2 Operational Aspects
In terms of the IT operational framework, a number of issues suggest themselves. To begin with, there is the establishment of inflation targets. This is the setting of a point target or a band and choosing the time period over which the target is expected to be achieved. It is important to note that the target horizon (over which the central bank is expected to achieve its inflation target) cannot be shorter than the control horizon (over which the policy is expected to affect the target variable). Clearly, choosing a range as opposed to a point for the inflation target contains a great deal of flexibility, not only for output stabilization, but also for accommodating large movements in the nominal exchange rate; this is a particularly thorny issue in the case of emerging countries and Brazil, in particular, as

shown below. In those cases where a range is chosen, there is the question of symmetrical/asymmetrical response with respect to the central target. Symmetrical behavior purports to show equal concern for both inflation and deflation, and helps to maintain support for central bank independence. An asymmetric approach to inflation targeting may be advantageous when high inflation rates threaten credibility. This is often the case for developing and emerging countries adopting inflation targeting. A greater weight on overshoots than undershoots in the loss function is suggested under these circumstances.

IT also requires the setting up of a model or methodology that can provide information on future inflation, an issue that relates to the necessity of forecasting inflation. There is also the key issue of how to measure inflation. A relevant question in this context is whether the chosen price index should reflect the prices of goods and services for current consumption only, or for both current and future consumption. In the latter case constructing such a price index is, of course, not feasible. Then there is the problem of noisy or erratic short-run movements in prices, which suggest that an adjusted or core (long-term) price index should be used. Such an index might exclude from the general or headline price index items such as food and energy prices, shocks to the exchange rate, indirect taxes, or regulated prices on the assumption that such changes are the result of temporary and self-correcting, short-term shocks that contain very little information on long-term price movements. Another important excluded category of items relates to changes directly associated with the policy change. Items that vary directly with the policy instrument, such as mortgage payments, may be excluded from the definition of the targeted price index. Such effects, however, may contain significant and protracted second-round effects. For example, a rise in indirect taxes that temporarily lowers inflation can affect aggregate demand, which may lower prices in the long run, thereby implying an important loss of information on future price developments.

There is still the question of the trade-off between reducing deviations of inflation from the target and preventing a high degree of output variability. This is particularly pertinent in the case of supply shocks that cause inflation to exceed the target and are associated at the same time with lower output. Monetary authorities have a serious dilemma in these circumstances: the quicker the disinflation, the shorter the period of actual inflation being above its target; the quicker disinflation is, the greater the potential output variability.

A policy preference and the magnitude of the supply shock are both important determinants of this trade-off. Flexibility is required in this context, which, however, may conflict with credibility if agents interpret it as reluctance by the central bank to deflate. There is, thus, another trade-off in this case between credibility and flexibility (Garfinkel and Oh 1993).

This discussion highlights another important operational aspect. This relates to the question of monetary rules. Central banks, on the whole, are assumed to follow one form or another of the Taylor rule (Taylor 1993). In its original formulation this monetary rule took the *ad hoc* formulation as shown in equation (1):

$$R_t = RR^* + p^T + d_1 Y^g_t + d_2(p_{t-1} - p^T) \qquad (1)$$

where the symbols are as follows: R is the rate of interest used for monetary control purposes, p^T is desired inflation in the original Taylor (1993) formulation (in current parlance, it is the inflation target set by the central bank), Y^g is output gap (i.e., the difference between actual and potential output), and p is actual inflation. Equations of the type depicted in equation (1) are called Taylor rules, since Taylor (1993) showed that a simple equation of this form, with $d_1 = 0.5$ and $d_2 = 1.5$, captures surprisingly well the behavior of the U.S. federal-funds rate and the Federal Reserve System (Fed) monetary policy. The nominal rate is increased more than one-to-one with respect to any increase in inflation. This policy reaction ensures that the real rate of interest will act to lower inflation. Given inflation, the real rate of interest is also increased as a result of output-gap positive changes. Taylor rules, therefore, require monetary policy to act automatically to inflation and output. These Taylor-type rules have been criticized (for example, Svensson [2004]) in terms of the possibility of real indeterminacy: if the rise in the nominal rate of interest in response to a rise in expected inflation is not high enough, then the real rate of interest falls, raising demand, which fails to check inflation. *Mutatis mutandis*, an excessive rise in the nominal rate of interest in response to a rise in expected inflation would also cause indeterminacy. However, indeterminacy can be avoided if monetary authorities respond rather aggressively, that is, with a coefficient above unity to expected inflation, but not overly higher than unity. This result has been demonstrated in the closed-economy case

(Clarida, Gertler, and Galí 2000), as well as in the small open-economy case (De Fiore and Liu 2002).

3. RECENT BRAZILIAN EXPERIENCE: FROM THE EXCHANGE RATE ANCHOR TO INFLATION TARGETING

Stabilization policies in Brazil and, more generally, in Latin American countries in the 1990s were based on some form of exchange rate anchor. Liberalization of the trade, financial, and capital accounts was thought paramount. The experience with those programs showed that although they were successful in ending the history of chronically high inflation, they showed, nonetheless, that local currency appreciation as a result of favorable differentials between domestic and foreign prices was causing balance of payments disequilibria. A new problem emerged that was closely related to the endeavor to achieve and maintain balance of payments equilibria. This problem was the use of high interest rates by monetary authorities to attract foreign capital. The need to maintain high interest rates in order to attract foreign capital increased public internal debt (monetary authorities had to sterilize the inflow of foreign capital), which deteriorated economic performance and fiscal balances. Under these conditions in a global world where financial and productive capital are mobile, the successful application of an internal stabilization policy generated an endogenous process of deteriorating economic conditions. That, then, left Latin American countries vulnerable to speculative attacks on their currencies and, thus, subjected them to currency crises (Kregel 1999). The currency crises in Mexico (1994–95), Brazil (1998–99, and 2002), and Argentina (2001–02) are some good examples of this dynamic process. The unhappy experience of some Latin American countries with pegged exchange rate regimes and the associated era of deep financial crises in the 1990s led them to search for alternative nominal anchors. Since at more or less the same time several industrial countries adopted IT as a new monetary policy framework, it became an alternative policy regime for countries in Latin America.[1]

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[1] In fact, IT was adopted by Chile in 1990, Mexico in 1999, Colombia in 1999, Brazil in 1999, and Peru in 2002.

The "*Real* Plan"[2] in Brazil was created on the same basis as the stabilization programs applied all over Latin America over the period of the late 1980s to the late 1990s. This system was characterized by a fixed or crawling-peg exchange rate, in combination with a more open trade policy. The exchange rate was the price anchor utilized throughout that period.[3] During the exchange rate anchor period, very high interest rates were targeted to attract short-term foreign capital for balance-of-payments purposes. The volume of those capital flows was many times greater than the volume required for the needs of the balance of payments, thus raising the level of foreign reserves and leading to a real appreciation of the exchange rate.[4] That appreciation resulted in a significant balance of trade deficit. The effect of that liberal economic policy arrangement aggravated Brazil's external fragility and, consequently, the country had three speculative attacks on its currency over the three-year period from 1995 to 1998. Furthermore, from the third quarter of 1998 to the first quarter of 1999, the Brazilian economy was characterized by macroeconomic instability, resulting in a sharp outflow of short-term capital. Thus, repeated financial crises in a very short period of time (i.e., the South East Asian crisis and the Russian crisis, along with the international recession of 1997–1998) contributed to deteriorating the Brazilian economy. In fact, as a result of the effects of the Russian crisis in particular, Brazil was forced to abandon its crawling-peg exchange rate and adopt a floating exchange rate regime. The exchange rate depreciated as a result, thereby producing significant price pass-through effects with inevitable adverse consequences on the inflation front.

Following the transition to a floating exchange rate in January 1999, Brazil adopted an IT regime in June 1999 to keep inflation under control. At the same time, the Central Bank of Brazil (BCB) raised the basic short-term interest rate to accommodate the currency-depreciation shock. As a result, an appreciation to the exchange rate occurred very

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[2] The *real* is the currency unit of Brazil.

[3] The Brazilian *Real* Plan differed from Argentina's Convertibility Plan in that it adopted a more flexible exchange rate anchor. At the launch of the Brazilian program in July 1994, the government's commitment was to maintain an exchange rate ceiling of one-to-one parity with the dollar. Moreover, the relationship between changes in the monetary base and foreign reserve movements was not explicitly stated, allowing some discretionary leeway. After the Mexican crisis, the exchange rate policy was reviewed and, in the context of a crawling exchange rate range, the nominal rate began to undergo gradual devaluation. In early 1999, however, after six months of speculative pressure, the *real* was devalued and, some days later, the Brazilian government adopted a floating exchange rate. For a general analysis of the origins and development of the *Real* Plan, see Ferrari-Filho and Paula (2003).

[4] During the pegged exchange rate period, July 1994 to January 1999, the basic interest rate (Selic) was raised and kept at high levels in order to avoid large outflow of reserves.

fast, and inflation, despite the huge devaluation in the beginning of 1999, ended the year in single figures.

4. THE BRAZILIAN EXPERIENCE WITH INFLATION TARGETING FROM 1999 TO 2007

4.1 The Institutional Dimension

The Brazilian IT monetary policy regime is modeled on the basis of the British IT model. The National Monetary Council (CMN) sets the inflation targets, which are proposed by the minister of finance. CMN has three members: the minister of finance, the minister of planning, and the president of the BCB. All three members are appointed by the president of Brazil and do not have fixed mandates. In June of each year, the CMN establishes the inflation targets and their corresponding intervals of tolerance for the next two years. Besides the inflation target, CMN is also responsible for the approval of the main norms related to monetary and exchange rate policies, as well as the regulation of the financial system.

The Central Bank of Brazil Monetary Policy Committee (COPOM) has to achieve the inflation target through the use of the short-term interest rate.[5] Inflation targets are based on the headline inflation index, i.e., extensive national consumer price index (IPCA).[6] A certain degree of flexibility is introduced through defining IT within a range that has varied between 2.0 or 2.5 percentage points above and below the central point target. The other main reason for the introduction of this flexibility is that it helps the Central Bank of Brazil to achieve its inflation target in view of the serious supply shocks to which the Brazilian economy is exposed.

The inflation target is fulfilled when the yearly variation of the inflation index is inside the set range. If inflation breaches the target set by the CMN, the governor of the BCB is required to write an open letter to the minister of finance explaining the reasons the

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[5] COPOM was created on June 20, 1996 and was assigned the responsibility of setting the stance of monetary policy and the short-term interest rate. It is composed of the members of the BCB's board of directors.
[6] IPCA covers a sample of families with a multiple of up to 40 times the minimum wage, which is determined every year by the Brazilian federal government. It now stands at approximately US$260 per month (beginning of August 2008) and it is thought to be enough to cover the basic needs of a family. The sample covered by IPCA has a broad geographical basis that includes families in the biggest cities of Brazil. IPCA is calculated by National Bureau of Geography and Statistics (IBGE).

target was missed, as well as the measures proposed to bring it back to target and the time period over which these measures are expected to take effect. The interest rate target set by the COPOM is the target for the Selic interest rate—the interest rate for overnight interbank loans, collateralized by those government bonds that are registered with and traded on the "Sistema Especial de Liquidação e Custodia" (Selic). The Selic target is fixed for the period between its regular meetings. The governor of the BCB, however, has the right to alter the Selic interest rate target anytime between regular COPOM meetings (once per month). This is made possible by the COPOM, which has the right to introduce a monetary policy bias at its regular meetings, where the bias refers to easing or tightening of monetary policy outside meetings. The COPOM authorizes the governor of the BCB to alter the SELIC interest rate target in the direction of the bias at anytime between regular COPOM meetings. Eight days after each meeting, the committee releases the minutes on the BCB website and to the press through the BCB press officer. The minutes provide a summary of the COPOM's discussion and decisions. At the end of each quarter (March, June, September, and December), the COPOM publishes the BCB inflation report, which provides detailed information on economic conditions, as well as the COPOM's inflation forecasts upon which changes in the Selic interest rate are determined. The objective of this report is to inform the public and the market about the goals, design, and implementation of monetary policy.

4.2 Experience with Inflation Targeting

Table 1 shows actual inflation and the targets for 1999–2007. From 1999 (when IT was introduced in Brazil) to 2002, the tolerance intervals were 2 percentage points above and below the central target; for 2003 and 2004 the intervals were enlarged to 2.5 percentage points.[7] The inflation rate was 8.9% and 6.0% for targets of 8% and 6% in 1999 and 2000, respectively; the targets were within the acceptable range. However, in 2001 and 2002, several external and domestic shocks—such as domestic energy crisis in Brazil, effects of September 11, 2001, the Argentine crisis, and the confidence crisis related to the presidential election in 2002—hit the Brazilian economy with significant impacts on

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[7] For more information on the macroeconomic background that led to the shift of IT in Brazil, see Bogdanki, Tombini, and Werlang (2000).

inflation. Indeed, the inflation rate reached 7.7% in 2001, 1.7% above the target's upper range, and 12.5% in 2002, more than 5 percentage points above the upper range. According to Minella et al. (2003: 6–8), the exchange rate rose 20.3% and 53.5% in 2001 and 2002, respectively. As a result, in 2001, 38% of the inflation rate could be explained by the exchange rate depreciation, whereas for 2002 the contribution of the exchange rate stood at 46%.[8] In 2003, the inflation rate was 9.3% above the adjusted target of 4.0% and outside the range of 2.5% tolerance interval.[9] The high inflation in 2003 was due mainly to the initial effect of the 2002 high inflation, in spite of the maintenance of the conservative economic policy with very high interest rates by the new president, Lula da Silva, from the Workers Party. In 2004, IPCA was 7.6%, well above the target of 5.5%. Growth of administered prices (mainly gasoline, health plans, fixed telephone, and electricity rates) in the same year reached 10.2%, accounting for 29.0% of the change in the IPCA or, equivalently, 2.94% out of 10.2%. In 2005, the inflation rate was 5.7%, which was within the upper and lower tolerance levels for inflation set by the CMN for that year. The factors that influenced the lower growth rate in prices (mainly in market prices) in 2005 were, among others, an abundant supply of farm products (rice, perishable foodstuffs, and soybean) and, especially, exchange rate appreciation. In 2006, the inflation rate was 3.14%—it was the lowest inflation rate in the period 1999–2007. Once again, the exchange rate appreciation explains the low inflation rate for 2006. Finally, in 2007, the inflation rate was 4.46% (0.04% below the inflation target).[10]

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[8] The calculations of Minella et al. (2003) are based on the structural model of the BCB and the information concerning the mechanisms for the adjustment of administered prices.

[9] CMN Resolution No. 2972, June 27, 2002, changed the inflation targets for 2003, while a later resolution, No. 3108, June 25, 2003, changed inflation targets for 2004. They were raised to 4.0% and 5.5% for 2003 and 2004, from the original inflation targets of 3.25% and 3.75%, respectively.

[10] It is important to mention that high real interest rates, combined with the current account surplus from 2005 to 2007, resulted in a gradual appreciation of the Brazilian exchange rate that contributed to the reduction of the inflation rate. As we know, exchange rates can influence inflation rate ("exchange rate pass-through") through the prices of traded final goods and imported intermediate goods, and their impact on agent's inflation expectations. Ho and McCauley (2003), for instance, show evidences that: (i) income is negatively and significantly correlated with pass-through as lower-income economies have a larger portion of traded goods in the consumption basket; and (ii) exchange rate pass-through has tended to be stronger in Latin America than in Asia.

TABLE 1. Inflation Targets and Consumer Price Index in Brazil: 1999 to 2007

Year	Point Inflation Target	Range of Inflation Target	Actual IPCA
1999	8.0%	From 6.0 to 10.0%	8.94%
2000	6.0%	From 4.0 to 8.0%	5.97%
2001	4.0%	From 2.0 to a 6.0%	7.67%
2002	3.5%	From 1.5 to 5.5%	12.53%
2003	4.05	From 1.5 to 6.5[a]	9.30%
2004	5.5%	From 3.0 to 8.0%[b]	7.60%
2005	4.5%	From 2.0 a 7.0%	5.69%
2006	4.5%	From 2.5 to 6.5%	3.14%
2007	4.5%	From 2.5 to 6.5%	4.46%

Notes: (a) The original inflation target was 3.25% (with a tolerance interval of 2.0%). Subsequently, in 2003, the BCB decided to change the inflation target to the maximum limit of 8.5%; (b) The original inflation target for the year 2004 was 3.75% (with a tolerance interval of 2.5%).
Source: BCB (2008)

Examining table 1 more closely, further comments are in order. It is notable that over the period 1999–2007, IT targets in Brazil were within the set range in three out of the nine years of the operation of this monetary policy strategy. The targets were missed in 2001, 2002, and 2003 (despite raising the inflation target to 5.5% from 3.75%) by a substantial margin, especially in 2002. On a different occasion (2004), the inflation target was only met after it had been raised by mid-2003. It may, thus, be concluded that IT in Brazil was not completely successful over the first nine years of its implementation. Moreover, inflation targets were only met when international financial conditions allowed it; that is, IT was successful when the exchange rate helped the BCB's efforts to keep inflation under control.[11] This begs the question of whether this result can be sustained when Brazil's IT performance is compared with that of other emerging countries, both

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[11] For more details on the influence of the exchange rate on inflation in Brazil, see Barbosa-Filho (2007).

within Latin America and outside it, and also both with IT and non-IT countries. In section 5 (below) we undertake this particular exercise. We look into further data in an attempt to prepare the discussion of section 5.

4.3 Inflation, GDP, and Unemployment Performance in Brazil: 1999 to 2007

The average inflation rate in Brazil from 1999 to 2007 was 7.2%. This means that the average inflation rate in Brazil is still high. Furthermore, Brazil's GDP performance has been poor. When we consider the period of IT implementation (1999 to 2007), the average growth rate of GDP was only 3.0%, while during the same period the average growth rate of emerging countries was 5.1% per year (according to Fabris [2007]). In addition, GDP has followed a *stop-go* pattern over this period: according to IPEA data (table 2), GDP growth was 0.3% in 1999, 4.3% in 2000, 1.3% in 2001, 2.7% in 2002, 1.1% in 2003, 5.7% in 2004, 3.1% in 2005, 3.7% in 2006, and 5.4% in 2007. The variance is 1.8, indicating quite high variation. Table 2 also shows the average unemployment rate during the inflation-targeting period in Brazil. From 1999 to 2007, the average unemployment rate, according to IBGE (2008) data, was 9.3% per year.

TABLE 2. GDP Growth and Unemployment Rates in Brazil (average rate per year, in %)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	Average
GDP Growth Rate	0.3	4.3	1.3	2.7	1.1	5.7	3.1	3.7	5.4	3.0
Unemployment Rate	8.3	7.9	6.8	7.9	12.3	11.5	9.8	10.0	9.3	9.3

Sources: IPEADATA (2008) and IBGE (2008)

Turning to the rate of interest over the period of the IT regime, it is clear that it has been very high in Brazil, even after the adoption of the exchange rate regime in January 1999. The average nominal basic interest rate (Selic) was 18.3% over the period 1999 to 2007 (figure 1), while the average real interest rate (Selic/IPCA) during this period was 10.3%. It was so high because of the monetary policy requirement that aimed at keeping inflation under control and stabilizing the exchange rate volatility. Indeed, empirical studies show that the monetary authorities use interest rate not only to control inflation directly, but

also to control exchange rate pressures, with evident "fear of floating" behavior.[12] On the other hand, the literature that estimates the reaction function of the BCB (after the adoption of IT) shows that the BCB reaction to inflation has been asymmetric: (i) the increase in the inflation rate generates a more than proportional reaction of the Selic; and (ii) BCB reacts very gradually (it reduces the Selic very slowly) when there is a fall in the inflation rate and/or a sharp reduction in the output growth.[13] The consequences of high interest rates are: (i) serious constraints on economic growth through the price of credit (loan rates) and entrepreneurs' poor expectations; and (ii) increases in public debt, which have been formed mainly by indexed bonds or short-term prefixed bonds.[14] Despite the significant improvement in the balance of payment figures since 2003, due essentially to the surplus in the trade balance increasing, Brazil's recent experience shows that in countries with a high level of external debt and a fully-liberalized capital account, external capital flows can cause periods of intense exchange rate instability.[15] This can jeopardize efforts to achieve and maintain announced inflation targets. This situation has also caused low economic growth because monetary authorities tend to increase interest rates during periods of external turbulence in order to meet inflation targetsand also to stabilize exchange rates.

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[12] Mendonça (2005), using a Taylor rule to study the determination of interest rate by the BCB over the period 1999–2004, finds that exchange rate changes explained a great deal of the variation of the Selic interest rate (around 57% after one year of the exchange rate shock in 2003).

[13] According to Modenesi (2008: 21), the weight of the autoregressive components of the BCB reaction function ($\alpha_1 + \alpha_2 = 0.92$) is much higher than the Federal Reserve System reaction function during the Volcker-Greenspan period ($\alpha_1 + \alpha_2 = 0.79$).

[14] The behavior of the domestic public debt in Brazil has proved particularly vulnerable to changes in the rate of interest and exchange rate (see, in this regard, Paula and Alves Jr. [2003]).

[15] According to data from BCB, the ratio of external debt to exports declined from 3.6 in 2001 to 1.5 in 2007 due to the recent increase in exports, and the ratio of foreign reserves to external debt increased from 17.1 in 2001 to 75.9 in 2007.

FIGURE 1. Nominal and Real Interest Rates in Brazil (in %): 1999 to 2007
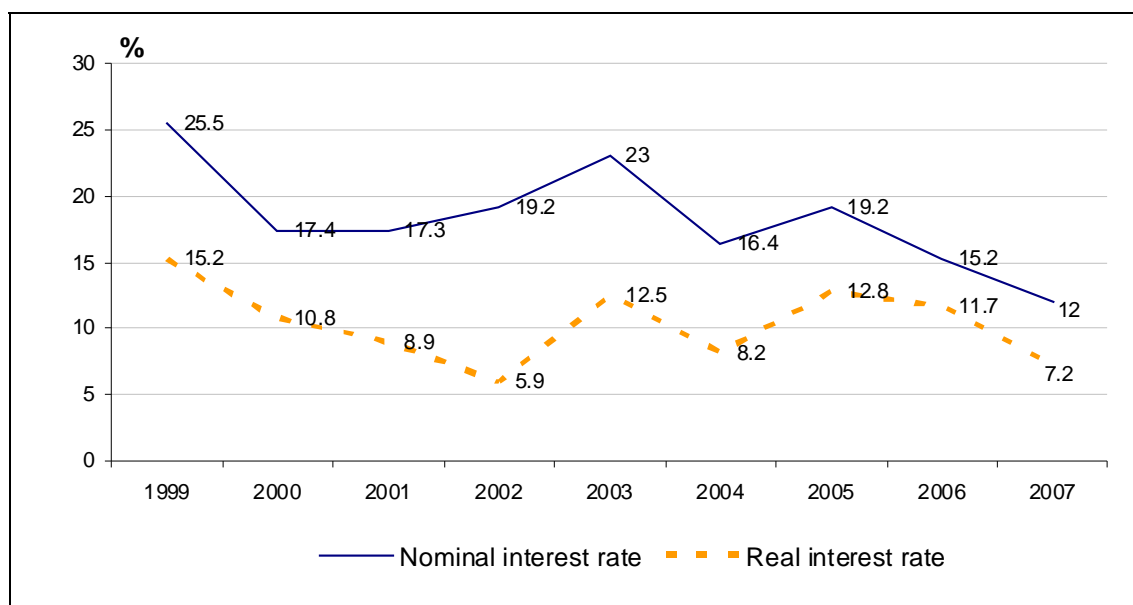

Source: BCB (2008)

In Brazil, exchange rate volatility has been considerable[16] (figure 2). Macroeconomic instability brought a strong currency devaluation of the *real*, which, as a result, affected domestic prices via the exchange rate pass-through. This came about through the direct impact of devaluation on the imported inputs or indirectly through the "monitored" prices. Monitored or administered prices are defined as those that are relatively insensitive to domestic demand and supply conditions, or that are in some way regulated by a public agency. The group includes oil by-products, telephone fees, residential electricity, and public transportation. Its dynamics differ from those of market prices in three ways: "i) dependence on international prices in the case of oil by-products; ii) greater pass-through from the exchange rate; and iii) stronger backward-looking behavior" (Minella et al. 2003: 7), as electricity and telephone rates are generally adjusted annually by the general price index (IGP).[17] Furthermore, figure 3 shows that administered

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[16] Souza and Hoff (2006), using Calvo-Reihart's fear of floating indicators, show that from January 1999 to December 2005 the frequency that monthly variation of exchange rate exceeded the band of ± 2.5% was 52% in Brazil, compared to 27% in other emerging countries of Latin America, and 19% in Asian emerging countries (Indonesia, Singapore, Thailand, and South Korea).

[17] IGP is prepared by Getulio Vargas Foundation, a private foundation, and it is calculated through a weighted index that includes the wholesale price index (60.0%), consumer price index (30.0%), and national index of building costs (10.0%). The reason for the use of this index to adjust electricity and telephones rates (instead of IPCA) is that when these services were privatized in the second half of the 1990s, the Brazilian government

prices increased more than market prices from 1999 to 2006. In 2007, however, market prices increased more than administered prices.

FIGURE 2. Volatility of the Exchange Rate, R$/USD, and Inflation Rates, Accumulated over 12 months (IPCA and IGP-DI), Brazil: 1999 to 2007
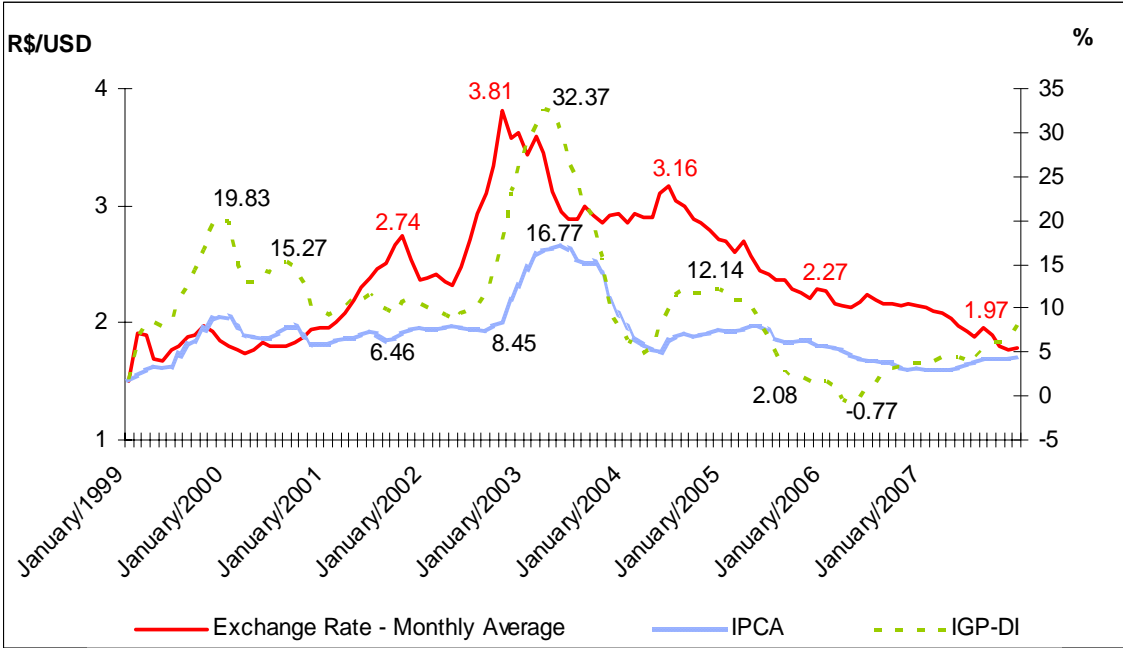

Note: Volatility of exchange rate was calculated as the difference between average annual exchange rate and the monthly average exchange rate.
Source: IPEADATA (2008)

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was interested in attracting foreign firms and, for these firms, IGP is better than IPCA, as it is much more sensitive to exchange rate variations (due to the high weight of the wholesale price on it).

FIGURE 3. Brazil: Extensive Consumer Price Index (IPCA)
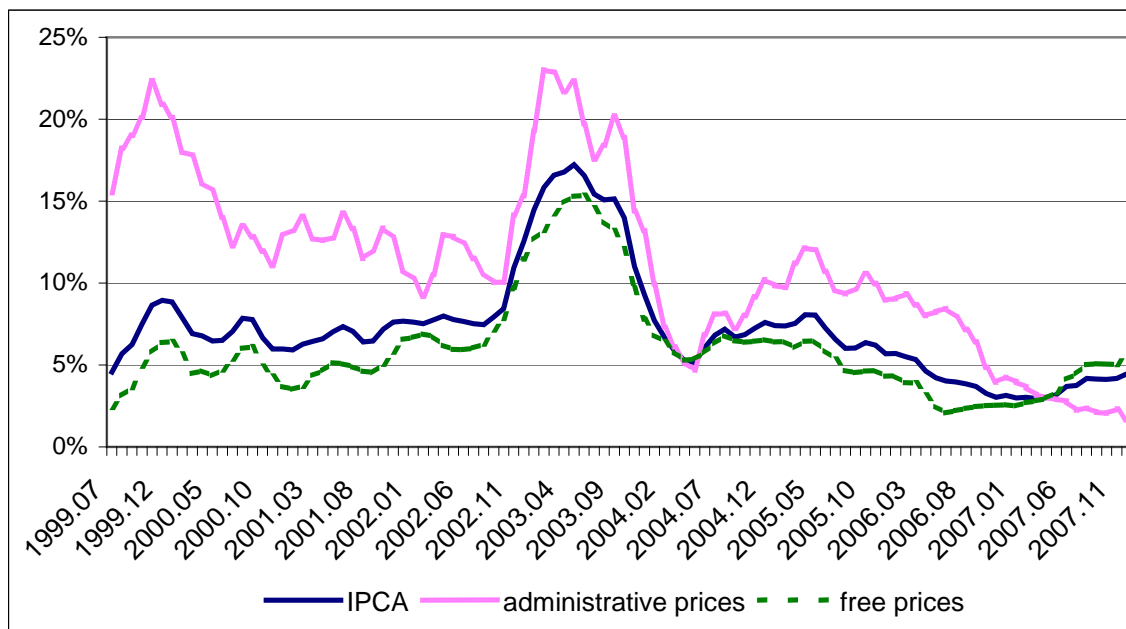
Note: Administered prices include utilities services (fixed-telephone fees, residential electricity, etc.), oil by-products, and private health plans, that is, prices that are or determined (or authorized) directly by government or by governmental permission that includes some sort of price indexation.
Source: IPEADATA (2008)

A final comment on the transmission channel from exchange rate to inflation in Brazil is in order. Exchange rate variations affect the IGP, which, in turn, affects the index of administered prices. As administered prices change, IPCA is also affected.[18] IPCA is also affected directly by exchange rate changes due to their effects on the imported inputs. Since IGP has been higher than IPCA, the latter has been influenced by the IGP behavior through administered price adjustments (see figure 2). On the other hand, periods of appreciation of the exchange rate have resulted in a decrease in the rate of inflation (after a time lag). As we show above, the decline in the inflation rate in 2005 and 2006 (compared to 2003 and 2004) is basically related to the exchange rate appreciation over the period, so inflation in Brazil is very much influenced by exchange rate movements.[19] Under these

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[18] Minella et al. (2003: 25) estimated that the pass-through to administered prices from July 1997 until December 2002 was 25%, resulting in a pass-through of about 16% for the headline IPCA.

[19] Ferreira (2004), using a VAR model to evaluate the determinants of the rate of inflation in Brazil in 1995–2004, finds a positive response of inflation to shocks in nominal exchange rate, an effect that spreads over time. In the same connection, Gomes and Aidar (2005) estimate (using a VAR) a Taylor rule for the Brazilian economy from January 1999 to May 2004 and conclude that 24.4% of the inflation rate (IPCA) variation is explained by the exchange rate. It is interesting that some economists of the BCB also conclude that "exchange rate volatility is an important source of inflation variability. The design of the inflation-targeting

conditions, monetary policy may have some effect on market-determined prices, but it is not very effective in controlling administered prices. Consequently, in view of the importance of administered prices in the determination of the Brazilian inflation rate, inflation pressures result in the BCB having to increase interest rates higher than might be necessary to restrain inflation that derives from market prices. This is because the BCB has to account for the secondary effects that emanate from the shocks of monitored prices.[20]

The argument may be briefly summarized: inflation in Brazil has been mainly cost-determined, explained by negative or positive supply shocks (movements in the exchange rate, changes in the international prices of commodities and energy, etc.) and by partial inertia due to the indexation of the administered prices.

5. COMPARING THE BRAZILIAN EXPERIENCE WITH OTHER "SIMILAR" COUNTRIES

We compare the experience of Brazil with other countries with the help of tables 3 and 4, which contain data on inflation and GDP (average, standard deviation, and coefficient of variation).[21] Two groups of countries are examined: one is a group of emerging countries that have adopted IT (Brazil, Chile, Colombia, Mexico, and South Africa) and another group comprised of countries that have not adopted the IT strategy (Argentina, China, India, and Russia). So, we have selected the so-called BRIC countries (Brazil, Russia, India, and China), plus South Africa and the more important Latin American countries (Argentina, Chile, Colombia, and Mexico, besides Brazil). Standard deviations and coefficients of variation can be sometimes misleading, as, for example, in the case of China, where a high inflation standard deviation is present as a result of a sharp decline of high to low inflation, although this country has had a very low inflation since the late 1990s. It is for this reason that we also report data on inflation in figures 4 and 6 by

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framework has to take into account this issue to avoid [the possibility of not meeting] inflation targets as a result of exchange rate volatility [which is bound to reduce] the credibility of the central bank" (Minella et al. 2003: 29).

[20] The credit channel is also limited in Brazil since the ratio of credit to GDP has been around 24–35% from 2000–07, according to data from Central Bank of Brazil (2008), while it was 45.3% in the United States, 84.7% in Japan, and 103.7% in the euro area in 2000 (Belaisch 2003).

[21] The coefficient of variation is calculated as the ratio of the standard deviation over the average of the variable in question.

countries that adopt IT and those that do not adopt IT, respectively. These figures are very important for the analysis since they report inflation trends in each country.

The following observations are in order:

(a) Inspection of tables 3 and 4 clearly shows that the fall of inflation is a recent general tendency in emerging countries, whether or not they adopt an IT regime (see also, figures 4 and 6).[22] Although in all IT-emerging countries the rate of inflation declined after the adoption of IT, in most of them the coefficient of variation increased (table 3). It is also true that countries that did not adopt IT experienced improvements around the same time as IT countries (table 4). Indeed, some emerging non-IT countries, such as China and India, have had low inflation rates in the last few years. Argentina and Russia have had a gradual reduction in the inflation after the peak of 2002 (41.0%) and 1999 (85.7%), respectively, due to the huge exchange rate devaluation in 2001–02 in Argentina and the subsequent Russian crisis in 1998. For some countries (China, India, and Russia) the stability of the nominal exchange rate had an important role for price-stabilization purposes over the period (Paula 2008). So, IT and non-IT countries have experienced similar reductions in inflation in recent years. Theory suggests that "flexible" IT stabilizes both inflation and output. However, there is no clear evidence that emerging countries that adopted IT have had a better performance in GDP terms (both in terms of output growth and GDP coefficient of variation) when compared to the emerging countries that do not adopt IT; the evidence as reported in this paper (figures 5 and 7) is very clear on this point. Indeed, China and India are amongst the countries that have had the highest output growth in recent years and they are non-IT countries (their growth rates are 10.3% and 6.3%, respectively, for the years 1991–2007). Consequently, there is no evidence that inflation targeting improves performance in emerging economies as measured by the behavior of inflation and output. This finding suggests that better performance resulted from something other than IT.[23]

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[22] In table 3 (IT emerging countries) we consider the time "before IT" (ten years before the implementation of IT), while in table 4 (non-IT emerging countries) we divide this group of countries into two periods, 1991–1998 and 1999–2007, so that this division allows a better comparison with Brazil's performance since this country adopted the IT framework in 1999.

[23] One might argue that these findings are due to specific economic problems of emerging countries, problems that developed countries are not faced with, and thus IT might be better suited for these countries. However, a

TABLE 3. IT Emerging Countries

Country	Before IT						After IT					
	Inflation			GDP			Inflation			GDP		
	Average	SD	CV	Average	SD	CV	Average	SD	CV	Average	SD	CV
Brazil	405.17	911.83	2.25	1.97	3.00	1.52	7.22	2.83	0.39	3.06	1.92	0.63
Chile	20.38	5.46	0.27	2.92	6.87	2.35	6.32	4.77	0.75	5.57	3.02	0.54
Colombia	23.03	4.70	0.20	3.64	1.62	0.44	6.61	1.67	0.25	3.21	3.40	1.06
Mexico	20.34	13.20	0.65	3.37	3.59	1.07	5.71	2.99	0.52	3.05	2.09	0.69
South Africa	7.40	2.48	0.34	2.20	1.92	0.87	5.68	4.35	0.77	4.53	0.91	0.20

SD = standard deviation; CV = coefficient of variation (SD/average)

Note: Before IT / After IT: (i) Brazil = 1989–1998/1999–2007; (ii) Chile = 1981–1990/1991–2007; (iii) Colombia = 1989–1998/1999–2007; (iv) Mexico = 1989-1998/1999-2007; and (v) South Africa = 1992–2001/2002–2007.
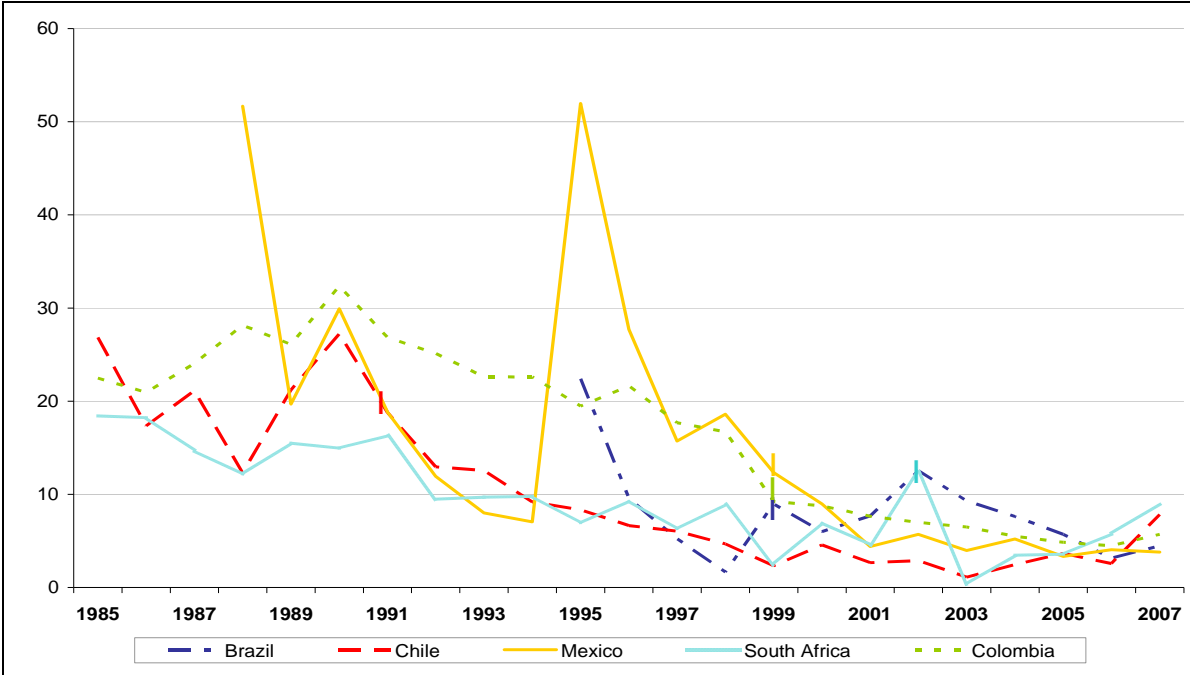**Source:** IMF (2008)

TABLE 4. Non-IT Emerging Countries

Country	1991–1998						1999–2007					
	Inflation			GDP			Inflation			GDP		
	Average	SD	CV	Average	SD	CV	Average	SD	CV	Average	SD	CV
Argentina	12.66	28.58	2.26	5.86	4.25	0.72	7.95	13.19	1.66	2.48	7.69	3.10
China	8.94	9.01	1.01	11.04	2.42	0.22	1.67	2.33	1.40	9.59	1.32	0.14
India	10.12	3.58	0.35	5.39	1.77	0.33	4.14	1.97	0.47	7.08	2.12	0.30
Russia	222.21	854.60	3.85	- 6.69	5.18	- 0.77	15.96	8.45	0.53	6.95	1.59	0.23

SD = standard deviation; CV = coefficient of variation (SD/average)

**Source:** IMF (2008) and Deutsche Bank Research (2008)

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recent paper on OECD countries shows that this is not the case: comparing seven OECD countries that adopted inflation targeting in the early 1990s to thirteen that did not, Ball and Sheridan (2003) find that, on average, there is no evidence that IT improves performance as measured by the behavior of inflation, output, and interest rates. They conclude that "the formal and institutional aspects of targeting—the public announcements of targets, the inflation reports, the enhanced independence of central banks—are not important. *Nothing in the data suggests that convert targets would benefit from adopting explicit targets*" (Ball and Sheridan 2003: 29, italics added). See also Angeriz and Arestis (2007a, 2007b, 2008).

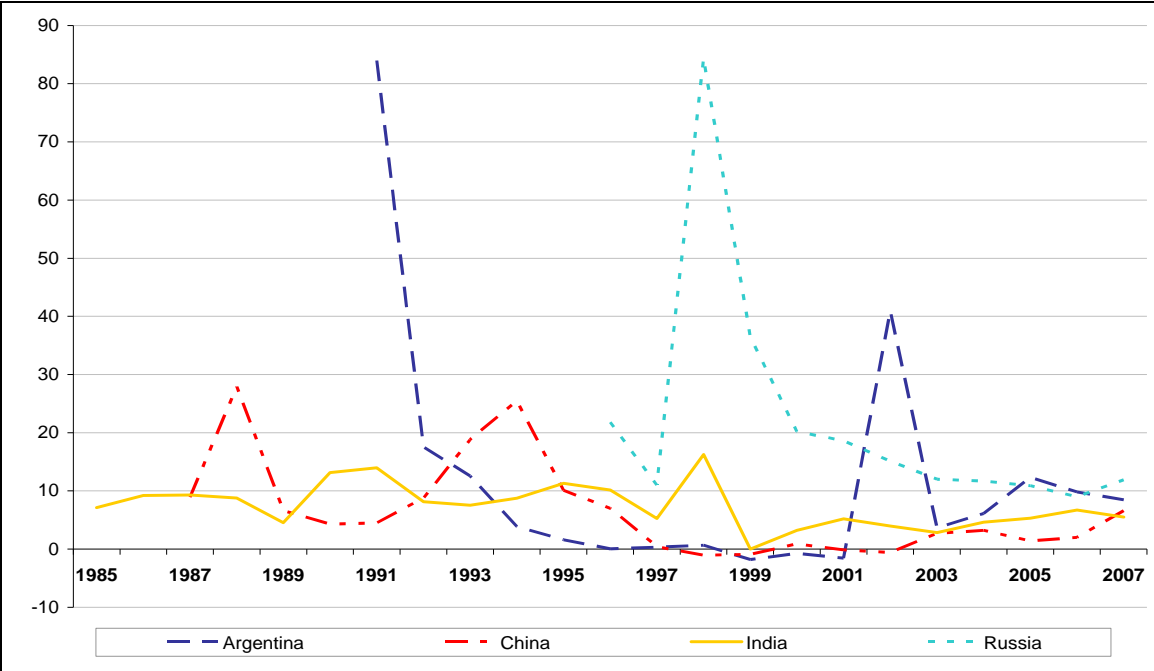**FIGURE 4. Inflation Rate (Annual Consumer Prices) in IT Emerging Countries**

FIGURE 5. GDP in IT Emerging Countries (in %)
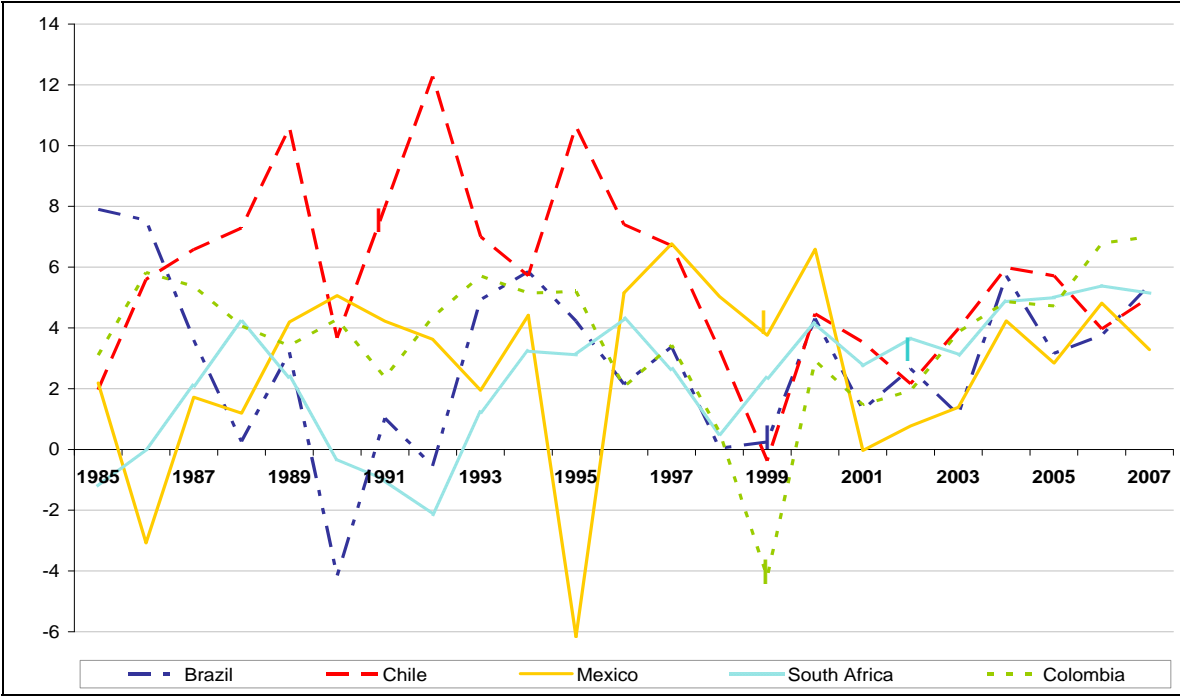
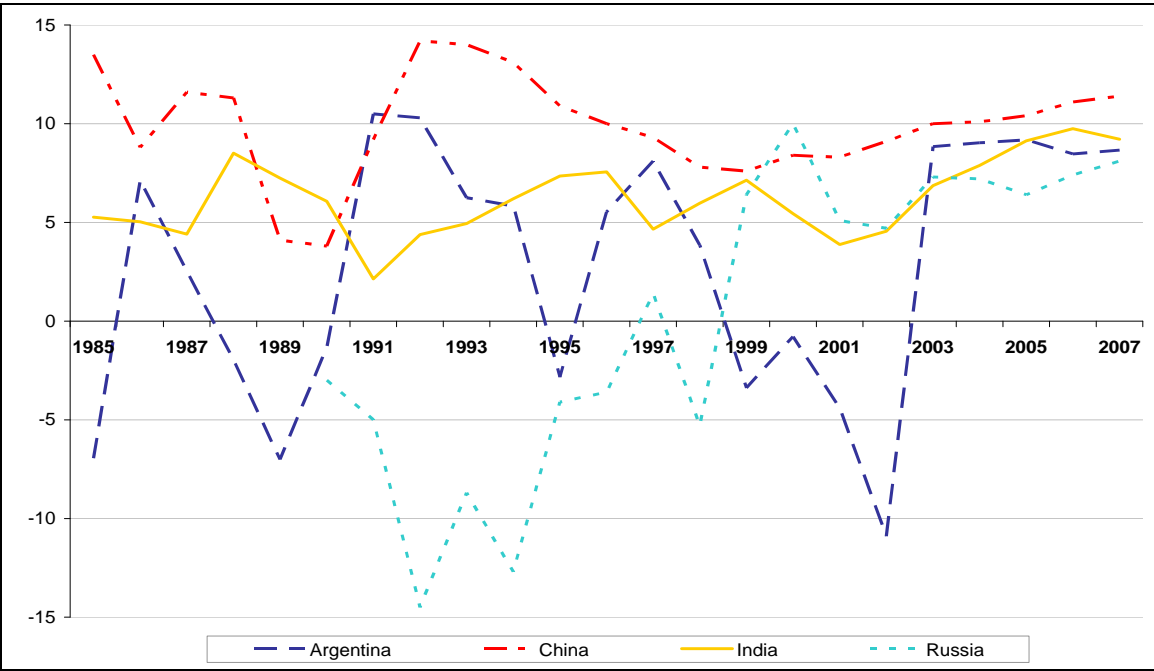**FIGURE 6. Inflation (Annual Consumer Prices) in Non-IT Emerging Countries**

FIGURE 7. GDP in Non-IT Emerging Countries (in %)

(b) The picture in Latin American countries should be interpreted with due attention given to the fact that these countries have suffered currency crises recently: Mexico in 1994–95, Brazil in 1998–99 and 2002, and Argentina in 2001–2002. Such crises have had big effects on both inflation and GDP in these countries. Argentina, after the experience of hyperinflation (1989–1990), adopted a currency board in 1991 and the inflation rate declined sharply during the 1990s. In 2002, the country had a serious currency crisis and, as result, a sharp recession in 2001–2002 took place, followed by a rapid recovery after the crisis. Indeed, and since 2006, the inflation rate has increased in Argentina. Mexico has had poor economic performance with declining inflation after the 1994 Tequila crisis. Although general conclusions are difficult to derive in the case of Latin America in view of the fact that IT is a recent import in these countries, a general observation emerges from this experience: in three cases—Brazil, Colombia, and Mexico—economic performance worsened since their adoption of IT (table 3). Chile is an exception; it is the single Latin American country that has had real GDP growth above 5% (from 1991 to 2007 the average growth rate was 5.6% per year). Non-IT countries have had similar experiences (table 4).

(c) Although there is a clear downward trend in inflation in emerging countries, Brazil is an interesting case. Inflation has remained high in relation to other IT countries over the relevant period; from 1999 to 2007, the average inflation rate was 7.2%. However, the coefficient of variation is the lowest over the same period (table 3). Furthermore, Brazil's GDP performance has been poor compared to other "big" emerging countries; from 1999 to 2007, the average growth rate was 3.0%, as compared to the average of the other countries in the BRIC group (figure 4).

(d) In Brazil, as argued earlier, nominal and real interest rates have been high and exchange rate volatility has been considerable (figures 1 and 2). The combination of high interest rates and exchange rate volatility has contributed to low economic growth and a pass-through effect from exchange rate to inflation.

6. SUMMARY AND CONCLUSIONS

We have summarized the theoretical aspects of IT and the principles that govern its implementation in the case of Brazil. It is clear from this analysis that the authorities in Brazil adhere religiously to the theoretical principles of the IT framework. We have examined the experience of Brazil with IT and compared it with the experience of the pre-IT period, as well as with the experience of other countries—both IT and non-IT.

Two general conclusions emerge from this analysis. IT countries appear to have been successful in taming inflation, but so have non-IT countries. Furthermore, although Brazil has implemented IT as the theory of the framework suggests, inflation rates over the IT period have been high. Brazil has one of the highest interest rates in the world and it has been maintained at this high level for awhile. The BCB has to maintain very high interest rates in its attempt to control inflation. High interest rates have been associated with poor economic growth performance and deterioration of other macroeconomic variables, such as public debt. It appears that we have a rather bad economic scenario in Brazil: low economic growth with relatively high inflation.

Our results conform to recent contributions on the IT experience of a number of Latin American countries. Especially so with the Eichengreen's (2002) contention that IT is more complicated in countries like the Latin American ones, essentially for three main reasons: their economies are exposed to financial and international commodity shocks because of the liberalization of the balance of payments trade, which means liberalization of financial and capital accounts; second, their liabilities are almost dollarized; and finally, their policy-makers lack credibility. The first and the second reasons are particularly pertinent in the case of Latin American countries. Openness exposes these economies to disturbances that emanate from exchange rate fluctuations that cause pass-through inflation. Liability dollarization affects financial institutions because, in general terms, the banking systems of Latin American countries are weak and, as such, they bring financial vulnerability when external shocks occur. However, Paula and Alves Jr. (2003) demonstrate that this is not typical of the Brazilian banking sector in recent years. Moreover, IT is essentially too rigid for these countries because it affects the economic growth and exchange rate flexibility that is required under such a regime of monetary rules.

The latter can cause financial instability, a very real possibility in these countries, as history has vividly demonstrated. Schmidt-Hebel and Werner (2002: 2) are very clear on the dangers of IT: "all Latin American inflation targeters are open economies that employ floating exchange rate regimes … [and] are subject to large external shocks and significant exchange rate volatility, and the exchange rate may therefore play an important role in the conduct of monetary policy under inflation targeting." Exchange rate market volatility generates frequent changes to inflation rates and results in countries not being able to meet their inflation targets.

The larger external shocks faced by Latin American countries affect the exchange rate and, consequently, the inflation rate, leading to higher interest rates to curb the inflationary pressures. As a result, these economies, in general, are confronted by higher volatility of interest rates and exchange rates. In this context, "monetary policy in emerging economies may therefore be more sensitive to exchange rate movements both indirectly (because of pass-through effects on inflation) and directly (because the exchange rate is an additional argument in central bank objective functions, reflecting their concern for devaluation-induced bank failures and domestic recessions)" (Schmidt-Hebel and Werner 2000: 15). In other words, the pass-through from exchange rate changes to inflation is larger and more significant in the Latin American economies than in industrial countries because the former have a substantially higher degree of openness, a history of high inflation, and low central bank credibility. In addition, Latin American countries present large mismatches between foreign currency assets and liabilities, which bring two adverse shocks: self-fulfilling attacks and financial crises on the country's asset, as well as domestic recession following large exchange rate depreciations. It is the case that Latin American countries are susceptible to supply shocks, perhaps more so than many other countries, than to demand shocks. To the extent that this is validated, IT might not work as effectively as in those countries where demand shocks dominate over supply shocks. Brazil is no exception and these conclusions are applicable with some force in the case of this country.

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