Monetary Policies and Inflation Targeting in Emerging Economies

Edited by Luiz de Mello



OECD

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Foreword

The current volume is based on the proceedings of a conference, organised by the Economics Department of the OECD and the Bank of England's Centre for Central Banking Studies, and hosted by the Economics Department of the OECD on 28 February 2007, on monetary policy in inflation-targeting emerging-market economies.

The volume emphasises cross-country issues related to the conduct of monetary policy in emerging markets and the role of inflation targeting in improving macroeconomic performance. The experiences of several countries in the OECD area and beyond, including Brazil, Chile, Czech Republic, Indonesia, South Africa and Turkey, are discussed in separate case studies. A focus on Brazil, Chile, Indonesia and South Africa is opportune, because the OECD launched in May 2007 a process to open discussions for membership with Chile, in addition to Estonia, Israel, Russia and Slovenia, and for "enhanced engagement" with a view to possible membership with Brazil, Indonesia and South Africa, in addition to China and India.

The cross-country analysis and the case studies underscore a rich diversity of experiences with inflation targeting. The monetary regime appears to be working rather well in the countries under examination. Inflation targeting seems to have played an important role in achieving and sustaining disinflation in some cases and in building confidence in the macroeconomic policy setting in most countries. But several common policy challenges have emerged from the discussions and will need to be addressed to strengthen the policy frameworks further. Of particular interest are those related to the need to deal with the constraints imposed on the monetary authorities by fiscal and financial dominance in some cases, as well as the effects of structural reforms on relative prices and on the process whereby inflation expectations are formed. Globalisation and its effects on asset prices also pose challenges for monetary policymaking.

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Executive summary

This volume is based on the proceedings of a conference co-organised by the OECD Economics Department and the Bank of England's Centre for Central Bank Studies on monetary policymaking in inflation-targeting emerging-market economies. The conference, held at the OECD Headquarters in Paris on 28 February 2007, brought together central bank officials from three OECD member countries (Czech Republic, Mexico and Turkey) and four non-member countries (Brazil, Chile, Indonesia and South Africa).

The volume contains a cross-country chapter that focuses on Latin America. The experiences of Brazil, Chile, Czech Republic, Indonesia, South Africa and Turkey are discussed in separate case studies.

Lessons learned

The cross-country analysis and the case studies highlight a rich array of experiences with inflation targeting (IT). In all countries under examination, fully-fledged IT was adopted at different points in time over the last ten years or so as the underlying framework for the conduct of monetary policy. The economic circumstances under which IT was put in place vary considerably among these countries, but a few common lessons and policy challenges can be highlighted. The main conclusions that have emerged from the conference are:

- IT was implemented in virtually all countries under examination after the collapse of exchange-rate pegs or the abandonment of alternative nominal anchors, such as monetary targeting. The need to put in place a monetary regime to both guide policymakers when setting monetary policy and to anchor inflation expectations was particularly important in countries that had used managed exchange rates to break inflationary inertia following long periods of high inflation. This is the case of Brazil and Turkey, for example. Experience with monetary targeting in environments of unstable money demand also prompted countries, such as Indonesia, for example, to adopt IT. Another consideration is the search for a credible monetary regime in countries where efforts towards disinflation needed to be complemented by

policy initiatives to liberalise prices in the course of structural reform. This is the case of the Czech Republic, for example.

- Different, looser forms of IT were experimented with prior to, and often in preparation for, the adoption of fully-fledged IT. For example, Chile only abandoned exchange-rate targeting in 1999, having put in place a looser form of IT, including by granting the central bank operational autonomy and announcing explicit inflation targets, in the early 1990s. Turkey combined monetary targeting with the announcement of inflation targets until 2006, when the money base targets were abolished. Brazil, however, adopted IT in June 1999, soon after the collapse of the exchange-rate peg in January of the same year, but did not rely on an intermediate nominal anchor during the transition period.

- IT was adopted in all countries under examination, even though many of the standard preconditions associated with this policy framework had not been fulfilled. There is now broad agreement that for IT to be effective, not only do formal targets need to be set and announced, but the central bank also needs to develop its internal modelling and forecasting capabilities, in addition to putting in place vehicles for formal reporting of monetary policy decisions and communications with the public. Nevertheless, most central banks examined in the case studies lacked adequate analytical tools, such as a structural model of the economy, and surveys of market expectations when IT was adopted. In others, it has often been argued that inflation was too high, as in Turkey, and fiscal imbalances too large, as in Brazil, for monetary policy to be conducted effectively under IT. The case studies suggest that, by and large, these deficiencies have not undermined the implementation of IT where policy efforts have been focused on addressing them. An emphasis on the need to build credibility from the outset called for considerable emphasis in the early days of IT on upgrading internal analytical capabilities in most countries and on strengthening reporting and communications tools.

- Fiscal and financial dominance are among the main obstacles to successful IT in many emerging-market economies. The main policy challenge brought about by fiscal dominance is that monetary policy is constrained by its effect on public finances, especially when the debt dynamics is considered unsustainable. The experiences of Brazil and Turkey are particularly interesting in this regard. Both countries went through periods of fiscal retrenchment as the cornerstones of

macroeconomic adjustment and disinflation. Concern about the sustainability of the public debt often resulted in confidence crises, as in the case of Brazil in 2002, which called for decisive action by the monetary authorities. The case of Indonesia is also illustrative of the challenges posed by substantial capital inflows in the course of disinflation. In any case, when monetary policy is constrained, or perceived to be constrained, by its expected effect on public finances and/or capital flows, the central bank's commitment to – and capacity to act in pursuit of – the inflation target is compromised.

- Supply-side considerations also pose challenges for IT in emerging-market economies. The option for accommodating the first-round effects of adverse supply shocks in a volatile economic environment, while reacting to the second-round effects of these shocks, may affect inflation expectations and undermine the monetary authorities' efforts to build credibility in the policy regime. Structural reform also often creates one-off inflation shocks that need to be dealt with by the central bank. This is the case of changes in price setting that are related to overall economic liberalisation following central planning, as in the case of the Czech Republic, for example. It is also the case of supply bottlenecks and distribution hurdles in Indonesia. These considerations have a direct bearing on the definition of the inflation index to be targeted, including the option of selecting core/trimmed, rather than headline, inflation. This issue has nevertheless not yet been resolved in some countries. The targeted inflation indices have also changed over time in some countries, including the Czech Republic and Indonesia, for example.

- IT appears to be working well, despite general agreement that there are options for improving the policy framework and addressing upcoming challenges in most countries. It is not easy to ascertain the extent to which changes in macroeconomic performance are due to adoption of IT alone. In some cases, the time span for empirical analysis is too short for reliable inference to be made. In others, implementation of IT was part and parcel of broader structural reform, which affects the economy at large, and the monetary transmission and price-setting mechanisms in particular, in ways that go beyond the conduct of monetary policy. The nature of the shocks hitting the economy also changes over time, reflecting global economic and financial conditions that are beyond the control of policymakers in individual countries. But, all in all, there is fairly compelling evidence for some countries under examination that inflation has become less volatile and persistent in the post-IT period, interest rates have

become less volatile and inflation expectations more responsive to monetary policy moves.

The chapters

Luiz de Mello and Diego Moccero evaluate a conventional New Keynesian model to empirically test whether adoption of IT in a flexible exchange-rate regime after 1999 has affected macroeconomic volatility in four Latin American countries (Brazil, Chile, Mexico and Colombia). The authors show that these monetary policy regime changes have been accompanied by lower volatility in the monetary stance in Brazil, Colombia and Mexico, despite higher inflation volatility in Brazil and Colombia. The authors show that the post-1999 regime has been associated with greater responsiveness by the monetary authority to changes in expected inflation in Brazil and Chile, while in Colombia and Mexico monetary policy has become less counter-cyclical. Also, lower interest-rate volatility in the post-1999 period was found to owe more to a benign economic environment than to a change in the policy setting itself. Finally, the change in the monetary regime has not yet resulted in a reduction in output volatility in these countries.

Afonso Bevilaqua, Mário Mesquita and André Minella discuss the conduct of monetary policy in Brazil. The authors assess the convergence of inflation and inflation expectations to the targets after the confidence crisis of 2002. The analysis covers the ensuing disinflation period and economic recovery, as well as the consolidation of disinflation in 2005-06. It is argued that the conduct of monetary policy and the overall improvement in macroeconomic fundamentals have contributed to creating a more stable, predictable macroeconomic environment, evidenced by a reduction in inflation uncertainty. Furthermore, the econometric analysis reported in the chapter underscores the critical role played by the inflation targets as "attractors" for expectations.

The Chilean experience with IT is discussed by Rodrigo Valdés. He focuses on the last sixteen years and highlights a number of institutional characteristics of the Chilean IT regime that have contributed to, or acted as a pre-requisite for, a good track record of inflation control. The chapter also sheds light on particular macroeconomic outcomes, including changes in the dynamics of inflation, as well as on selected practical issues in the conduct of monetary policymaking under IT, including the role of inflation expectations and the exchange rate.

The experience of the Czech Republic with IT – the first one in a transition economy – is discussed by Kateřina Šmídková. The author argues that IT was adopted only after other monetary policy regimes had failed. An important

feature of the Czech regime is the need to build an exit strategy into the policy framework, given the country's expected entry into the euro zone, although no date has yet been announced. The problem of exiting from a monetary policy regime has so far been faced by countries with fixed exchange-rate regimes (including currency boards), rather than IT.

Hartadi Sarwono discusses the Indonesian experience. The author emphasises rapid structural changes in post-crisis Indonesia as an important feature of the country's monetary regime. The need to deal with fiscal dominance and relatively shallow financial markets are additional important challenges for the monetary authorities, especially against a backdrop of exchange-rate volatility and sudden shifts in capital inflows. The author argues that, due to these characteristics of the Indonesian regime, policy co-ordination between the monetary authorities and the government at large needs to be enhanced. This co-ordination is particularly important to minimise the inflationary pressures associated with a large share of administered prices (which are set by the government) in the consumer price index and volatile food prices.

The South African experience is discussed by Monde Mnyande. The author describes the institutional underpinnings of monetary policymaking in South Africa, including the instruments that have been put in place since introduction of IT to strengthen the central bank's communication with market participants and the public in general. On discussing the main features of the South African regime, he contends that monetary policy has become more forward-looking following the introduction of IT.

Finally, Gülbin Şahinbeyoğlu discusses the case of Turkey. The author explains how the monetary policy regime was changed in response to the collapse of the exchange-rate peg in 2001 and how inflation targeting was adopted. She discusses how the preconditions for formal IT were fulfilled, and how these achievements helped to lower inflation at single digits. The move to formal IT in 2006, as well as the institutional changes it entailed, is also discussed in the chapter, as well as the successes and challenges the monetary authorities were confronted with within this new policy regime. The chapter concludes with an assessment of the lessons to be drawn from Turkey's experience with IT.

Chapter 1

Monetary policy and macroeconomic stability in Latin America: The cases of Brazil, Chile, Colombia and Mexico

Luiz de Mello and Diego Moccero,*

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This chapter uses co-integration analysis to estimate simultaneously a monetary reaction function and the determinants of expected inflation for Brazil, Chile, Colombia and Mexico in the post-1999 period. It also tests for the presence of volatility spillovers between the monetary stance and inflation expectations based on M-GARCH modelling. The results of the empirical analysis show that: i) there are long-term relationships between the interest rate, expected inflation and the inflation target, suggesting that monetary policy has been conducted in a forward-looking manner and helped anchor inflation expectations in the countries under examination, and ii) greater volatility in the monetary stance leads to higher volatility in expected inflation in Brazil, Colombia and Mexico, suggesting that interest-rate smoothing contributes to reducing inflation expectations volatility. No volatility spillover effect was detected in the case of Chile.

* The views expressed in this chapter are the authors' own and do not necessarily reflect those of the Economics Department of the OECD and the organisation's member countries. Previously published as: "Monetary Policy and Macroeconomic Stability in Latin America: The Cases of Brazil, Chile, Colombia and Mexico", *OECD Economics Department Working Papers*, No. 545, OECD Publishing. http://dx.doi.org/10.1787/285851107845

Introduction and summary

There is a growing empirical literature, pioneered by Taylor (2000) and Clarida *et al.* (2000), among others, on how changes in a country's monetary policy regime affect macroeconomic volatility.[1] The main finding in this literature is that, at least as far as the United States is concerned, a more pro-active policy stance since the mid-1980s, whereby the monetary authority responds strongly to changes in expected inflation, has contributed to anchoring expectations at low, stable levels and reducing business-cycle fluctuations in economic activity. Greater macroeconomic stability is also due to the fact that the shocks hitting the economy have become milder over the last 20 years or so (Ahmed, Levin and Wilson, 2002; Stock and Watson, 2002; Cecchetti, Flores-Lagunes and Krause, 2004; Boivin and Giannoni, 2005). Another factor militating in favour of lower inflation volatility in the United States is a change in price-setting mechanisms, which have been found to have become more forward-looking since the 1980s (Moreno, 2004).

A complementary strand of literature focuses on how the adoption of inflation targeting in many countries, coupled with exchange rate flexibility, has affected macroeconomic volatility. The argument is that, by allowing the exchange rate to float freely the monetary authority can respond more forcefully to changes in the inflation outlook in pursuit of its inflation target, instead of defending a nominal exchange rate peg. Empirical evidence for industrial countries suggests that, where the policy regime is credible and monetary policy is conducted in a transparent, forward-looking manner, adoption of inflation targeting has delivered lower volatility in the monetary stance (Kuttner and Posen, 1999; Woodford, 1999 and 2004). However, as suggested by the empirical evidence surveyed by Mishkin (2006), the fall in macroeconomic volatility since the 1990s is a worldwide phenomenon, and, therefore, inflation targeters in the developed world have not done better than non-inflation targeters at reducing macroeconomic volatility, although they have done a better job at anchoring expectations in the sense of reducing the sensitivity of expected inflation to shocks in current inflation. With regard to emerging-market economies, de Mello and Moccero (2006) use co-integration and M-GARCH analysis to test for the presence of long-run relationships among the policy interest rate, inflation expectations and the inflation target, as well as of volatility spillovers between inflation expectations and the monetary stance in Brazil, Chile, Colombia and Mexico. The authors conclude that the monetary stance has become more persistent under inflation targeting and exchange rate flexibility, which has contributed to anchoring inflation expectations around the pre-announced targets in these countries.

Against this background, this chapter tests the hypothesis that a change in the monetary regime has reduced macroeconomic volatility in four Latin American countries (Brazil, Chile, Colombia and Mexico), where inflation targeting has been complemented by flexible exchange rate regimes since 1999.[2] To this end, a small New Keynesian structural model comprising aggregate supply and demand equations and a monetary reaction function is estimated. Impulse response functions are computed for the structural model and for an unrestricted VAR in the interest rate, inflation and the output gap. A counterfactual exercise is performed to assess the role played by changes in the policy regime and in the shocks hitting the economy in explaining changes in macroeconomic volatility across policy regimes. The counterfactual exercise allows for the estimation of the volatilities that would arise from a given combination of shocks and monetary policy parameters, thus identifying the factors that make for greater macroeconomic stability.

Modelling and data

A simple structural model

A conventional macro-structural model is estimated to highlight the main stylised facts about how macroeconomic volatility has been affected by changes in policy and shocks across monetary regimes in Brazil, Chile, Colombia and Mexico since the mid-1990s. The New Keynesian framework has become the reference point for analysing the relationship between inflation, monetary policy and the business cycle. In its simplest form, it consists of three equations:

$$\pi_t = \delta E_t \pi_{t+1} + (1-\delta)\pi_{t-1} + \lambda y_t + u_{\pi_t}, \tag{1.1}$$

$$y_t = \mu E_t y_{t+1} + (1-\mu) y_{t-1} - \phi(r_t - E_t \pi_{t+1}) + u_{y_t}, \tag{1.2}$$

$$r_t = \rho r_{t-1} + (1-\rho)(\beta E_t \pi_{t+1} + \gamma y_t) + \tau e_t + u_{r_t}, \tag{1.3}$$

where π_t, y_t, r_t and e_t denote respectively inflation, the output gap, the nominal interest rate and the nominal exchange rate at time *t*; E_t is the expectations operator conditional on information available at time *t*; and u_{π_t}, u_{y_t} and u_{r_t} are the structural errors.

Equation (1.1) is a conventional Phillips curve, including Calvo-type price stickiness, Equation (1.2) is an aggregate demand function, and Equation (1.3) is an augmented Taylor-type monetary reaction function, which includes the

nominal exchange rate as a pre-determined variable. There is some controversy over whether or not the exchange rate should enter the reaction function. But we have opted for including it, because there may be more complex interactions between movements in the exchange rate and macroeconomic performance in the context of emerging-market economies that are not captured in the conventional Taylor rule. A case in point is "fear of floating" in countries that have resorted to exchange rate targeting for extended periods. Exchange rate-augmented monetary reaction functions have been estimated by Ball (1999), Mishkin and Savastano (2001), Minella *et al.* (2003), and Mohanty and Klau (2005), among others.

Monetary policy regimes: A brief summary

The four countries under consideration have upgraded their institutional setting for monetary policymaking since the 1990s as a means of entrenching macroeconomic stability (Fracasso *et al.*, 2003; Carstens and Jacome, 2005; Avendano and de Mello, 2006). Institutional reform has aimed at reducing the scope for central bank financing of budget deficits and on granting *de jure* operational autonomy to the monetary authority. Brazil is an exception, however, because the central bank is not formally independent, although it is perceived as enjoying *de facto* autonomy from the executive branch of government. Inflation targeting was formally adopted in Brazil in June 1999, following the January 1999 floating of the *real*, and in January 1999 in Mexico. Chile and Colombia had pursued some looser form of inflation targeting since the early to mid-1990s, combining pre-announced targets for both headline inflation and the exchange rate. The exchange rate was nevertheless allowed to float freely in both countries in September 1999. The levels of inflation targeted differ among countries, as well as the tolerance bands around the central targets. Chile and Mexico currently target headline inflation within a 2-4% band, whereas Brazil and Colombia target a higher level of inflation, at 4.5%. The tolerance band is wider in Brazil (2.5-6.5%) than in Colombia (4-5%).

The monetary authorities rely predominantly on open-market operations, and central bank credit and deposit facilities to conduct monetary policy in these four countries (Avendano and de Mello, 2006). The use of reserve requirements as a monetary policy instrument has become less important over time. Unremunerated reserve requirements are high in Brazil for demand deposits, but have come down, as well as in Colombia, and have been used in Chile to discourage short-term capital inflows. Interest rate controls are less widespread, although the rate on short-term demand deposits is regulated in Chile, as well as selected longer-term rates in Brazil (TR and TJLP, for example).

Empirical evidence for Brazil, Chile, and Mexico (Schmidt-Hebbel and Werner, 2002; Minella *et al*., 2003; OECD, 2005; de Mello and Moccero, 2006) suggests that inflation targeting is working well in these countries. Inflationary inertia has been reduced where the monetary authority has been forward-looking and responsive to deviations of expected inflation from the targets. The exchange rate regime has played an important role in shaping inflation dynamics in these countries, and inflation has come down more rapidly in the countries that have used exchange rate anchors to break inflationary inertia, especially where inflation had been chronically high, such as in Brazil. The reduction in inflation has been more gradual in Chile and Mexico.

Data and times-series properties

System (1.1)-(1.3) is estimated by full information maximum likelihood (FIML) using monthly data for Brazil, Chile, Colombia and Mexico over the period spanning 1996:1 through 2006:2. The system is estimated for two sub-samples: *i*) the period prior to the abandonment of formal or informal exchange-rate targeting in Brazil, Chile and Colombia, and prior to the adoption of formal inflation targeting in Mexico, and *ii*) thereafter, when inflation targeting was complemented by exchange rate flexibility. Mexico allowed the *peso* to float at end-1994 but formally adopted inflation targeting only in 1999. Conversely, Colombia and Chile adopted inflation targeting in the early to mid-1990s, but allowed their currencies to float freely only in September 1999. The cut-off dates are therefore January 1999 for Mexico and September 1999 for Chile and Colombia. In the case of Brazil, two different cut-off dates are set: January 1999, due to the floating of the *real*, and June 1999, which corresponds to the formal adoption of inflation targeting in a floating exchange-rate regime.

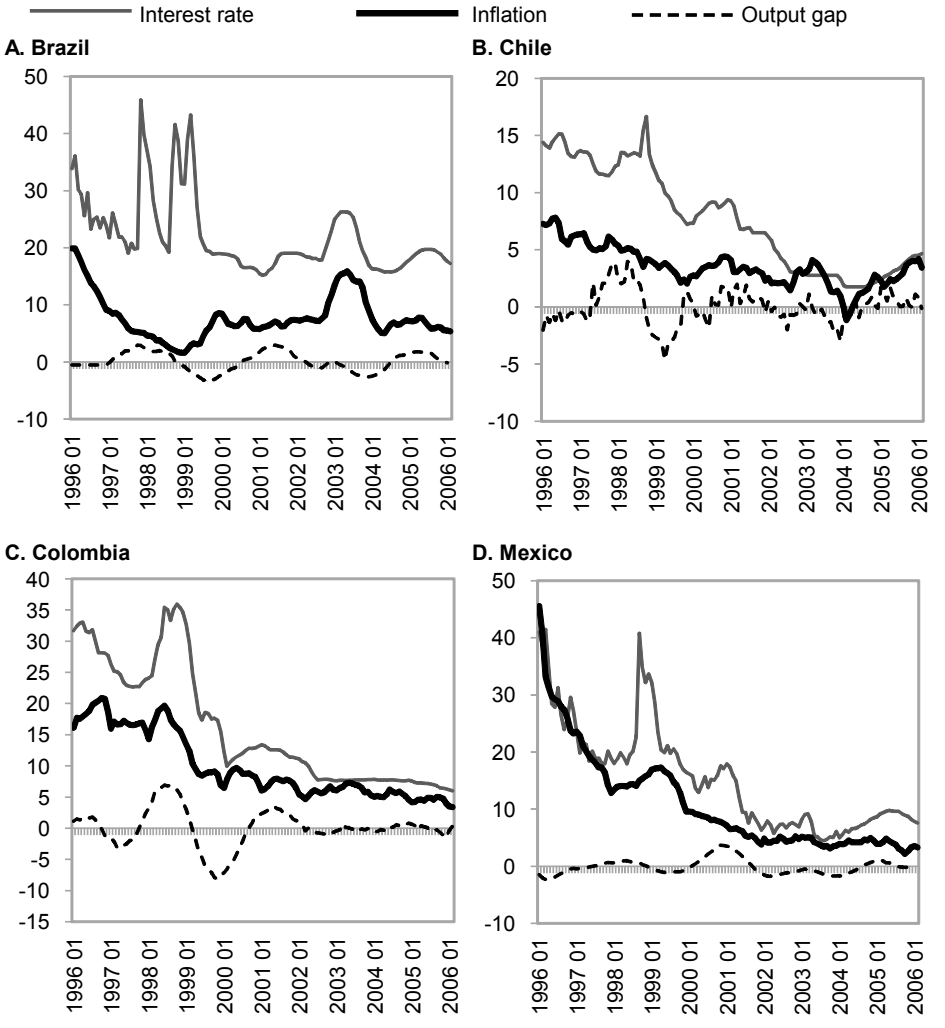
Monthly data for the four countries are available from national sources. Inflation is measured by the consumer price index (IPCA in Brazil, IPC in Chile and Colombia, and INPC in Mexico). The nominal interest rate (annualised in all countries) is the SELIC rate in Brazil, the TPM rate in Chile (inflated by the annual variation in the UF (*Unidad de Fomento*) before August 2001), the rate on 90-day deposits (CDT) in Colombia and the rate on the 28-day CETES bonds in Mexico. The output gap was computed as the percent difference between the seasonally-adjusted industrial production index and its Hodrick-Prescott (HP)-filtered trend (IMACEC index in the case of Chile). The exchange rate is the period-average rate defined as units of national currency per US dollar.

The inflation, interest rate and output gap series are depicted in Figure 1.1. Visual inspection of the data suggests that interest rates seem to have become less volatile in all countries since 1999. This is also the case of inflation for

Colombia and Mexico. The output gap does appear to have become less volatile in Colombia, where the amplitude of business-cycle fluctuations seems to have moderated somewhat since 2001 and to a lower degree in Chile, since the end of 1999.

Figure 1.1. **Trends in inflation, interest rate and output gap, 1996:1-2006:2**

In per cent



1. A 12-month moving average is reported for the output gap.

Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico; and authors' calculations.

A battery of unit root tests was performed (results available upon request), including the augmented Dickey-Fuller (ADF), the Philips-Perron (PP) and the Zivot-Andrews tests. The latter test allows for a one-off structural change under the alternative hypothesis.[3] On the basis of these tests, the inflation, interest rate and nominal exchange rate series appear to have unit roots in all countries when the variables are defined in levels. They therefore enter the model in first differences. The output gap was found to be stationary in levels in all countries, except Chile.[4] On the basis of the Zivot-Andrews test, the interest rate series were found to have structural breaks between late 1998 and early 1999 (except in Chile), which corresponds to the selected cut-off date of end 1988 used in the empirical analysis.

Estimation of the structural model

The results of the estimation of the structural model, reported in Table 1.1, suggest a relative stability across policy regimes in the parameters of the Phillips curve and the aggregate demand equation in all countries. By contrast, the results of a similar structural model estimated by Moreno (2004) for the United States show that the Phillips curve became more forward-looking over time, suggesting an important change in price setting. The inflation and the output gap equations exhibit a fair degree of persistence, which has not changed in a discernible way across policy regimes in the Latin American countries in the sample. The output gap does not enter the Phillips curve in a statistically significant manner and the *ex ante* real interest rate does not appear to be a powerful determinant of the output gap.

Monetary policy appears to have become increasingly persistent over time in all countries, except in Mexico. This is not surprising because of the abandonment of exchange rate targeting in these countries, which allows monetary policy to pursue price stability unencumbered by the need to defend a pre-announced target for the nominal exchange rate. The monetary authority also became more forward-looking over time in Chile, as evidenced by the positively-signed and statistically significant coefficient on expected inflation (β), and in Brazil in the sample that excludes the transition period of January-June 1999. This finding is consistent with those reported by Corbo *et al*., (2002) in the case of Chile, on the basis of a one-equation monetary reaction function, and by Minella *et al*., (2003) for Brazil.

In addition, monetary policy was found to be responsive to changes in the exchange rate in Mexico (both periods) and in Brazil in the post-1999 regime, although this is not the case if the January-June transition period is excluded.

Table 1.1. **Structural model estimations: Brazil, Chile, Colombia and Mexico**[1]

	Brazil			Chile		Colombia		Mexico	
	1 1996:1 to 1998:12	2A 1999:1 to 2006:2	2B 1999:7 to 2006:2	1 1996:1 to 1999:9	2 1999:10 to 2006:2	1 1996:1 to 1999:9	2 1999:10 to 2006:2	1 1996:1 to 1998:12	2 1999:1 to 2006:2
δ	0.49** (0.235)	0.50*** (0.054)	0.54*** (0.083)	0.48*** (0.167)	0.51*** (0.076)	0.60*** (0.084)	0.52*** (0.088)	0.49*** (0.066)	0.50*** (0.078)
λ	0.00 (0.008)	0.00 (0.003)	0.00 (0.004)	-0.02 (0.142)	-0.12 (0.123)	0.00 (0.001)	0.00 (0.002)	0.00 (0.009)	0.00 (0.010)
μ	0.44*** (0.122)	0.47*** (0.065)	0.46*** (0.066)	0.52*** (0.134)	0.51*** (0.120)	0.40** (0.172)	0.53*** (0.113)	0.56*** (0.087)	0.50*** (0.079)
ϕ	1.85 (5.960)	1.59 (1.376)	1.20 (2.168)	-0.48 (0.751)	0.00 (0.352)	-1.95 (26.619)	-10.70 (10.774)	1.19 (1.351)	-0.72 (1.278)
ρ	0.03 (0.299)	0.66*** (0.071)	0.61*** (0.057)	0.30 (0.547)	0.63*** (0.085)	0.29* (0.169)	0.56*** (0.092)	0.10 (0.090)	0.11 (0.097)
β	0.54 (1.883)	0.14 (0.192)	0.19** (0.088)	0.02 (0.072)	0.11** (0.046)	0.24 (0.219)	-0.12 (0.223)	0.29 (0.302)	0.15 (0.139)
γ	0.01 (0.031)	0.01 (0.007)	0.01** (0.003)	-0.02 (0.049)	-0.02 (0.051)	0.01*** (0.002)	0.00 (0.004)	0.03** (0.012)	0.01 (0.006)
τ	5.08 (22.921)	0.47*** (0.105)	0.02 (0.080)	-0.40 (1.138)	-0.16 (0.277)	-0.24 (0.240)	-0.13 (0.325)	2.85*** (0.491)	3.75*** (0.630)

1. Expected values are measured by one-period-ahead values in the relevant variables. Standard errors are reported in parentheses. (***), (**) and (*) denote, respectively, statistical significance at the 1, 5 and 10% levels.

Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico; and authors' estimations.

When the transition period is included in the sample, the significance of the coefficient on the exchange rate (τ) is probably due to the volatility that characterised the period of overshooting following the floating of the *real* and subsequent stabilisation of the nominal exchange rate. Finally, evidence of counter-cyclicality in the monetary stance was found in Colombia and Mexico in the first period, where the coefficient of the output gap (γ) was found to be positively signed and statistically significant, and in Brazil in the current policy regime (in the sample that excludes the January-June 1999 transition period).

In sum, estimation of the structural model suggests that monetary policy has been conducted in a more gradual, forward-looking manner in Brazil and Chile since the policy regime change that occurred in 1999. The monetary stance has also become more counter-cyclical in Brazil. Instead, in the cases of Colombia and Mexico, monetary policy has become less counter-cyclical, a finding which may be associated, at least in the case of Colombia, with greater interest-rate smoothing after the policy regime change.

VAR analysis

It has become standard to assess the implications of a change in the monetary policy regime using split-sample estimates of impulse response functions derived both from unrestricted, reduced-form VARs (Boivin and Giannoni, 2002 and 2005), as well as from structural models. Therefore, impulse responses to a monetary shock, defined as a one-standard-deviation innovation to the interest rate, are computed for inflation, the output gap and the interest rate for the two sub-samples corresponding to the different monetary policy regimes. The endogenous variables enter the VAR in the following order: inflation, the output gap and the interest rate. This recursive causal ordering has become conventional (Christiano, Eichenbaum and Evans, 1998) and imposes minimum structure in the VAR in the sense that the output gap and inflation have contemporary effects on the interest rate but not the converse. The exchange rate enters the model as a predetermined variable. Lag length selection was performed on the basis of the Schwarz Information Criterion (SIC).

Stability tests conducted for the VAR representation of system (1.1)-(1.3) show that no AR root lies outside the unit circle for the full sample and for both sub-samples in all countries. Cogley and Sargent (2003) discuss the power of a host of parameter stability tests and conclude that failure to reject the hypothesis of time invariance is due to the fact that procedures are unable to detect drifting parameters. Tests performed on the individual time series (not reported) suggest the presence of parameter shifts but did not provide a consistent selection of the

timing of the structural breaks for the system as a whole. Therefore, as in the case of the structural models reported above, the cut-off dates were selected on the basis of the official dates of institutional changes in the policy regimes, while making sure that the sub-samples are not too short. This procedure was also followed by Boivin and Giannoni (2002; 2005).

Impulse response functions were computed for the unrestricted VAR and for the structural model. The methodology used to compute the structural impulse response functions is reported in Annex 1.A1. In the case of the pre-1999 policy regime, there does not seem to be a stationary solution to the structural model for Brazil, Chile and Mexico; the impulse responses are therefore omitted. Failure to identify a stationary equilibrium is not surprising, given the high volatility that characterised the pre-1999 monetary periods in these countries.

By and large, the shape of the impulse responses computed for the structural models tend to coincide with those of the VAR representation (Figure 1.2).[5] The VAR impulse responses suggest the presence of a price puzzle, whereby a positive interest rate shock is associated with an increase, rather than fall, in inflation, except for Brazil and Colombia in the current monetary regime. When a price puzzle exists, the response function is statistically significant only in the cases of Chile in the pre-1999 period and Mexico in the current policy regime. Only in the case of Colombia in the current policy regime do the impulse responses differ between the VAR and the structural model, with the latter exhibiting a price puzzle. Inclusion of a commodity price index in the VAR, as suggested in the empirical literature for the United States, does not solve the puzzle. This is consistent with the findings reported by Avendano and de Mello (2006), who estimate VAR and FAVAR models for these four countries over a similar time period and propose the inclusion of variables, such as monetary aggregates and measures of interest rate deviations from trend, to deal with the price puzzle in the impulse response functions.[6] Other studies have dealt with the price puzzle by adding considerably more structure or by including more endogenous variables in the VAR.[7] Notwithstanding these options for solving (or at least attenuating) the price puzzle, the VARs used to compute the impulse responses reported below were estimated including only inflation, the output gap and the interest rate as endogenous variables and the exchange rate as a predetermined variable, to facilitate comparison with the structural model.

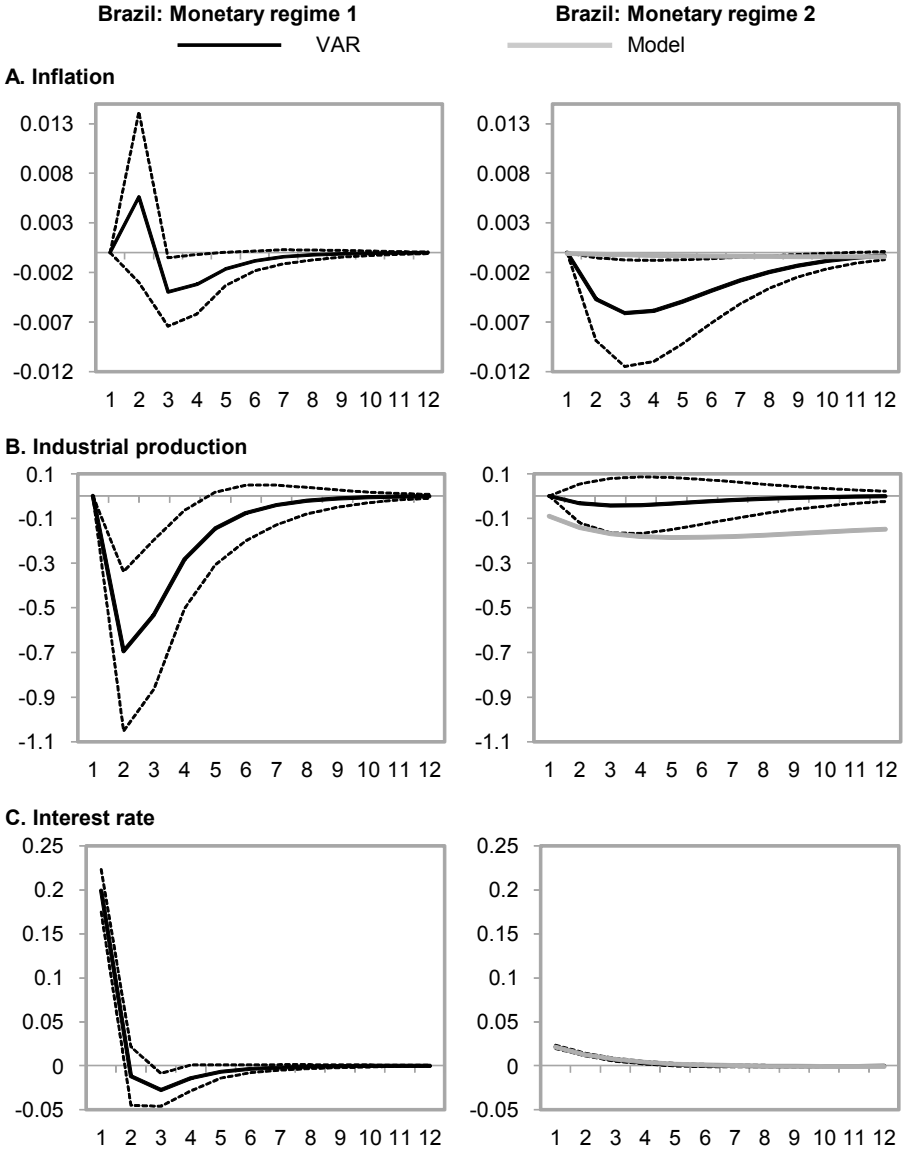
The responses of the output gap to a monetary shock are negatively signed in Brazil and Chile for the unrestricted VAR in both policy regimes (even though they are statistically significant only in the first regime) and for the structural model in the post-1999 regime, which is the only period for which

estimations could be performed. When a statistically significant positive reaction was computed (Colombia in the first monetary regime), it might be indicating that agents expect a reduction in future interest rates after the initial shock, which leads to a recovery in economic activity. In any case, the responses of economic activity to a monetary shock are milder in the current policy regime than in the previous one in all cases except Mexico. With regard to the interest rate response to a monetary shock, there is considerably more persistence in the current policy regime than in the pre-1999 period in Brazil and Chile and less so in Mexico.

It should also be noted that the impulse response estimates are fairly imprecise in some cases, which makes it difficult to ascertain whether they actually differ across policy regimes in a statistically significant manner. However, the results of the estimation of the structural models, showing important changes in the estimated policy reaction function, suggest that the changes in the responses across policy regimes are robust. The stronger estimated responses (except for Mexico) under managed exchange rates may be attributed to greater interest rate volatility due to the need to defend pre-announced pegs, especially against speculative attacks. Against this background, an important policy question is to identify the factors that lie behind the changes in macroeconomic volatility across policy regimes.

Figure 1.2. **Estimated impulse response to a monetary shock**

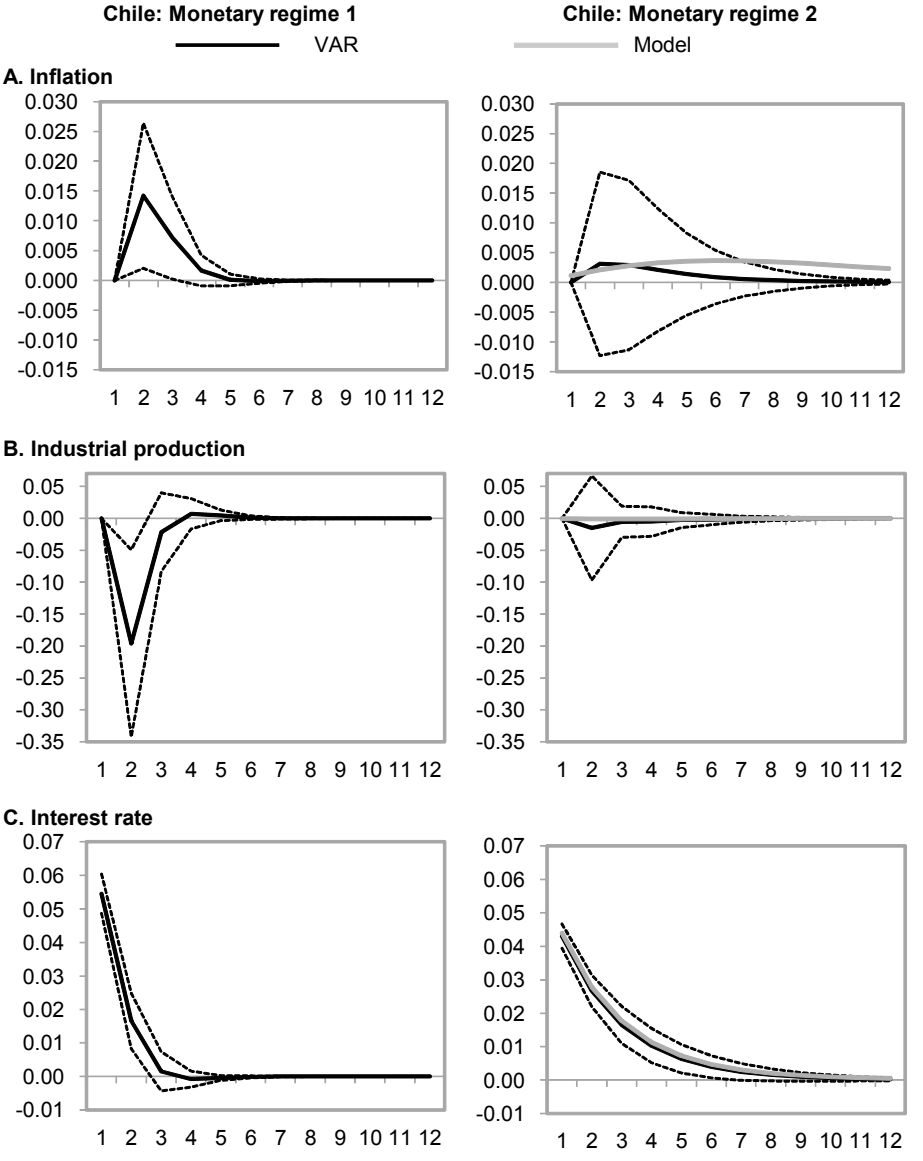
(Responses to a 1 standard-deviation innovation in the interest rate with ±2 standard-error bounds)



Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico, and authors' estimations.

Figure 1.2. **Estimated impulse response to a monetary shock** (*cont'd*)

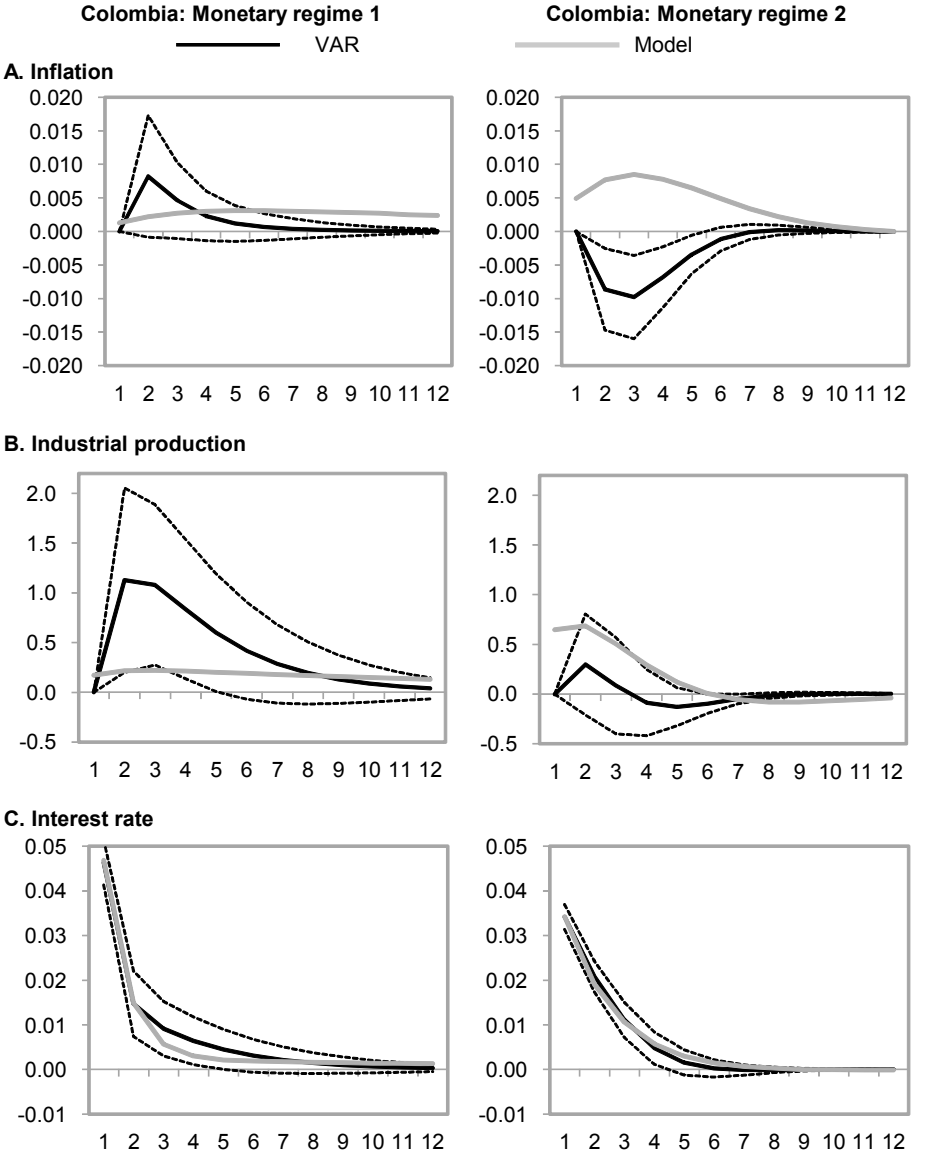
(Responses to a 1 standard-deviation innovation in the interest rate with ±2 standard-error bounds)



Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico, and authors' estimations.

Figure 1.2. **Estimated impulse response to a monetary shock** (*cont'd*)

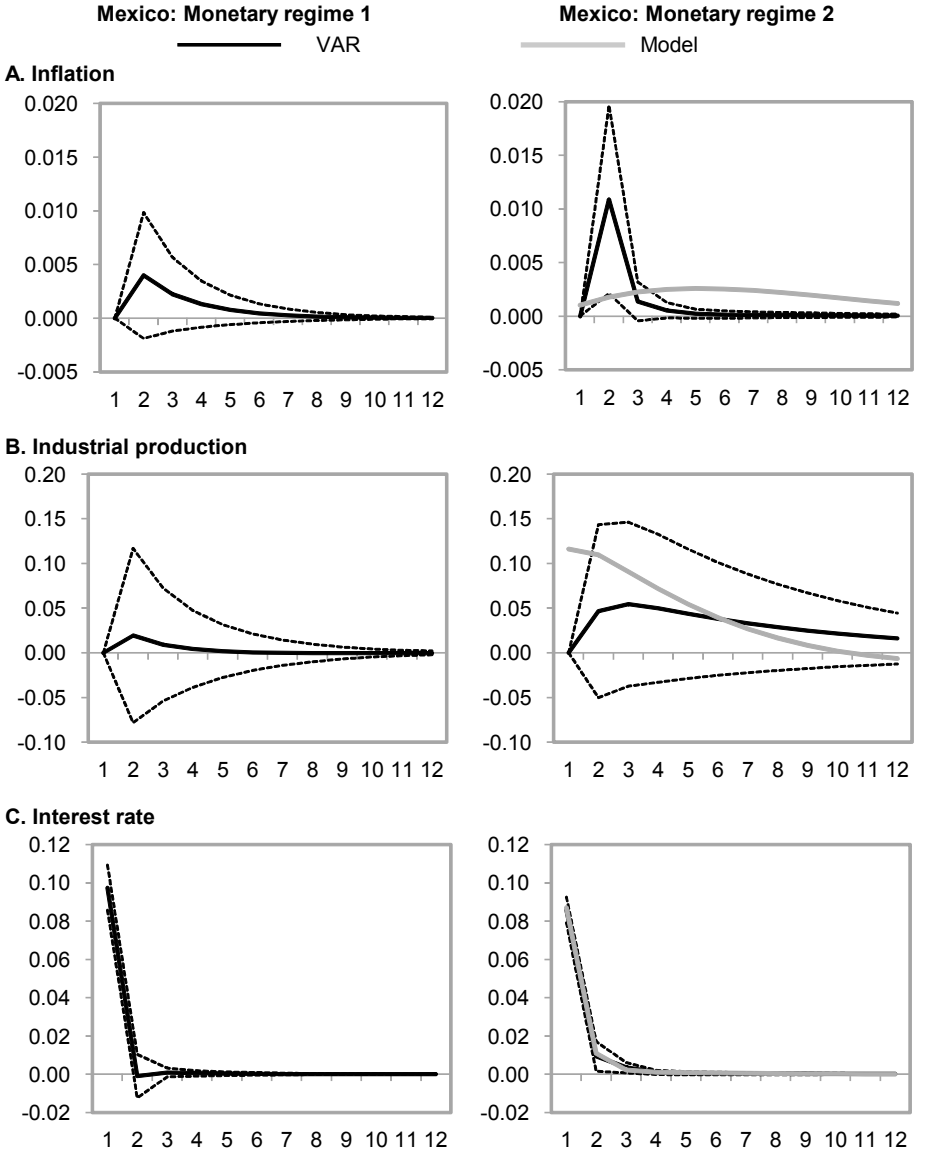
(Responses to a 1 standard-deviation innovation in the interest rate with ±2 standard-error bounds)



Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico, and authors' estimations.

Figure 1.2. **Estimated impulse response to a monetary shock** (*cont'd)*

(Responses to a 1 standard-deviation innovation in the interest rate with ±2 standard-error bounds)



Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico, and authors' estimations.

Counterfactual analysis

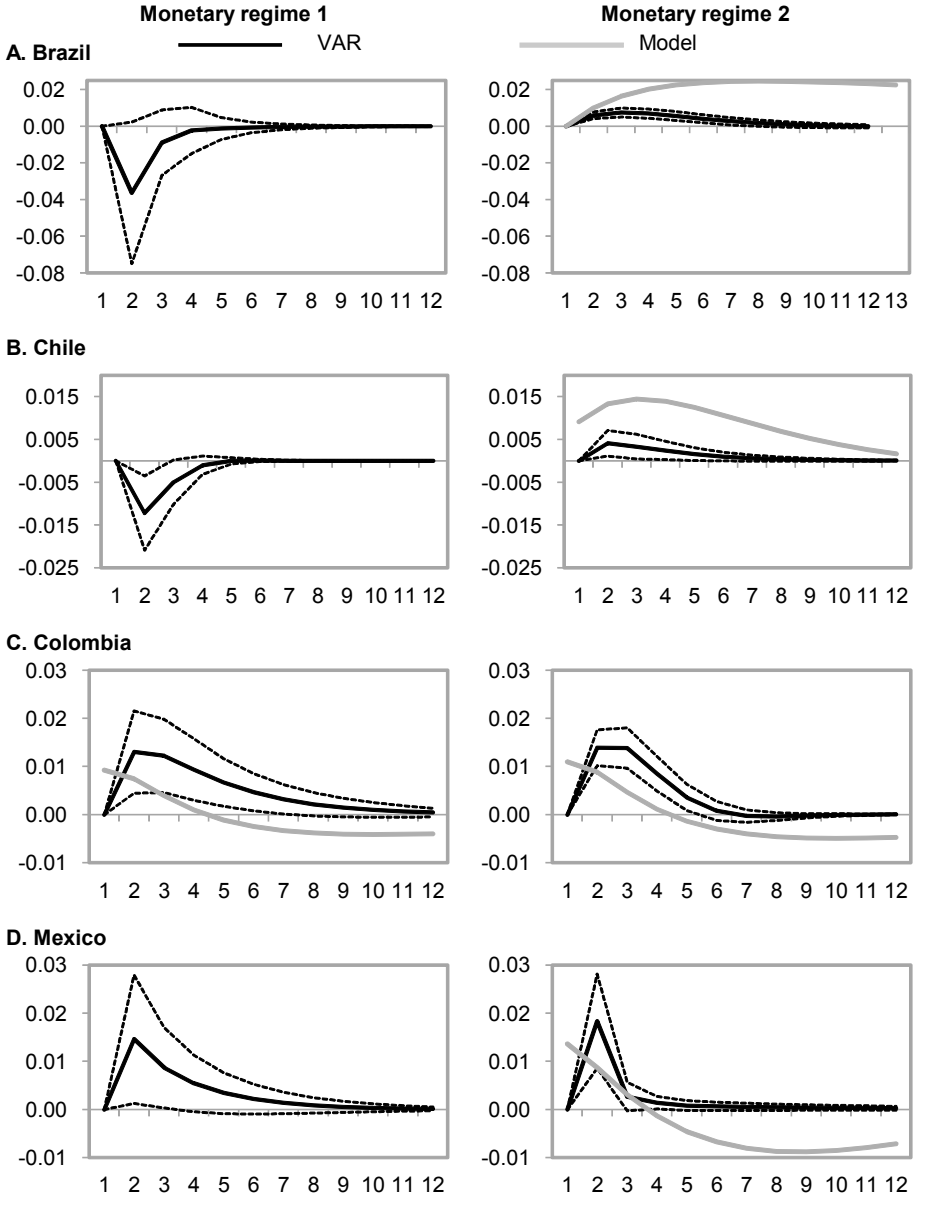
Policy versus shocks across policy regimes

Changes in output, inflation and interest rate volatility may be due to a shift in the policy regime but also to changes in the nature of the shocks hitting the economy. Different methodologies have been used to decompose the effect of policy and shocks on the variability of inflation and output over time. Cecchetti, Lopes-Lagunes and Krause (2004) construct an output-inflation variability frontier derived from a structural model and conclude that policy accounted for the bulk of the improvement in economic performance from the 1980s to the 1990s in a sample of industrial and emerging-market economies. An alternative approach consists of comparing volatility outcomes across time periods for different combinations of shocks and policy parameters. Using structural VAR analysis, Boivin and Giannoni (2002 and 2005) show that monetary policy has become more stabilising in the United States since the 1980s, because it has become more responsive to changes in inflation expectations. In turn, this stabilisation effect on both inflation and output is stronger than that of shocks, which have become milder. Instead, Ahmed, Levin and Wilson (2002) also estimate a structural VAR for the United States and show that milder shocks have accounted for most of the decline in output volatility since the 1980s. Likewise, the evidence reported by Moreno (2004), also for the United States, shows that more forward-looking price setting, due to greater flexibility in indexation mechanisms for wages and financial contracts, rather than the conduct of monetary policy *per se*, was the most important contributor to the fall in inflation variability in the 1990s relative to the 1980s.

When conducted under a managed exchange-rate regime, the focus of monetary policy is to defend a nominal peg, rather than to respond to changes in inflation expectations. Impulse responses can be computed for the unrestricted VAR and the structural model to assess the reaction of monetary policy to innovations in inflation across policy regimes (Figure 1.3). The unrestricted VAR estimations suggest that the central bank has reacted to inflationary shocks more strongly in the current policy regime both in Brazil and Chile, where monetary responses have also been more persistent.[8] Rather, monetary responses do not appear to have become stronger nor more persistent in the current policy regime in Colombia and Mexico. The impulse responses computed for the structural model are stronger than those computed for the unrestricted VAR in Brazil and Chile, and more persistent in all countries.

Figure 1.3. **Estimated monetary response to an inflationary shock**

(Responses of the interest rate to a 1 standard-deviation innovation in inflation with ±2 standard-error bounds)



Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico, and authors' estimations.

To shed further light on the role of policy and shocks, a counterfactual exercise in the spirit of Ahmed, Levin and Wilson (2002), Stock and Watson (2002) and Moreno (2004) was conducted as follows. The volatility of variable X in vector V, for $V = (\pi, y, r)$, given the monetary policy regime of period j (P_j) and the structure of shocks of period i (S_i), for $j = (1,2)$ and $i = (1,2)$, is denoted by $\sigma_X^2(P_j, S_i)$. Based on this notation, accepting the null hypothesis $H_0^1 : \sigma_X^2(P_1, S_1) / \sigma_X^2(P_2, S_2) > 1$ implies that volatility fell in the current policy regime (period 2) relative to the period-1 policy regime, based on each period's own shocks and policy parameters. This can be due to changes in the nature of shocks and/or the policy regime. The fall in volatility due to shocks can be assessed by testing the following two hypotheses: $H_0^2 : \sigma_X^2(P_1, S_1) / \sigma_X^2(P_1, S_2) > 1$, where volatility falls in period 2 relative to period 1 by holding the policy setting in period 2 unchanged relative to period 1 (*i.e.* the parameters of the monetary reaction function do not change across monetary regimes), and $H_0^3 : \sigma_X^2(P_2, S_1) / \sigma_X^2(P_2, S_2) > 1$, where volatility falls in period 2 relative to period 1 holding the policy setting in period 1 constant as in period 2 (*i.e.* the parameters of the monetary reaction function estimated for period 2 are set to hold in period 1).

A fall in volatility due to policy can be assessed by testing the following two hypotheses: $H_0^4 : \sigma_X^2(P_1, S_2) / \sigma_X^2(P_2, S_2) > 1$, where volatility falls in period 2 under the period-2 policy setting, holding shocks constant as in period 1 (*i.e.* the parameters of the monetary reaction function differ across policy regimes, but the shocks estimated in period 2 are applied to period 1); and $H_0^5 : \sigma_X^2(P_1, S_1) / \sigma_X^2(P_2, S_1) > 1$, where volatility falls in period 1 under the period-2 policy setting, holding shocks constant as in period 1 (*i.e.* the parameters of the monetary reaction function differ across policy regimes, but the shocks estimated in period 1 are applied to period 2). The counterfactual exercise therefore allows the estimation of the volatilities that would arise from a given combination of shocks and monetary policy parameters, keeping the remaining structural parameters in the model unchanged across monetary regimes. The factors that militate in favour of greater macroeconomic stability can therefore be uncovered from the data.

The results of the counterfactual exercise, reported in Table 1.2, suggest that inflation became more volatile across policy regimes in Brazil and Colombia, essentially as a result of shocks. This may be associated with an increased volatility in agricultural commodity prices after 1999, whereas the shocks that affected these economies in the second half of the 1990s had

operated predominantly through the exchange rate, rather than directly through inflation. On the other hand, the interest rate became less volatile in the current policy regime in all countries, except Chile, which is due to a change in the nature of shocks that have hit these economies since the change in these countries' exchange-rate regimes. Colombia is the only country where the change in policy regime is associated with a fall in output volatility, a finding that is essentially due to the change in the nature of the shocks that have hit the economy over the period of analysis.

The counterfactual analysis also shows that, controlling for differences in shocks, the policy regime shift appears to have increased interest-rate volatility in Brazil and Chile. Applying the period 1 policy parameters under the current shock scenario would have reduced volatility interest-rate volatility in these countries. This is most likely because shocks have become milder: a less persistent, less forward-looking monetary response, as in the previous regime, would have allowed the interest rate to revert to its pre-shock level more swiftly, thus reducing volatility. But less persistent, less forward-looking monetary responses might not have stabilised, and subsequently anchored, expectations during the initial phase of confidence-building after the regime transition. The counterfactual exercise also shows that applying the current monetary responses to the previous policy regime would have increased interest-rate volatility, although not by an amount that would make these volatilities statistically distinguishable. Given the magnitude of the shocks that hit these economies in the second half of the 1990s, the greater persistence in the monetary stance pursued in the current regime would have been inconsistent with exchange rate targeting and, therefore, exacerbated volatility.

These findings are related to a growing literature on the effect of gradualism in the conduct of monetary policy on inflation expectations. If the policy setting is credible and implemented in a transparent, forward-looking manner, monetary responses to inflationary shocks are mild (Woodford, 1999 and 2004), and the market's ability to forecast monetary policy is enhanced (Lange *et al.*, 2001). The empirical evidence reported by de Mello and Moccero (2006) for the same sample of Latin American countries under the current policy regime shows that greater variability in the monetary stance leads to higher volatility in expected inflation in Brazil, Colombia and Mexico. This suggests that interest-rate smoothing contributes to reducing volatility in inflation expectations, which makes it easier for the monetary authority to anchor expectations around the targeted level.

Table 1.2. **Counterfactual analysis: Brazil, Chile, Colombia and Mexico**[1]

	π		y		r	
	Brazil					
$H_0^1 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_2)$	0.29	***	1.39		33.38	***
$H_0^2 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_1,S_2)$	0.29	***	1.39		85.85	***
$H_0^3 : \sigma_X^2(P_2,S_1)/\sigma_X^2(P_2,S_2)$	0.28	***	1.38		43.52	***
$H_0^4 : \sigma_X^2(P_1,S_2)/\sigma_X^2(P_2,S_2)$	1.00		1.00		0.39	***
$H_0^5 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_1)$	1.01		1.01		0.77	
	Chile					
$H_0^1 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_2)$	0.93		1.07		0.80	
$H_0^2 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_1,S_2)$	0.88		1.07		1.49	
$H_0^3 : \sigma_X^2(P_2,S_1)/\sigma_X^2(P_2,S_2)$	0.92		1.07		1.04	
$H_0^4 : \sigma_X^2(P_1,S_2)/\sigma_X^2(P_2,S_2)$	1.05		1.00		0.53	**
$H_0^5 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_1)$	1.00		1.01		0.76	
	Colombia					
$H_0^1 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_2)$	0.60	**	1.65	**	1.72	**
$H_0^2 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_1,S_2)$	0.60	**	1.59	*	2.36	***
$H_0^3 : \sigma_X^2(P_2,S_1)/\sigma_X^2(P_2,S_2)$	0.60	**	1.93	***	1.62	*
$H_0^4 : \sigma_X^2(P_1,S_2)/\sigma_X^2(P_2,S_2)$	1.00		1.04		0.73	
$H_0^5 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_1)$	0.99		0.86		1.06	
	Mexico					
$H_0^1 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_2)$	1.09		0.74		2.31	***
$H_0^2 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_1,S_2)$	1.10		0.75		2.08	***
$H_0^3 : \sigma_X^2(P_2,S_1)/\sigma_X^2(P_2,S_2)$	1.10		0.75		2.95	***
$H_0^4 : \sigma_X^2(P_1,S_2)/\sigma_X^2(P_2,S_2)$	1.00		0.99		1.11	
$H_0^5 : \sigma_X^2(P_1,S_1)/\sigma_X^2(P_2,S_1)$	1.00		1.00		0.78	

1. The numbers reported are the ratios between the two standard deviations. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% levels, respectively, on the basis of an *F* test.

Source: Data available from the central banks of Brazil, Chile, Colombia and Mexico; and authors' estimations.

Conclusions

This chapter estimated a simple New Keynesian structural model for four Latin American countries that adopted a monetary regime characterised by inflation targeting and floating exchange rates in 1999: Brazil, Chile, Colombia and Mexico. The chapter's main findings are as follows:

- The post-1999 regime, characterised by inflation targeting and exchange rate flexibility, has been associated with stronger, more persistent responses by the monetary authority to changes in expected inflation in Brazil and Chile. The monetary stance has become less counter-cyclical in Colombia and Mexico than in the previous policy regime, but more counter-cyclical in Brazil. Mexico is the only country in the sample where changes in the nominal exchange rate were found to be statistically significant in the central bank's reaction function.

- The impulse reaction functions computed for unrestricted VARs on the interest rate, inflation and the output gap, as well as for the structural model, suggest that the responsiveness of monetary policy to inflationary shocks became stronger and more persistent in Brazil and Chile in the current regime. This is consistent with the formal abandonment of exchange rate targeting in these countries and the adoption of a more pro-active policy stance underpinned by the shift to inflation targeting.

- Lower interest-rate volatility in the post-1999 period owes much to a more benign economic environment. The change in monetary regime has not yet resulted in a reduction in output volatility, a finding that may be attributed to the relatively short time span of analysis. Colombia is nevertheless an exception, where greater output stability was found to be due essentially to milder shocks in the current policy regime, rather than the regime change itself. Inflation volatility was found to have increased in Brazil and Colombia, again due to a change in the nature of shocks. Given that the current policy regime has been characterised by milder shocks, the remaining volatility in the interest rate is due to greater monetary policy responsiveness of expected inflation, despite interest-rate smoothing, at least in the cases of Brazil and Chile.

Notes

1. See Cecchetti and Debelle (2006) for evidence and a survey of the recent literature on univariate analysis, Cecchetti, Flores-Lagunes and Krause (2004) for cross-country evidence based on structural models, and Boivin and Giannoni (2005) for evidence based on VAR modelling.

2. Peru is another inflation targeter in Latin America, but it was not included in the sample. This is because inflation targeting was formally adopted in 2002, which would have severely reduced degrees of freedom in the post-regime change sample. The Peruvian economy is also highly dollarised, which makes the monetary transmission mechanism somewhat different from those in the countries under examination (Leiderman *et al.*, 2006).

3. The timing of this structural break does not need to be known *a priori*. The date of the break is estimated from the data as the observation that maximises the absolute value of the unit root statistics (Zivot and Andrews, 1992).

4. The ADF test, unlike the other unit root tests, suggested the output gap exhibits a unit root only in Mexico.

5. The second monetary regime for Brazil excludes the transition period January-June 1999.

6. The authors suggest that introduction of an indicator of interest rate misalignment, defined as the interest rate deviations from a HP-filtered series, as an endogenous variable in the VAR instead of the policy interest rate solves the price puzzle for Chile and reduces it considerably for Mexico.

7. See Avendano and de Mello (2006) for a review of the empirical literature on monetary VARs for Latin American countries.

8. In Chile, a positive inflationary shock induces a negative reaction by the interest rate in the first period.

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Annex 1.A1

Solving the rational expectations model

This Annex describes the rational-expectations solution to the structural model defined by System (1.1)-(1.3) and computes the associated impulse response functions (IRFs). The system can be re-written in matrix form as:

$$\begin{bmatrix} 1 & -\lambda & 0 \\ 0 & 1 & \phi \\ 0 & -(1-\rho)\gamma & 1 \end{bmatrix} \begin{bmatrix} \pi_t \\ y_t \\ r_t \end{bmatrix} = \begin{bmatrix} \delta & 0 & 0 \\ \phi & \mu & 0 \\ (1-\rho)\beta & 0 & 0 \end{bmatrix} E_t \begin{bmatrix} \pi_{t+1} \\ y_{t+1} \\ r_{t+1} \end{bmatrix} + \begin{bmatrix} (1-\rho) & 0 & 0 \\ 0 & (1-\mu) & 0 \\ 0 & 0 & \rho \end{bmatrix} \begin{bmatrix} \pi_{t-1} \\ y_{t-1} \\ r_{t-1} \end{bmatrix} +$$

$$+ \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & \tau \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ e_t \end{bmatrix} + \begin{bmatrix} u_{\pi_t} \\ u_{y_t} \\ u_{r_t} \end{bmatrix}$$

Or, in compact notation:

$$BX_t = AE_tX_{t+1} + CX_{t-1} + TH_t + u_t, \qquad (1.A1.1)$$

where $u_t \sim iid(0, D)$ is the vector of structural errors, D is the variance-covariance matrix, 0 denotes a 3x1 vector of zeros, $X_t = (\pi_t\ y_t\ r_t)'$, $H_t = (0\,0\,e_t)'$, and B, A, C and T are matrices of structural parameters.

When a unique rational-expectations solution to System (1.A1.1) exists, it can be written in reduced form as (Anderson, 2006):

$$X_t = \Omega X_{t-1} + \sum_{s=0}^{+\infty} F^s \Phi u_{t+s} + \sum_{s=0}^{+\infty} F^s \Phi T H_{t+s}, \qquad (1.A1.2)$$

where $\Phi=(B-A\Omega)^{-1}$ and $F=\Phi A\Omega$.

Given that $E_t(u_{t+s}) = 0, \forall\, s \geq 1$, and assuming a random-walk process for the (log) exchange rate, Equation (A1.2) simplifies to:[1]

$$X_t = \Omega X_{t-1} + \Phi u_t + \Phi TH_t . \qquad (1.A1.3)$$

Using an undetermined coefficient approach to solve (1.A1.1), it follows that Ω must satisfy the following matrix polynomial equation: $\Omega = (B - A\Omega)^{-1}C$. For Ω to be an admissible solution to the system, it must by real-valued and exhibit stationary dynamics. Also, because Ω is a non-linear function of the structural parameters, there can be potentially no solution to the system or, instead, multiple stationary equilibria. Uhlig (1997) proposes an algorithm to solve for Ω and characterises the uniqueness and stationarity conditions for the solution.[2] However, when multiple equilibria exist, the algorithm says nothing about how to choose a particular solution among them. In such a case, the Blanchard and Kahn (1980) criterion is used.

The IRFs can be computed as the derivative of X_t with respect to u_{t-s}, using the following infinite-vector moving-average representation (VMA) derived from Equation (1.A1.3):

$$X_t = \sum_{s=0}^{+\infty} \Omega^s \Phi u_{t-s} + \sum_{s=0}^{+\infty} \Omega^s \Phi TH_{t-s} .$$

Notes

1. Remember that *et* is the first difference of the (log) exchange rate. Also, note that the implied reduced-form of the structural model defined by System (1.1)-(1.3) is simply a VAR(1) model with highly non-linear parameter restrictions (Moreno, 2004).

2. Anderson (2006) compares Uhlig (1997)'s algorithm with other methods to solve rational expectations models.

Chapter 2

Brazil: Taming inflation expectations

Afonso S. Bevilaqua, Mario Mesquita and André Minella,*

Central Bank of Brazil

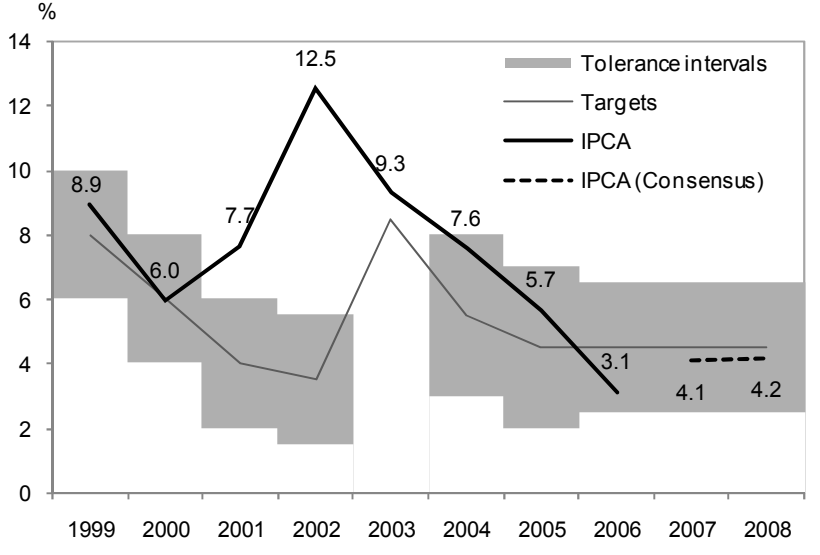
This chapter discusses the conduct of monetary policy in Brazil. It assesses the convergence of inflation and inflation expectations to the targets after the confidence crisis of 2002. The analysis covers the ensuing disinflation period and economic recovery, as well as the consolidation of disinflation in 2005-06. It is argued that the conduct of monetary policy and the overall improvement in macroeconomic fundamentals have contributed to creating a more stable, predictable macroeconomic environment, evidenced by a reduction in inflation uncertainty. The econometric evidence reported in the chapter underscores the critical role played by the inflation targets as "attractors" for expectations.

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Introduction and background

Brazil adopted inflation targeting (IT) in the aftermath of the devaluation and floating of the *real* in 1999.[1] The new regime was instrumental in anchoring expectations after the collapse of the nominal exchange-rate peg and signalled a substantial improvement regarding the transparency of monetary policymaking in the country. Initial concerns about fiscal dominance proved unfounded, as fiscal policy was strengthened in line with the requirements of the new regime. Instead, the early years of IT in Brazil were marked by three waves of currency depreciation, to which monetary policy reacted.[2] The *real* weakened by 48.9% in 1999, 18.5% in 2001 and 53.2% in 2002. While there were signs – and consensus amongst analysts – that the *real* had appreciated substantially before the float, the exchange rate moved progressively towards equilibrium in the following couple of years. Therefore, the potential and actual inflationary impact of depreciations became gradually more severe. For 2001, for instance, the Central Bank of Brazil (BCB) estimated that inflation would have been 4.8% in the absence of the exchange-rate depreciation, not too far from the 4% target, as opposed to the actual 7.7% rate (Figure 2.1).

Figure 2.1. **Brazil: Inflation, targets and expectations**



Source: Central Bank of Brazil.

Since the beginning of the IT regime, inflation expectations have played an important role in the policymaking process. Regular surveys of market expectations of inflation, taken amongst some 100 professional forecasters, mainly financial institutions, have been compiled since the early years of the regime, and a summary of consensus macroeconomic forecasts has been published weekly.[3] In order to strengthen incentives for an accurate reporting of forecasts, the BCB regularly publishes rankings of the best short- and medium-term forecasters of several variables. The survey system in place has been considered exemplary and has been emulated by other central banks.

In short, the BCB's monetary policy committee (Copom) guides its policy decisions on the basis of its own forecasts of inflation over the relevant time horizon and the prospective balance of risks. Market expectations of inflation are important inputs into the BCB's forecasting models, as is usual in this policy framework. Expectations, in turn, have been influenced by past inflation behaviour, the inflation targets, exchange-rate and commodity-price developments, economic activity and the stance of monetary policy. Recursive estimates suggest that the backward-looking component of market expectations has been ceding ground to the inflation target, which provides evidence that the IT system is gaining credibility. Nevertheless, as will be seen below, credibility has not been perfect, since inflation expectations seem to have over-reacted to current developments on many occasions, in particular to upward inflationary surprises. Thus, the BCB often had to act so as to prevent negative short-term developments from contaminating the medium-term outlook. In this sense, the process of disinflation has been, and still is, a process of taming inflation expectations.

Disinflation and recovery in 2003

The 2002 sudden stop of capital inflows and consequent currency depreciation left a burdensome legacy for monetary policy. The BCB's challenge was to undertake a major disinflation in an environment of limited credibility ("conservative" monetary policy having been a constant focus of heavy criticism during the 2002 electoral campaign) and after inflation expectations had risen in a seemingly persistent fashion. The monetary policy response began before the political changeover was completed in a one-off unscheduled meeting of the monetary policy committee on 14 October 2002, when the basic interest rate was hiked by 300 basis points to 21% per year. This was the first and last, to date, Copom meeting outside the pre-announced schedule since adoption of IT. Monetary tightening continued until February 2003, with a cumulative 550 basis-point increase in the policy interest rate, which peaked at 26.5% per year, complemented by an increase in the reserve requirements of commercial banks.

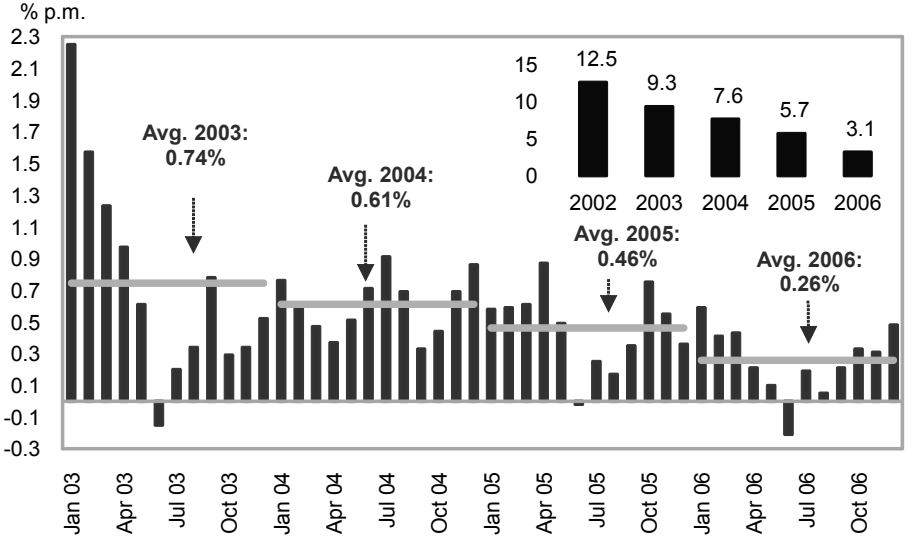
Given Brazil's history of chronically high inflation, which both thrived on and fostered sophisticated indexation techniques, monetary policymakers naturally had a stronger preference against too gradual a disinflation process, even if desirable from the viewpoint of minimising GDP volatility, although this argument is questionable (Ball, 1994). Issues of credibility also argued for faster, rather than more protracted, disinflation. *First*, despite the new government's commitment to fiscal austerity, confirmed by the increase in the target for the primary (*i.e.* before net interest payments) surplus of the consolidated public sector from 3.75% of GDP in 2002 to 4.25% in 2003, there was still concern about fiscal dominance. The argument was that monetary tightening would worsen the public debt dynamics, thereby leading to a depreciation of the *real* and higher, rather than lower, inflation (Blanchard, 2005). *Second*, another line of reasoning, which is still recurrent in Brazil, despite the achievements of recent years, refers to the effectiveness of monetary policy, which is alleged to be blunted by blockages in the transmission mechanism (arising from low credit-to-GDP ratios and limited, if not perverse, wealth effect due to a large share of floating-rate public debt) and the presence of indexation of utility prices and other contracts.

Thus, a strategy of relatively rapid disinflation was adopted, in spite of difficult initial conditions. The average monthly inflation rate between October 2002 and March 2003 was 1.9% (about 25.5% in annualised terms), and inflation expectations for 2003 continued to worsen until late April, peaking at 12.5%, compared with an (adjusted) inflation target of 8.5% and expectations for 2004 at 8%. It was only when Copom decided in its April meeting, against tremendous public outcry, to keep the Selic rate unchanged at 26.5% per year for the third month in a row that monetary resolve showed signs of paying off in terms of falling inflation expectations for both 2003 and 2004.[4] The Selic rate was kept unchanged again in May, and, by the June meeting, market expectations for 2003 and 2004 had receded to 11.7% and 7.4%, respectively. Copom opted for a modest 50 basis-point cut in June. When the committee met in July, expectations had fallen to 10.4% for 2003 and 6.5% for 2004, which prompted a further 150 basis-point cut, bringing the Selic rate to 24.5% per year.

A powerful signal that the government supported the disinflation strategy was given in late June, when it set the official inflation target for 2004 at 5.5%, although inflation was running at 12.5% at end-2002 and 4.5% for 2005, both with a tolerance margin of ±2.5 percentage points. The gains of assertive monetary policymaking were reaped in mid-year, when monthly inflation was very low (there was actually deflation in June), helped by appreciation of the *real* (Figure 2.2). As in the following years, this achievement quickly elicited claims that inflation was dead in Brazil and that the pace of monetary easing

could be increased. Copom's interpretation of events was that the mid-year collapse of inflation was a transitory event. The committee took comfort instead in the fact that, indeed, estimates of inflation persistence were on coming down, auguring well for further disinflation.

Figure 2.2. **Brazil: IPCA inflation**



Source: Central Bank of Brazil.

At that stage, the challenge was to calibrate the pace of monetary easing so as not to put the disinflation process at risk. Central bank officials signalled through statements and Copom minutes that rate cuts would continue as long as disinflation progressed, but that monetary easing would be gradual. Special effort was made to spread the usual message that monetary policy affects the economy through shifts in the entire term structure of interest rates, which in turn depends on the overnight rate, as well as market perceptions of future overnight rates. In a process of disinflation, the current Selic rate was by itself a particularly poor measure of the policy stance, as market rates for longer maturities, which are the relevant ones for pricing credit, already incorporated expected rate cuts. Too steep a (negatively sloped) yield curve could undermine the intended contractionary stance and therefore jeopardise the disinflation path.

With twelve-month headline inflation averaging 3% between June and November 2003, inflation expectations fell sharply, creating scope for significant easing. From the beginning of the easing cycle to November 2003,

the nominal Selic was cut by 900 basis points, and the one-year nominal rate fell by 820 basis points, while the inflation-adjusted one-year rate fell by almost 500 basis points. There was, thus, substantial monetary stimulus already in the pipeline.

Towards the end of the year inflation expectations for 2004 were close to 6% per year, against a target of 5.5% for the year and with 8% expected at the beginning of the year. Expectations for 2005 were at 5%, higher than the 4.5% target, but also lower than at the beginning of the year. Under these circumstances, another rate cut of 100 basis points was undertaken. By that time it was clear that the economy had recovered fairly rapidly from its early 2003 slowdown. In fact, after contracting in the second quarter of 2003 and growing by just 2% in annualised terms in the third quarter of 2003 growth surged to about 7% in the last quarter of the year.

Inflation rebound and policy response in 2004

Inflation had accelerated in late 2003 and early 2004, activity was strengthening at a healthy pace, and a substantial share of previous monetary impulses had yet to feed through the economy. In that environment, after a pause in the January meeting, Copom cut rates again in March and April by a more parsimonious total of 50 basis points. During the early months of 2004, rising prices of manufactured goods at the wholesale level posed a short-term risk for consumer price inflation. However, consumer-price inflation expectations remained stable throughout March and early April, which suggested that current inflationary pressures would not last long.

However, the outlook for inflation worsened substantially thereafter under various negative influences. The most visible trigger for this process, albeit not the only one, was a sudden, sharp depreciation of the *real* ahead of the beginning of the cycle of monetary tightening in the United States. The sovereign spread widened from 559 basis points at the end of March to 650 basis points at the end of June, and the exchange rate, which had been relatively range-bound around 2.90 *reais* per US dollar since the beginning of February, rose to 3.20 *reais* per US dollar within a few weeks. Interestingly, these movements were soon reversed, as the country's improved balance-of-payments position reasserted its influence over asset prices. Nevertheless, the damage to the inflation outlook was more lasting and would eventually elicit a policy response.

Inflation expectations for 2004 had been stable at just over 6%, compared with a target of 5.5%. Similarly, expectations for 2005 were stable at 5%. Revisions to forecasts in the first fourth months of the year mostly reflected

short-term inflation surprises and had not affected the market's medium-term inflation expectations. The situation nevertheless changed in May, when the *real* depreciated in an environment of strong economic activity, resulting in an increase in the inflation forecasts for wholesale and the so-called administered prices.[5] Inflation expectations for the coming twelve months increased from 5.5% at the time of the April Copom meeting to 5.7% in the May meeting and 6.0% at the time of the June meeting, a period in which the policy rate had been unchanged. Heightened uncertainty regarding the external scenario, thanks to the looming tightening in the United States, translated into increased uncertainty about the domestic inflation outlook, affecting the targets' role as an attractor for market expectations. The influence of the current and expected depreciation of the *real* over the inflation outlook called for additional caution. In sum, not only was there an upward shift in the path of expected inflation, but uncertainty surrounding this path was also increasing.[6]

It is worth stressing that currency depreciation was not the only issue, as other factors were also important drivers of the process. As of mid-2004 the economy was growing at about 5% per year, after two quarters of growth near 7%, which indicated that the output gap was probably closing. Moreover, indices of capacity utilisation in manufacturing were above historical averages, actually reaching unprecedented levels in some sectors. Clearly, these signs suggested that a depreciation of the *real* and rising commodity prices had hit the economy at a time when firms had favourable conditions to hike prices.

At the end of June, the National Monetary Council (CMN) set the inflation target for 2006 at 4.5% and narrowed the tolerance interval to ±2 percentage points. By that time, the prospects for further easing had dimmed, and market participants began to ponder (and price in) the possibility that a new cycle of tightening might be needed to ensure convergence of inflation to the targets. Inflation expectations continued to increase (from 6.1% at the time of the July Copom meeting to 6.2% in August), and the policy rate was still unchanged. Continuously deteriorating market expectations indicated that inflation would not slow down and converge to the target without policy intervention. Thus, in September the basic rate was increased to 16.25% per year, the beginning of the first cycle of monetary tightening under the IT regime that was not in response to financial distress (after peaking at around 700 basis points at the end of May, the sovereign spread was below 500 basis points in September; similarly, the *real* had strengthened from 3.19 to 2.86 *reais* per US dollar).

Clearly, given the lags in the transmission mechanism of monetary policy, it was important at the time to signal to the public the central bank's strategy for bringing about convergence to the 4.5% target for 2005-06, as it was clear that

inflation was going to deviate substantially from the targeted path in 2004. Therefore, in the September meeting minutes Copom outlined a gradualist approach to deal with the consequences of the expected overshooting of inflation in 2004. The committee estimated that regular inflationary inertia stemming from the expected 2004 overshooting would amount to 0.9% in 2005. Making use of the flexibility inherent in the IT regime and in a manner consistent with maximum transparency, the committee opted to accommodate two-thirds of this inertia by setting an explicit inflation objective of 5.1% in 2005, rather than the 4.5% central target. This policy move was tantamount to extending the length of the convergence period from 12 to 24 months, as the target for 2006 remained unaltered.

More importantly, by committing to a 5.1% objective for 2005, Copom indicated that it would not allow inflation to remain close to the 7% ceiling of the target range, a level to which market expectations seemed to be converging. In addition to laying out clearly its baseline disinflation objectives, Copom announced that it would respond asymmetrically to shocks that could disturb the baseline trajectory by remaining particularly vigilant against the effects of shocks that threatened to increase the deviation of inflation from the original target, while taking full advantage of favourable shocks that might help to bring inflation down towards that target.

Monetary tightening had limited initial impact on inflation and expectations. In the last three months of 2004 annualised core inflation was running at around 7.5% per year and rising. Inflation expectations for 2005 were hovering at 5.8%, higher than before the beginning of the tightening cycle, despite various factors that might have helped, such as a tighter policy stance, an appreciation of the *real*, signs of accommodation in economic activity and lower international prices of some important commodities. Market participants and professional forecasters were clearly sceptical about the prospects for disinflation. This scepticism had several causes, in addition to the inevitable credibility issues in a regime that had faced so much turbulence in its early years and whose institutional underpinnings were still evolving. As the balance of payments continued to improve and asset prices to rise, the link between the policy and market rates appeared to have become weaker than in previous cycles in a Brazilian version of the yield curve "conundrum". Three months after the 2001 tightening cycle had begun, the spread between the one-year and the policy rates had been at 540 basis points, and the *ex ante* real one-year interest rate had increased by 630 basis points.[7] This time, after three additional hikes, the yield curve had flattened, and the increase in the one-year real interest rate was just 40 basis points. Moreover, buoyant asset prices contributed to generate financial wealth and boosting consumer confidence, which may have hindered the transmission of the monetary tightening further.

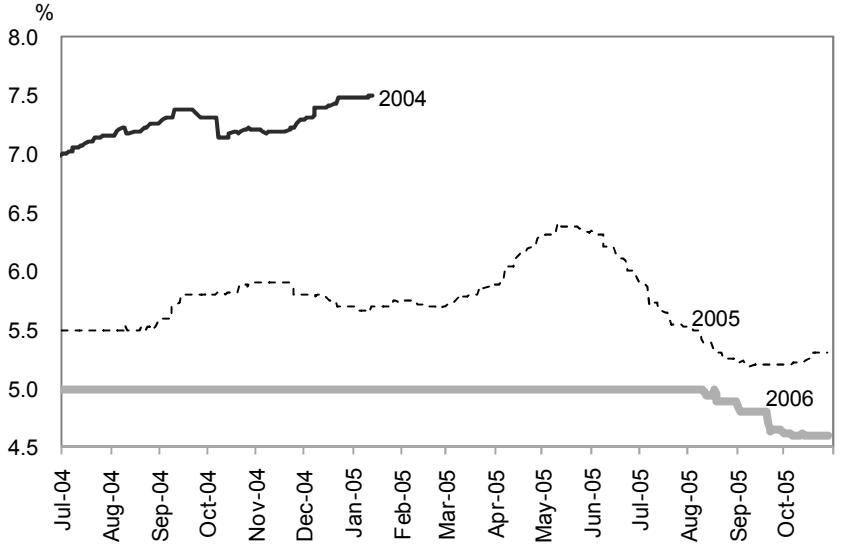
Last but not least, the institutional changes adopted in 2003 began to take effect, fostering credit growth, especially to the household sector, thereby supporting demand for consumer durables.[8] New lending to households increased by 9% between the third and fourth quarters of 2004, against an increase of 6% in the same period of 2003, and year-on-year household credit growth reached 37.8% in December 2004, compared with 29.3% in September. By the December Copom meeting, when the Selic rate was increased by 50 basis points to 17.75%, there had been no clear signs of convergence to the inflation target.

Consolidating disinflation in 2005-06

The first quarter of 2005 finally brought some relief to the inflation outlook. Longer-horizon projections by the central bank and independent analysts pointed to slower price increases. However, annualised core inflation was still at some 7.8%, far above the target. Despite improvements in the medium-term outlook, market participants were still revising upwards their inflation expectations for 2005 (from 5.7% in December 2004 to 5.9% in March 2005). In this context, the policy interest rate was raised by an additional 150 basis points in three monthly hikes of 50 basis points during the first quarter.

Monetary policy was at a crossroads in the second quarter of 2005. Forward-looking analysis and model projections of inflation carried out by the central bank were pointing towards convergence to the target sometime in 2006, but current rates of inflation remained stubbornly high. Moreover, under the influence of negative current inflation data, market expectations were still diverging from the target. Specifically, inflation expectations for the twelve months through December 2005 were moving towards 6.5%, compared with the objective of 5.1% and the original target of 4.5% (Figure 2.3). Thus, in April and May the policy rate was raised by another 50 basis points. These policy moves, which had not been anticipated, strengthened the perception amongst market participants that Copom would not allow inflation to become entrenched above the targeted path.

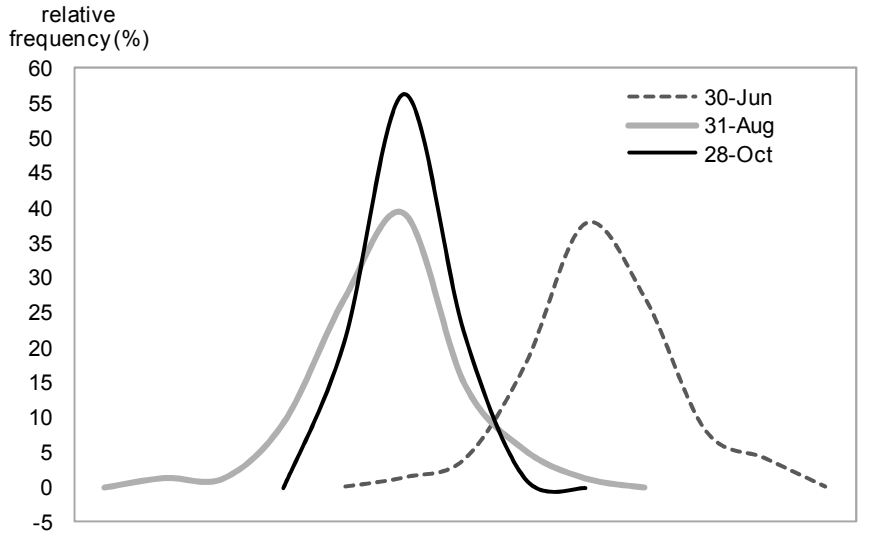
Figure 2.3. **Brazil: Market expectations for inflation, 2004-06**



Source: Central Bank of Brazil.

During the disinflation process, when central bank credibility is still being established, inflation expectations tend to over-react to short-term developments. This reinforces the case for a commitment by policymakers to allow positive surprises to be fully incorporated into firms' price-setting decisions, while actively counteracting negative shocks. The authorities' avowedly asymmetric stance meant that a series of favorable inflation surprises in June, July and August led to a sharp fall in the mean and dispersion of inflation expectations, as convergence toward the target accelerated (Figure 2.4). It is not that the last couple of 25 basis-point hikes broke inflation inertia; rather, the cumulative effect of previous policy moves combined with the signaling effect of these last few increases seem to have paid off.

Figure 2.4. **Brazil: Market expectations for inflation, 2005**



Source: Central Bank of Brazil.

An appreciation of the *real* on the back of strong balance-of-payments fundamentals contributed a great deal to disinflation as part of the transmission mechanism in an open economy. Although the tradable goods initially led the way towards the inflation target, the stance of monetary policy helped to spread the disinflation process to the prices of nontradables, including services.[9]

With the Selic rate unchanged until September, the disinflation process was consolidated during mid-2005, when the economy was cooling off. In fact, GDP growth would fall from an average of 3.2% in the first half of the year to nil in the second half. The argument for keeping the monetary stance tight despite a temporary deceleration of growth stressed the fact that the central bank was already pursuing an objective that exceeded the target set by the National Monetary Council. While moving towards the target, inflation expectations and inflation itself were above the 5.1% objective (inflation ended at 5.7% for the year as a whole). Moreover, there was no major supply shock at the time that would justify reconsidering the announced strategy and allow inflation to drift towards the ceiling of the tolerance band. In sum, the authorities tried to ensure that the Brazilian IT regime would deliver inflation hovering around the central target, instead of permanently moving between the central target and the ceiling of the tolerance range. Short-term costs in terms of foregone economic activity should be seen as an investment in stability, which would pay off in the years to

come through increased monetary policy credibility and effectiveness. Likewise, a reduction in the inflation risk premium would lead to lower real interest rates in the medium-term, and hence faster growth.

In September 2005 inflation expectations for 2006 were down to 4.6%, close to the 4.5% target, and a new process of monetary easing began with a 25 basis-point cut. This easing was followed by additional cuts of 150 basis points in the last three policy meetings of the year. In October 2005 Copom announced that, owing to the economy's reduced vulnerability to shocks, it would lower the frequency of its meetings from twelve to eight per year – every 45 days or so – starting in January 2006. The easing cycle that began in the third quarter of 2005 was the first sustained monetary relaxation under IT that did not coincide with the recovery period after a financial crisis and, as a result, witnessed smaller initial changes in asset prices. In spite of the effects of monetary policy shifts on the relevant macroeconomic variables, the old theme of ineffectiveness emerged again in the course of the easing cycle.

Because the previous easing cycle (2003-04) had been largely anticipated by market participants, the yield curve became inverted in the second quarter of 2003, leading to a fall in the cost of credit, which sustained the recovery from the third quarter. The same type of anticipation happened in 2005. Longer rates (specifically the 360-day swap rate) began to fall by April 2005, five months before the actual beginning of the easing process, and, as seen above, at about the same time as inflation started to turn around. Understandably, however, this effect was more muted than in 2003, when the policy rate had been raised much higher: when the 2003 loosening cycle began, the spread between the long-dated and the policy rates was -330 basis points, whereas in the beginning of the current cycle this spread was -159 basis points. In both episodes, the yield curve would gradually become less inverted, but this flattening process started earlier in the 2003-04 cycle.

Thus, the qualitative behaviour of the yield curve in 2005 was not a novelty. Neither could the fact that longer rates started to fall ahead of the policy rate cuts and that their fall slowed down while the basic rate continued to fall be interpreted as evidence of any decline in policy effectiveness. On the contrary, longer rates seem to have become, if anything, more sensitive to actual and expected changes in the policy rate. This, in turn, is consistent with the hypothesis that monetary policy has gained credibility and works through smoother movements in the policy rate. It is also consistent with a scenario in which, with lower macroeconomic vulnerability to shocks, risk premia are lower and less volatile.

Copom continued to cut the policy interest rate aggressively throughout early 2006, bringing it back to 15.25% in May, a level that had until then been the lowest under IT. At that meeting the committee reduced the pace of easing from 75 to 50 basis points. The move had been signalled in the minutes of previous policy meetings and was anticipated. Yet, the decision came during a period of stress in international financial markets, which led to a spike in local market rates. A few market participants actually positioned themselves for a cut of just 25 basis points or even a pause in the easing process. Yet, the economy had become more resilient to mood swings in international markets, basically through substantial external deleveraging, and asset prices soon recovered, as it became clear that the changing international environment would not endanger access to external funding.

Rather than the external scenario, at that stage the main risks to an otherwise benign inflation outlook was the transmission mechanism of monetary policy and the behaviour of commodity prices, especially oil. Given the relatively short time series since adoption of IT, estimates of the lags of the transmission mechanism are inevitably less robust in Brazil than in economies with a longer history under the monetary policy regime in force. Moreover, recent innovations in the credit market have the potential for impinging on the transmission mechanism. In addition, the easing process had lasted more than a year at the time of writing and brought nominal and inflation-adjusted interest rates down to historical lows. If the traditional pattern holds, however, domestic demand would not yet have been fully affected by the monetary easing already observed.

International oil prices continued to increase until late August but receded thereafter. Nevertheless, oil prices were still highly volatile, and a new upward trend could not be ruled out. While Brazil's self-sufficiency in oil shields the current account from oil-price shocks, rising fuel costs could have an important effect on inflation, not only through their direct impact on the official consumer price index (IPCA), but also through likely increases in administered prices, such as bus fares, and other potential second-round effects. Moreover, higher oil prices feed through the important petrochemical production chain and tend to have a non-negligible impact on inflation expectations.

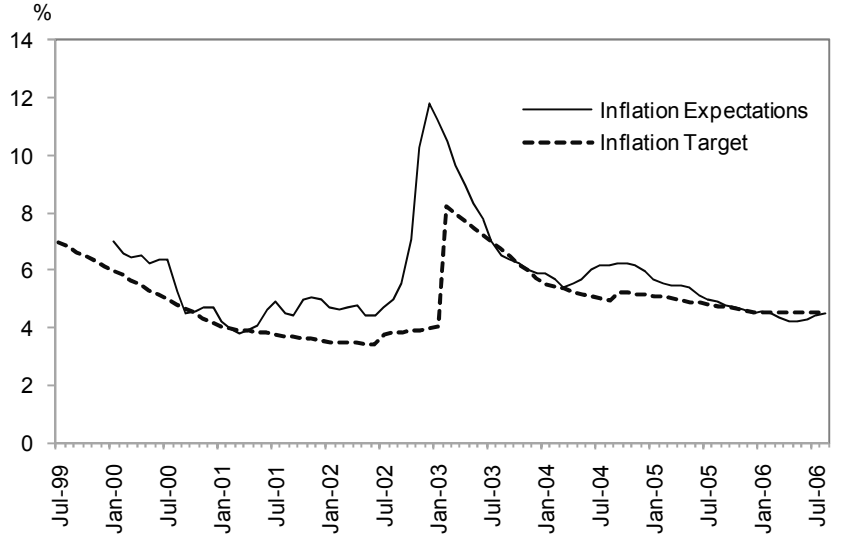
Inflation expectations continued to drift lower throughout 2006. Median market forecasts for inflation in 2006 fell below the 4.5% target in early April, and those for 2007 did so some five months later. Specifically, at the time of writing market expectations for 2007 were around 4.1%, compared with a target of 4.5% ±2 percentage points. Copom continued to cut the policy rate throughout the second half of 2006 in a total of 200 basis points in four meetings, bringing it to 13.25% in November, its lowest level ever. In 2006, for

the first time since adoption of IT, inflation undershot the central target but remained within the tolerance band, closing the year at 3.1%. This was a novel experience for Brazil, although quite usual for other inflation-targeting economies. Its importance should not be underestimated, since private agents, if they regard the lower half of the tolerance band as all but unattainable, would hardly choose to assign to inflation a subjective probability distribution with a mean at the central target. For as long as expectations remain biased towards the upper half of the tolerance range, the monetary authority has to keep leaning against such scepticism just to hit the central target.

Inflation expectations: convergence to the targets and lower inflation uncertainty

The critical test for implementation of IT is whether or not monetary policy is able to anchor expectations at the target. In the early years of the regime, the economy underwent several shocks, as discussed above; consequently, in some periods the central bank pursued either adjusted targets, such as the one announced in January 2003, or an off-centre objective within the original target range, announced in September 2004, which constituted the focal point for agents. In the early stages of IT, expectations converged to the declining targets. But, during the confidence crisis of 2002, they deviated substantially from the target path (Figure 2.5). Recently, however, they have been put back on track.

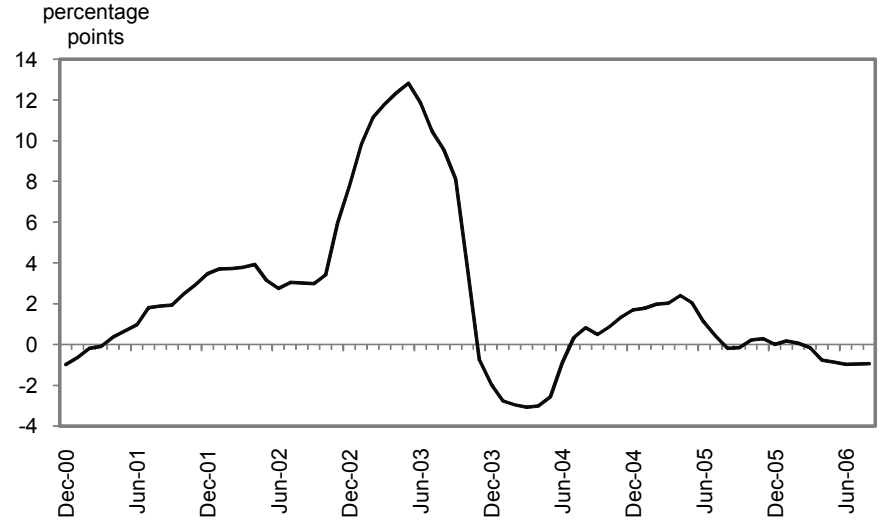
Figure 2.5. **Brazil: 12-month-ahead inflation expectations and targets, 1999-2006**



Source: Central Bank of Brazil.

There is evidence that monetary policy under IT and the overall improvement in macroeconomic fundamentals have contributed substantially to creating a more stable, predictable economic environment in Brazil. In particular, there are signs that uncertainty about inflation has declined. One such sign is the behaviour of forecast errors, measured as the difference between 12-month actual and expected inflation (Figure 2.6). Since the forecast horizons overlap over time, those errors are highly correlated. Rising inflation in 2001, and even more so in the second half of 2002 and first quarter of 2003, yielded forecast errors as high as 12.8 percentage points. However, as price acceleration was reversed, forecast errors declined. Most importantly, forecast errors became negative from November 2003 through June 2004 (*i.e.* expectations formed during the confidence crisis clearly overestimated future inflation). The trough of negative errors corresponds to inflation expectations at 9% formed in April 2003, compared with an inflation outturn of 5.9% in March 2004. This shows both the magnitude of the task faced by policymakers in 2003 and the extent of the change that was achieved. In recent years, forecast errors have been substantially lower: from July 2005 through August 2006 all forecast errors were lower than 1 percentage point in magnitude.

Figure 2.6. **Brazil: 12-month forecast errors: Actual minus forecasted inflation, 2000-06**

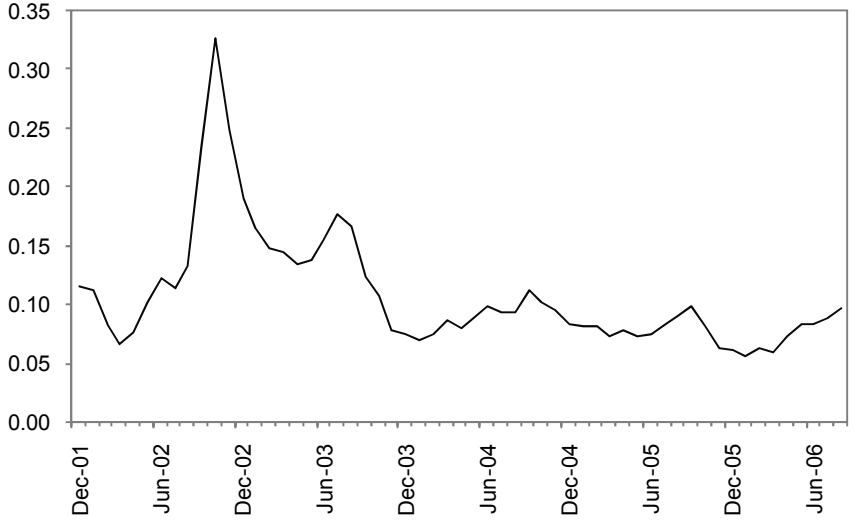


Source: Central Bank of Brazil.

Another indicator of inflation uncertainty is the dispersion of inflation expectations across survey respondents. Using the United States Survey of Professional Forecasters, Giordani and Soderlind (2003) computed aggregate inflation uncertainty as the combination of individual uncertainty (average standard deviation of individual histograms) and disagreement on the point forecast. In the case of the Brazilian survey, however, respondents provide only point forecasts instead of probabilities for different intervals, and the only available measure of uncertainty is disagreement among participants. In spite of this limitation, disagreement seems to capture to a large extent the degree of inflation uncertainty, as it is known to move together with individual uncertainty in the United States survey (correlation of 0.6). The coefficient of variation across respondents, measured as the ratio of standard deviation to the sample mean, soared above 0.3 between mid-2002 and mid-2003 but remained in general below 0.1 after late 2003 (Figure 2.7). After peaking at 2.6 percentage points, the standard deviation averaged 0.4 percentage points in the last two years.

Figure 2.7. **Brazil: Dispersion of inflation expectations, 2001-06**

Coefficient of variation



Source: Central Bank of Brazil.

Furthermore, there is evidence that the risk premium implicit in longer-term interest rates has declined.[10] Lower uncertainty about future inflation and, more directly, about future movements in interest rates tends to

strengthen the transmission mechanism of monetary policy, as it increases the signal/noise ratio of policy actions. Moreover, the role of inflation targets as attractors for inflation expectations is found to be statistically significant in econometric exercises. Initially, we simply regress inflation expectations on inflation targets in an exercise similar to those found in the literature that tests for rational expectations. Our concern is to test whether there is a systematic deviation of inflation expectations from the target (*i.e.* a constant term different from zero) and whether movements in the target affect expectations: if expectations are well anchored around the targets, the slope coefficient is close to one. We found that the constant term is positive and significant at the 10% level, indicating that inflation expectations were higher than the target over some relevant period (Table 2.1, model I). On the other hand, an estimated coefficient on the inflation target that is statistically different from zero and not different from unity underscores the important role played by targets in the expectation formation process. These results, however, have to be analysed with caution because of the problem of omitted variables in the regression.[11]

Table 2.1. **Brazil: Estimations of inflation expectations, 2000:1-2006:8**

Dependent variable: 12-month ahead inflation expectations

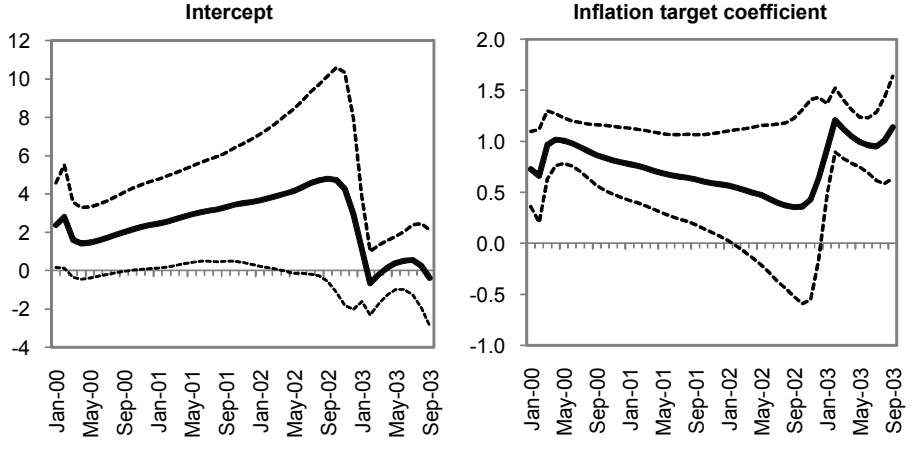
Regressors	Specifications					
	I		II		III	
Constant	1.81 (1.03)	*	0.25 (0.58)		0.97 (1.00)	
Inflation target (12-month ahead)	0.80 (0.18)	***	0.77 (0.23)	***	0.60 (0.29)	**
Output gap (-2)			0.09 (0.11)		0.14 (0.08)	*
12-month inflation (-1)			0.20 (0.11)	*	0.09 (0.10)	
6-month nominal exchange rate change (-1)			0.06 (0.01)	***		
Embi+ Brazil (-1)					0.15 (0.05)	***
Real effective exchange rate gap (-1)					0.08 (0.03)	***
R-squared	0.2939		0.6904		0.7995	
Adjusted R-squared	0.2849		0.6739		0.7859	

Note: Standard errors – shown in parentheses – were corrected by Newey-West heteroskedasticity and autocorrelation consistent covariance matrix estimator since estimation residuals present autocorrelation and heteroskedasticity. *, ** and *** indicate the coefficient is significant at the 10%, 5% and 1% levels, respectively.

Source: Central Bank of Brazil.

To assess the behaviour of these coefficients over time, we also estimate 36-month rolling regressions. In particular, we are interested in checking whether a sample period that does not include the 2002 confidence crisis yields considerably different results (Figure 2.8). For the sample period including the confidence crisis, the point estimates for the constant are higher than four and statistically significant, whereas for the recent period they are around zero and not significant. The coefficient declines abruptly for the sample starting in 2003, which excludes the months immediately prior to adoption of the adjusted target, when the difference between inflation expectations and the target was large. This tends to increase the magnitude of the intercept.

Figure 2.8. **Brazil: 36-month rolling regressions: Intercept and inflation target coefficient**[1]



1. The dates on the horizontal axes refer to the beginning of the rolling samples and the dashed lines are the bounds of the confidence intervals around the estimated coefficients.

Source: Central Bank of Brazil.

The behaviour of the coefficient on the inflation target over time also reflects the different stages of implementation of IT in Brazil. The magnitude of its estimates starts around unity but decline to less than one-half and become statistically insignificant as the sample period includes mainly the confidence crisis. For the recent period, however, the coefficient is significant and close to unity. Therefore, these regressions underscore the important, albeit not uniform, role played by the inflation targets, and in particular for the recent period, in better anchoring expectations.[12]

Nevertheless, the mere existence of a target does not tell the whole story. Other regressors must be included in the regression in order to assess the influence of different variables on the behaviour of inflation expectations. The objective of the exercise is also to test the robustness of the previous results. To this end, we include variables that, according to a basic Phillips-curve framework, should affect inflation, such as the inflation target, the output gap (computed as the HP-filtered industrial production series), six-month nominal exchange-rate changes and accumulated twelve-month inflation.[13] We find that the constant and the output gap are not statistically significant, whereas the other coefficients are all significant and have the expected signs (Table 2.1, model II). Furthermore, the coefficient on the inflation target is not statistically different from unity. The coefficient on the exchange-rate change is 0.06, which is similar to the pass-through coefficient usually found in Phillips-curve estimations for Brazil using data for the same period. Past inflation also affects inflation expectations, although the point estimate is relatively low: a one-percentage-point increase in actual twelve-month inflation raises twelve-month-ahead inflation expectations by 0.20 percentage point.

Of course, the presence of statistically significant regressors, except for the inflation target, is not necessarily an indication of low credibility in the monetary regime, but rather of how rich and complex the transmission mechanism is and of the fact that even highly credible IT regimes cannot completely eliminate fluctuations in inflation, including those associated with the business cycle. The simple presence of lags in the transmission mechanism of monetary policy implies that not all inflationary pressures will be curbed completely in the short run. Note that the dependent variable is not defined as expectations of inflation twelve months ahead, but as expectations of the twelve-month inflation rate twelve months ahead. It includes, therefore, the very short run.[14]

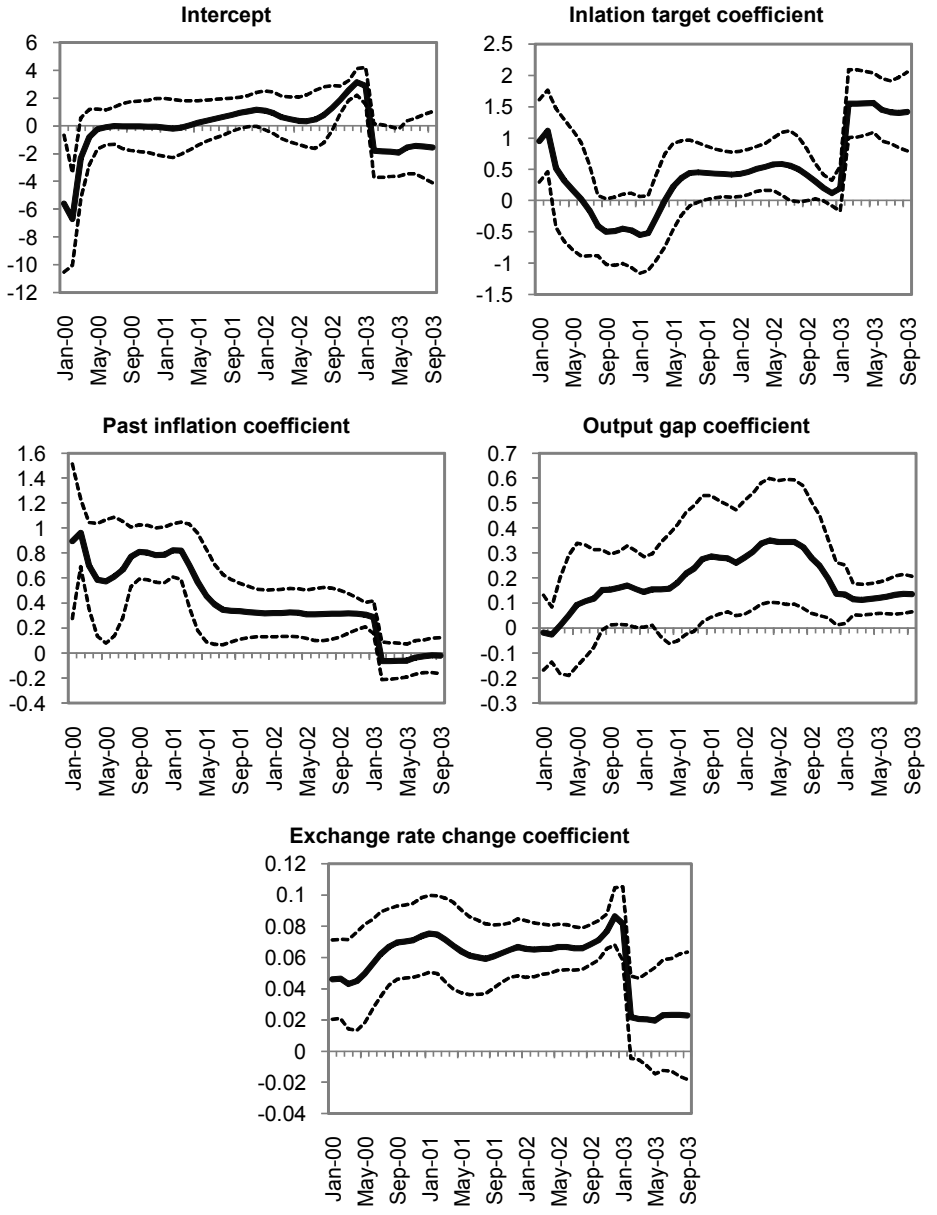
We also report the parameter estimates of 36-month rolling regressions (Figures 2.9). Although the point estimates differ from those in the previous regressions, the pattern is similar: in the sample period that includes mostly the confidence crisis, the constant term is significant and the coefficient of the inflation target is low or insignificant, whereas in the recent period the opposite is true (the intercept is even negatively signed, reflecting the downward trend of inflation expectations). Furthermore, we cannot reject the hypothesis that the inflation target coefficient is unity. The other coefficients underscore two important results. In the recent period, the coefficient on the exchange-rate change is lower (even not significant), indicating possibly a reduction in the exchange-rate pass-through. Most importantly, the coefficient on past inflation is around zero and not significant. Those results are also consistent with an increasing role played by the inflation target.

As a final robustness exercise, we consider an additional specification, which includes the Embi+ Brazil spread and the gap between the real effective exchange rate and its trend (calculated using an HP filter) instead of the change in the nominal exchange rate (Table 2.1, model III). The main difference is that past inflation is not significant in this specification when considering the full sample. The results using a rolling regression (not shown) are by and large similar to those found in the previous specification. In particular, the coefficient of past inflation is significant for the period including mainly the confidence crisis, but it is not significant in the recent period.

Conclusions

Price stability is a precondition for faster sustainable growth. Stability should contribute to creating an environment conducive to long-term financing of the public debt and the private sector, including of course labour-intensive industries, such as construction. But long-term planning requires not only that agents be comfortable with the central bank's forecasts of inflation, but also that they attach low a probability to outlying events. That is to say, what matters is not only the mean or median consensus forecast of inflation, but also the floor and – more importantly, given Brazil's history of large upward inflation surprises – the ceiling of such forecasts.

Figure 2.9. **Brazil: 36-month rolling-window regressions**[1]



1. The dates on the horizontal axes refer to the beginning of the rolling samples and the dashed lines are the bounds of the confidence intervals around the estimated coefficients.

Source: Central Bank of Brazil.

In this regard, while much has been achieved, Brazilian monetary policy still needs to establish a firmer track record of monetary stability. An imputed ceiling of inflation expectations twelve months ahead (which we calculated simply as the sum of mean and two standard deviations of inflation forecasts) has averaged 7.2% per year since December 2001. Most of the time, this ceiling has been within 5 to 10% per year, and about 15% of the time it has actually exceeded 10% per year. Only 13% of the time has the ceiling of market expectations of inflation been below 5% per year (it currently stands at some 4.6%).[15]

The Brazilian experience with inflation targeting illustrates, perhaps more forcefully than most other cases, the importance of credibility and the consequences of a lack thereof. Credibility was negatively affected by an erroneous notion that the government would not support stability-oriented, autonomously implemented monetary policymaking. In addition, a widespread misunderstanding of how monetary policy works, with recurrent concerns about policy ineffectiveness, seems to have prevailed. These handicaps have increased the effort required to achieve and entrench disinflation but have not weakened the resolve of the central bank to anchor inflation expectations and to deliver inflation convergence.

Notes

1. The first two sections draw heavily from Bevilaqua and Loyo (2005).

2. Bevilaqua and Azevedo (2005) describe foreign-exchange developments during this period.

3. In addition to forecasts of various inflation indices (annual and monthly), the weekly publication includes annual forecasts of interest rates, exchange rates, the trade and current-account balances, FDI flows, GDP growth, industrial production, and net public-sector debt stocks. The BCB's website provides daily data on the median, average and standard deviation of inflation forecasts, starting in January 2000 for the official inflation index. The existence of market for long-dated inflation-linked government bonds in principle creates scope for the computation of inflation expectations from asset prices. However, relatively low liquidity at time horizons that are policy relevant has so far limited the reliability of these indicators.

4. Targets are set by the National Monetary Council (CMN) in June for two-year-ahead calendar-year inflation. However, in January 2003, the BCB announced that it would follow an adjusted target of 8.5% for 2003 and 5.5% for 2004.

5. About one-third of the official inflation index (IPCA) consists of prices that are set by contracts, rather than by demand-and-supply forces. These prices are referred to as "administered". These contracts often include backward-looking indexation clauses linking the change in administered prices to the accumulated changes in the IGP-DI family of inflation indices, in which wholesale prices dominate and which are themselves highly sensitive to exchange-rate changes, as they have an important commodity component. Thus, real depreciation and/or increases in international prices of export commodities tend to have a meaningful lagged impact on administered prices.

6. For example, the standard deviation of twelve-month-ahead inflation expectations rose from 0.43 percentage point on average in April to a peak of 0.76 percentage point around the September meeting.

7. The spread was also very wide, at some 360 basis points, at a similar point in the 2002-03 tightening cycle.

8. Expansion of payroll-backed loans, regulated by a 2003 law, was, and remains, particularly strong.

9. See the box entitled "Preços de Itens não Comercializáveis – Evolução Recente" in Central Bank of Brazil (2006).

10. See the box entitled "Conteúdo Informacional dos Spreads de Taxas de Juros" in Central Bank of Brazil (2006).

11. We cannot assert that targets are uncorrelated with omitted variables, because they have been set on the basis of the country's inflation history.

12. The relevant role played by the targets was also found for a shorter sample size in Minella *et al.* (2003) and Cerisola and Gelos (2005). See also Alves and Areosa (2005).

13. We use a six-month change of the exchange rate, because monthly changes are too noisy. The output gap is lagged twice instead of once, because industrial production data are released with a two-month lag. A shortcoming of the regressions is that revised data are used and the HP filter was applied to the full sample series.

14. Moreover, since inflation is calculated using average prices during the month, price increases that take place after the first week of the month also show in the index of the following month.

15. Inflation within the 5-10% range is clearly outside what most economists, and most central banks, would normally associate with the notion of price stability.

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Chapter 3

Inflation targeting in Chile: Experience and selected issues

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This chapter discusses the Chilean experience with inflation targeting (IT). Emphasis is placed on a number of institutional characteristics of the Chilean IT regime that have contributed to, or acted as a pre-requisite for, a good track record of inflation control. The chapter also sheds light on particular macroeconomic outcomes, including changes in the dynamics of inflation, as well as on selected practical issues in the conduct of monetary policymaking under IT, including the role of inflation expectations and the exchange rate.

* I thank Fabian Gredig for very efficient assistance. All remaining errors are my own. This paper does not necessarily reflect the views of the Board of the Central Bank of Chile. A preliminary version of this text was published as "Inflation targeting in Chile: Experience and selected issues", *Economic Policy Papers* No. 22 , Central Bank of Chile, November 2007.

Introduction

Chile's macroeconomic performance over the last couple of decades, and particularly its macroeconomic framework during the 2000s, has been very well evaluated in different economic policy circles. The OECD country reports on Chile and the International Monetary Fund's Article IV consultation documents have usually praised the Chilean macroeconomic framework and management track record. One particular exceptional achievement in the past eighteen years has been the successful implementation of inflation targeting (IT), first partially during the 1990s and then fully during the 2000s. Indeed, the conduct of monetary policy under IT has resulted in the introduction of a strong, credible nominal anchor in a country that had endured high, unstable inflation for many decades (Table 3.1). Failed exchange rate-based stabilisation efforts in 1962 and 1982 contrast with the sustained decline in inflation in 1990-99 and its rather stable behaviour since then.

Of course, not only IT but also many other factors have helped to control inflation in Chile, including global developments. Internally, a number of institutional characteristics have favoured or even been a prerequisite for this outcome, including the independence of the Central Bank of Chile (CBC), a responsible fiscal policy stance and a strong financial system. This paper revisits the Chilean experience with IT, with a focus on some of these institutional characteristics, particular macroeconomic outcomes, and a few selected practical issues.

Table 3.1. **Chile: Inflation outturns, 1925-2006**

	Mean (in %)	Standard deviation (in %)	Coefficient of variation
1925-2006	39.2	89.7	2.3
1925-1989	47.5	99.1	2.1
1925-1989[1]	24.8	29.3	1.2
1990-2006	7.5	6.9	0.9
1990-1999	10.8	7.5	0.7
2000-2006	2.8	1.1	0.4

1. Excludes 1972-75 and refers to December-December inflation.

Source: Díaz and Wagner (2003) and National Statistics Bureau.

IT in Chile

IT was implemented partially in Chile in 1990 and fully in 1999. In this section I revisit the key institutional developments that underpinned the adoption and functioning of this policy framework, as well as its implementation in the two phases and important macroeconomic outcomes.

Institutional background

The CBC implemented IT within a particularly well suited institutional framework. To begin with, the central bank's Constitutional Organic Law provides the institution with a large degree of independence in terms of both objectives and instruments. It explicitly forbids any form of central bank financing of the government, sets a clear mandate with the sole objective of price stability and the normal functioning of the internal and external payments system, and contains strict provisions under which board members can be dismissed.[1]

The independence of the CBC can be further assessed by comparing it with other central banks around the world. Following Cukierman (1992), Cukierman and Lippi (1999) and Jácome and Vásquez (2005), it is possible to compute Chile's scores and percentile ranking in different criteria of independence in both 1980 and 1990. By the same token, following Fry *et al.* (2000), it is possible to evaluate Chile in a cross-section of countries in 1998. Tables 3.2 and 3.3 show the results. It is clear that the CBC's independence increased between 1980 and 1990 and, in terms of the Cukierman index, it achieved a very high ranking (percentile 97 among 37 countries) in 1990. According to Fry *et al.* (2000), the CBC's independence score was in the 93rd percentile in a sample of 93 cases.

Table 3.2. **Chile: CBC independence from an international perspective, 1980 and 1990**

Indicator	1980			1990		
	Chile	All countries (72)	Ranking (percentile)	Chile	All countries (37)	Ranking (percentile)
CB governor	0.46	0.47	46	0.71	0.57	82
CB's primary objective	0.80	0.38	94	0.60	0.50	61
Policy formulation	0.27	0.21	72	0.75	0.53	78
CB lending	0.50	0.33	88	1.00	0.60	96
Cukierman index	0.51	0.34	92	0.88	0.58	97

Source: Céspedes and Valdés (2006), based on Cukierman (1992), Cukierman and Lippi (1999), and Jácome and Vázquez (2005).

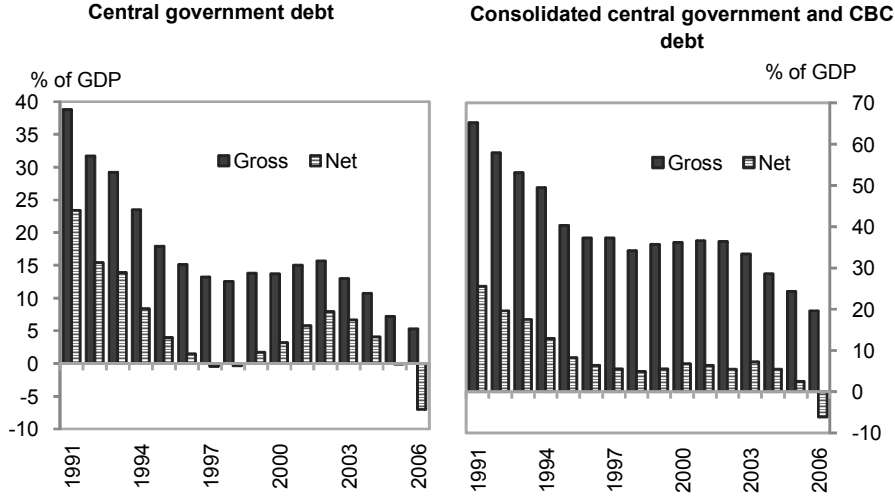
Table 3.3. **Chile: CBC independence from an international perspective, 1998**

	Chile	All countries (93)	Ranking (percentile)
Fry *et al*. Index (1998)	0.93	0.74	93

Source: Fry *et al*. (2000).

Aside from legal provisions, the CBC has not had to endure any form of fiscal dominance. In fact, it can be argued that the contrary has happened: while the central government's accounts have improved considerably and consistently during the past 15 years, the CBC's net worth has declined and, in accounting terms, turned negative. This negative CBC capital has not been an issue, in part because of the strength of fiscal policy. The central government's gross debt declined from 39 to 5% of GDP during 1991-2006 (Figure 3.1). Net debt, in turn, declined from 23 to -7% of GDP. Net consolidated debt has also declined substantially, to less than -6% in 2006.

Figure 3.1. **Chile: Gross and net public indebtedness, 1991-2006**



Source: Central Bank of Chile.

Financial dominance has not been an issue either for the conduct of monetary policy in Chile in the last decade and a half. After a severe banking crisis in 1982, the financial system's regulation was strengthened considerably

and supervision practices were upgraded. In this environment, banks have had low non-performing loan ratios and have been quite profitable, while capital ratios have been maintained well above minimum standards (Table 3.4). Furthermore, the issuance of CBC debt instruments to finance both a portion of the 1982 crisis cost still in its balance sheets and the accumulation of international reserves has found strong market appetite because of both the overall fiscal strength and a growing pool of institutional investors, especially pension funds.

Table 3.4. **Chile: Banking system indicators, 1995-2006**

	Non-performing loans (in % of total loans)	Capital (in % of risk-weighted assets)	Profits/capital (ROE, in %)
1995	0.9	10.5	12.9
1996	1.0	10.5	15.5
1997	1.0	11.5	13.7
1998	1.5	12.5	11.5
1999	1.7	13.5	9.4
2000	1.7	13.3	12.7
2001	1.6	12.7	17.7
2002	1.8	14.0	14.4
2003	1.6	14.1	16.7
2004	1.2	13.6	16.7
2005	0.9	13.0	17.9
2006	0.8	12.7	18.6

Source: Superintendencia de Bancos e Instituciones Financieras.

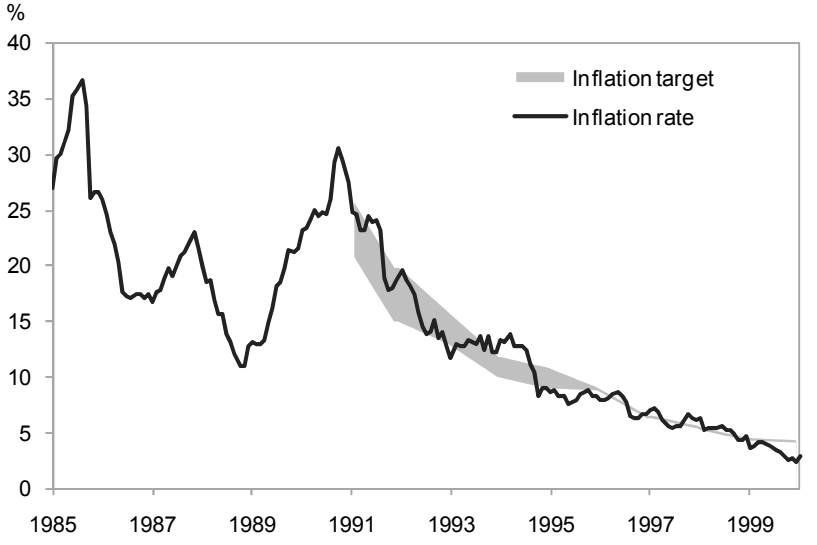
Against this backdrop of effective independence, the CBC meets all the pre-requisites for IT. This has not precluded due co-ordination with the government, particularly during the convergence phase, when targets were set after consultations with the minister of finance. The CBC charter has a special provision establishing that, when making decisions, the board of the CBC should take into consideration the economic policy of government.

Convergence phase: 1990-99[2]

During the IT convergence phase the CBC managed to reduce annual inflation from almost 30% in the early 1990 to less than 3% in late 1999, after

major fluctuations in previous years (Figure 3.2). Target achievements were impressive.

Figure 3.2. **Chile: Inflation outturns and targets, 1985-99**



Source: National Statistics Bureau and Central Bank of Chile.

The system had a few IT characteristics, in particular the announcement of an annual quantitative inflation target and the predominance of these targets as the nominal anchor of the economy. These targets eventually came into conflict with other nominal commitments, particularly the exchange rate, which was used as the main anchor. Other typical features of an IT regime were absent, however. For instance, both the transparency and the communication devices fell short of what is regarded today as a prerequisite for effective IT.

Annual targets for the December-December inflation rate for the following year were announced each September in the central bank's annual report to Congress, a mandatory information dissemination document in the CBC's charter. In communicating its ultimate inflation stabilisation objective, the central bank first considered the goal of converging to single-digit inflation and, once that objective had been accomplished, the final goal was to achieve the level of inflation prevailing in developed countries, a level that was not defined precisely.

The announcement process explicitly included the notion of slow convergence to lower inflation because of the prevalence of widespread backward-looking indexation in the Chilean economy. Rapid convergence to low inflation was considered risky, because the key price misalignments that were likely to emerge would have negative effects on the real economy and jeopardise the sustainability of the disinflation programme. Only once in eleven years was the inflation target revised in the course of the year: in 1995 the target was lowered from 9 to 8%. The initial inflation targets were defined as a range, and point targets were set after 1995.

Given the date of announcements and the focus of the inflation target on the rate prevailing in December of the coming year, the average duration of the targets was only seven and a half months in the 1990s, which is hardly long enough for monetary policy to have strong effects on inflation through the conventional transmission mechanisms. Rather, the announcements were a compromise between current inflation forecasts, and the need to lower inflation and to develop an effective communication strategy.

There is no consensus on the precise reasons for the remarkable reduction in inflation. Some authors (*e.g.* de Gregorio, 2003; García, 2003) identify the positive productivity shocks that hit the economy throughout the 1990s as a key driving force of the inflation dynamics. In their view, unit labour costs decreased, despite indexation and declining inflation, thanks to the economy's unexpectedly high growth performance. Others (*e.g.* Corbo, 1998; Morandé, 2001) underscore the existence of the inflation target as a key co-ordinating device for expectations. They show that the inflation dynamics changed substantially in the 1990s.

In addition to these annual inflation targets, the CBC managed a target band for the exchange rate. The band was perceived as the key instrument for ensuring the normal functioning of the external payments system, which in turn became the effective target (cap) for the current-account deficit. The exchange-rate band was based on a purchasing power parity rule, corrected in some periods for productivity differentials between Chile and its trading partners. It underwent a number of modifications over the 1990s, including changes in its width and once-and-for-all realignments. The CBC intervened not only at the edges of the band, but also actively within it. The CBC maintained important regulations on the capital account throughout the 1990s, including a non-remunerated reserve requirement for capital inflows (which was increasingly broadened until 1997) and a minimum stay for some inflows. These regulations were based on the desire to retain the possibility of managing the exchange rate within monetary policy autonomy and to manage inflows to keep total expenditures under control.

Finally, monetary policy implementation improved progressively over the 1990s. From a rather rough management of interest rates on a variety of instruments in 1990, the CBC converged to managing liquidity by targeting an overnight interest rate in the interbank market. In turn, foreign-exchange interventions were carried out in different ways: directly, through foreign-exchange purchases by public enterprises (mainly Codelco, the state-owned copper corporation), and indirectly, through open-market operations. Publicly available information did not specify the exact magnitude and timing of interventions, given that interventions and other international reserve movements were reported in a consolidated manner, although interventions were clearly aimed at countering real exchange-rate appreciations. The effort to sterilise inflows between 1990 and 1997 was a large one: during that period the CBC increased its foreign-exchange reserves from USD 2.5 billion to USD 17.8 billion. Its foreign-exchange position switched from a deficit of 5.1% of GDP to a surplus of around 25% of GDP. In 1998, the central bank also intervened in the foreign-exchange market by issuing dollar-linked debt and, briefly, using options.

Steady-state phase: Since September 1999

Although the macroeconomic policy framework generated remarkable results from 1990 to 1997, by the beginning of 1997 the Chilean economy had experienced unprecedented strong growth with signs of overheating. The Asian and Russian crises of 1997-98 had strong effects on the Chilean economy through both real and financial transmission mechanisms. Valdés (2007) revisits this episode and the policy responses at the time. Beyond the immediate response, the policy framework suffered large transformations in the years that followed. The implicit evaluation was that Chile suffered more than it should have, including a recession in 1999.

In the second half of 1999, the authorities began to implement a number of changes in the macroeconomic policy framework, including the adoption of fully-fledged IT in September 1999. Other key changes included: *i*) the introduction of a free-floating exchange-rate regime, *ii*) the deepening of foreign-exchange derivatives (forward) markets, *iii*) the total opening of the capital account, and *iv*) the "nominalisation" of monetary policy in 2001 (*i.e.* the CBC switched from using a CPI-indexed or UF-referenced interest rate – a real rate – to a nominal interest rate). The central bank explained these changes as improvements that were in line with the following considerations: inflation had already converged to low levels, greater exchange-rate flexibility was possible given the development of hedging mechanisms and lower exchange-rate mismatches, and the need to accommodate transitory inflationary

shocks and a longer time span for monetary policy to affect inflation (and thus prevent unnecessary output volatility).

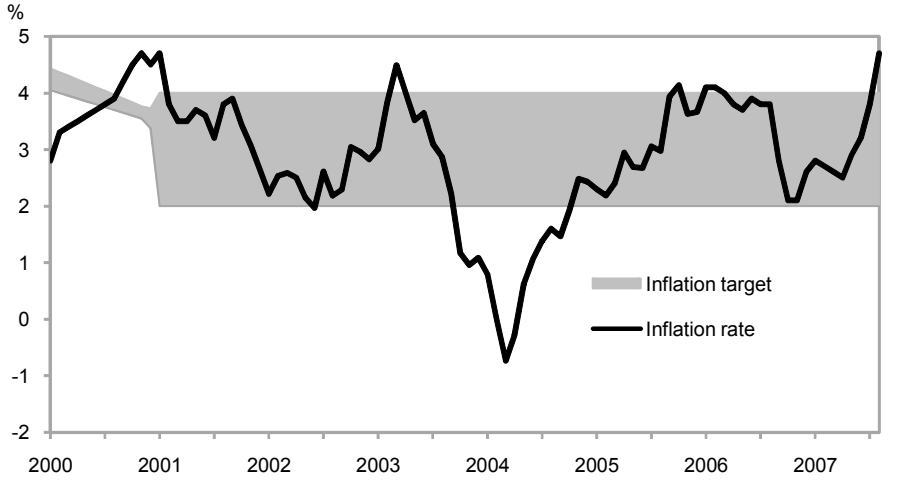
The gradual transition to a floating exchange-rate system was pursued with the adoption of a widening exchange-rate band in December 1998. After ten months in which the band's width was increased from 7 to 16% of the central parity, the CBC announced in September 1999 that the band was no longer part of the policy framework. The central bank officially retained the authority to intervene, but it announced that it would do so only in special circumstances, and it would inform the public about those decisions. In parallel to this "slow" transition to a floating-rate regime, the CBC made the necessary regulatory adjustments to foster the development of foreign-exchange hedging. In particular, it eased regulations to allow banks to participate more actively in the forward market. Volumes increased rapidly: between 1998 and 2003 total turnover in the derivatives market increased by 60%, while the spot market more than doubled in size. The CBC intervened in the foreign-exchange market only twice (each episode with duration of about three months) in 2001 and 2002.

In September 1999, an open-ended band of 2-4% was announced for the new inflation target starting in 2001 (the interim target for December 2000 was 3.5%). This 2-4% target was maintained until late 2006. In early 2007, the target was reformulated as being most of the time around 3%, with a tolerance interval of ±1 percentage point. The monetary policy horizon (*i.e.* the maximum period in which the CBC is expected to bring back inflation to target) was 12 to 24 months between 2000 and 2006. In January 2007 it was defined as around two years (more about these changes below). Between 2001 and September 2007 annual inflation averaged 2.8%, it was between 2-4% during 73% of the time, above 4% during 10% of the time and below 2% during 17% of the time (Figure 3.3).

During this phase the IT framework had several of the characteristics of this type of monetary regime. In addition to a floating exchange rate, the CBC began to publish an inflation report three times a year (the first issue was released in May 2000), to announce the dates of monthly monetary policy meetings six months in advance, and to disclose monetary policy meeting minutes with a three-month lag, which was subsequently shortened to three weeks. Overall, it improved markedly the disclosure of information, including detailed forecasts and views about transmission mechanisms. Procedural changes were enacted in a new central bank board ruling.

Figure 3.3. **Chile: Inflation and inflation target, 2000-01**

In per cent



Source: National Statistics Bureau and Central Bank of Chile.

Two key additional elements during this phase were fiscal policy and the CBC's anti-inflationary credentials earned in 1998. With regard to fiscal policy, the structural balance rule announced in 2000 facilitated macroeconomic policy co-ordination and improved the counter-cyclicality and credibility of the policy regime. The rule, based on a target for a structural surplus equivalent to 1% of GDP, consists of a cyclical adjustment of tax and copper revenues and limits the likelihood of sudden changes in expenditure.[3] The strong commitment by the CBC to controlling inflation, as evidenced by an extremely tight monetary policy in 1998, made it clear that the mandate of price stability would be fulfilled. This probably had a significant influence on the inflation process (Table 3.5). Particularly striking is the decline in inflation persistence for both headline and core measures after 1998 (García and Valdés, 2005). Other explanations include global factors and an update of the CPI reference basket in 1998.

Table 3.5. **Chile: Inflation persistence and volatility**[1]

	1991.1-1998.12			1999.1-2005.4		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Sum of coefficients	0.80	0.72	0.78	-0.15	-0.03	0.06
P-value	0.00	0.00	0.00	0.02	0.91	0.03
Residual SE	0.37%	0.36%	0.33%	0.25%	0.26%	0.24%
Volatility	0.82%	0.68%	0.71%	0.23%	0.26%	0.25%
Coeff. of variation	1.1	0.8	0.9	1.0	1.1	1.1

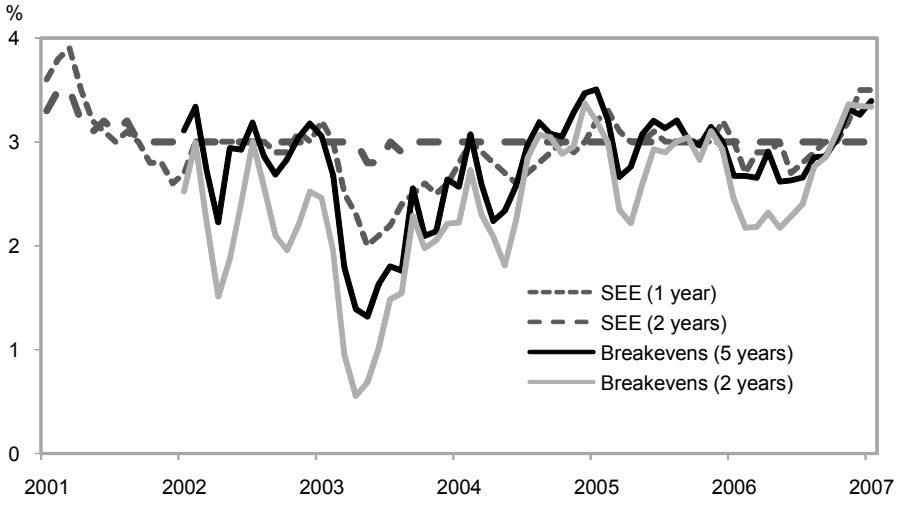
1. The three models consider $\Delta p_t = \alpha + \sum_k \beta_k \Delta p_{t-k} + \varepsilon_t$, where Δp_t is the monthly change in the log of the price level. All models are estimated using OLS. In Model 1, k = 1, 2, 3, 6 and 12; in Model 2, k = 1 to 12 and β is constant for all k; and, in Model 3, k = 1 to 12.

Source: García and Valdés (2005).

Macroeconomic performance under IT

Overall, the most important achievement of IT in Chile has been the reduction and control of inflation. Having a clear mandate and an unambiguous inflation target has provided an effective nominal anchor for the economy. An obvious way to assess this achievement is through the behaviour of market inflation expectations (Figure 3.4). The Survey of Economic Expectations (SEE) conducted monthly by the CBC shows that the 3% target acts as a strong magnet for one- and two-year-ahead expectations. In fact, the median of two-year-ahead inflation expectations has been 3% for several years. The same pattern emerges with inflation breakeven estimates (*i.e.* the difference between nominal and CPI-indexed bonds issued by the CBC with similar maturities). Although these measures are more volatile, they clearly converge to 3%.

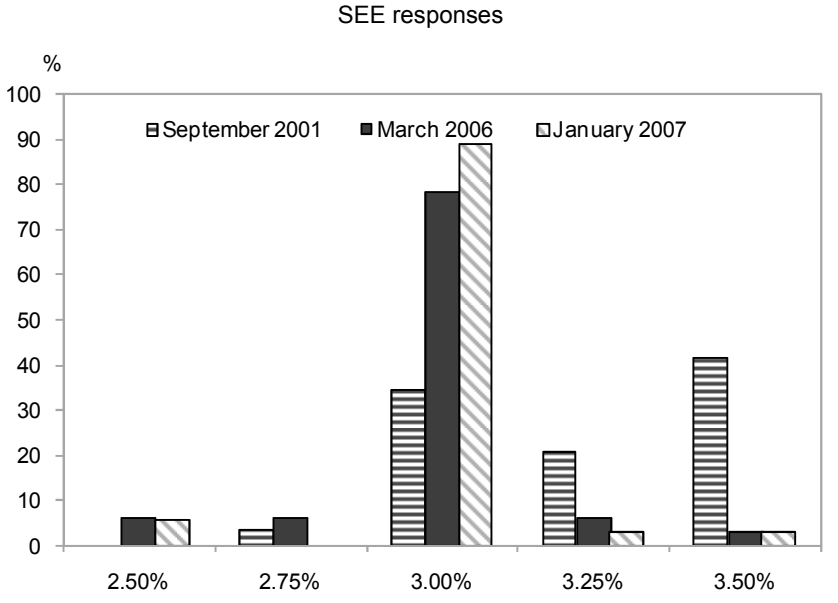
Figure 3.4. **Chile: One- and two-year-ahead expected inflation, 2001-07**



Source: Central Bank of Chile.

The gained credibility of the anchor can also be gauged by the distribution of inflation expectations among SEE respondents. Whereas in 2001 a large portion of analysts expected inflation two years ahead to differ from 3%, in early 2007 a solid 90% of responses was 3% (Figure 3.5). Macroeconomic performance in terms of output and inflation volatility, as well as inflation persistence, has also improved over the last decade and a half. Of course, it is virtually impossible to determine how much responsibility monetary policy has had for this outcome, since shocks may have been different, including those of foreign origin, and other policies also mattered, but it is still worthwhile to compare simple statistics.[4]

Figure 3.5. **Chile: Distribution of two-year-ahead expected inflation, 2001, 2006 and 2007**

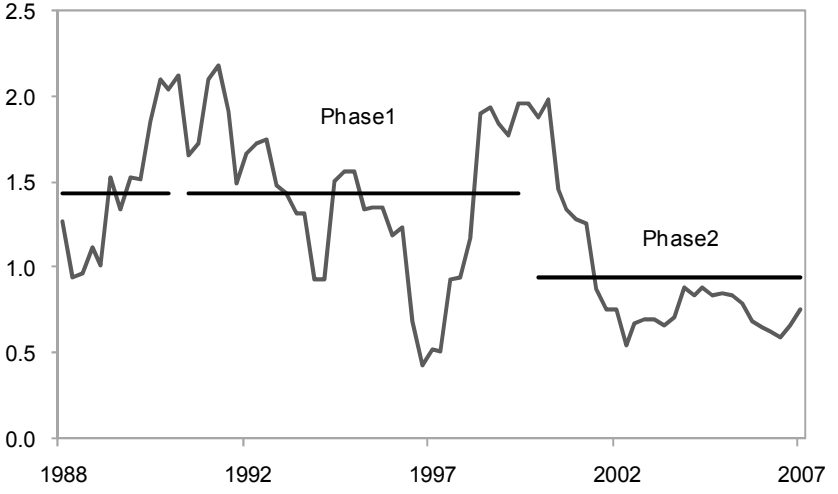


Source: Central Bank of Chile.

Output volatility has had ups and downs in the past few years, but on average it has clearly declined. During the current steady-state phase of IT, the standard deviation of the seasonally-adjusted quarterly growth rate of GDP over two-year windows has been close to 1%, around two-thirds of the level prevailing in the late 1980s (Figure 3.6). Inflation volatility has declined even more markedly and is about one-quarter of its pre-IT level (Figure 3.7). The two results are in line with what has been observed in developed countries: the "great moderation" phenomenon.

Figure 3.6. **Chile: GDP growth volatility, 1988-2007**[1]

In per cent

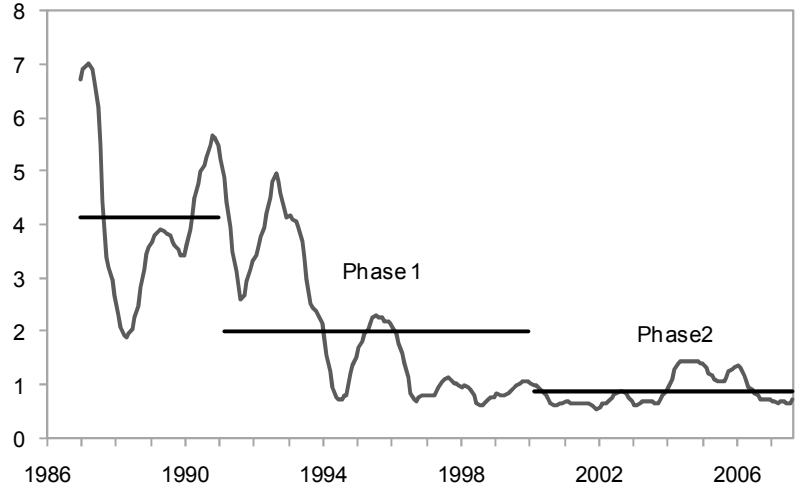


1. Two-year rolling-sample standard deviation of quarterly GDP growth (seasonally adjusted).

Source: Author's calculation based on Central Bank of Chile.

Figure 3.7. **Chile: Inflation volatility, 1986-2007**[1]

In per cent



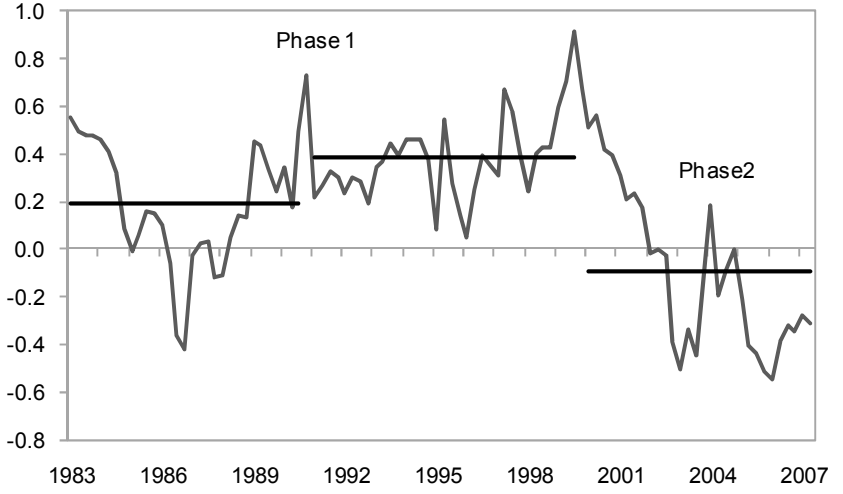
1. Two-year rolling-sample standard deviation of monthly year-on-year CPI inflation.

Source: Author's calculation based on National Statistics Bureau.

Finally, inflation persistence (measured as the sum of the autoregressive terms of quarterly inflation in rolling two-year samples) has not been different from zero on average during the steady-state phase of IT, which is clearly below the level observed during the convergence phase (Figure 3.8). This result is qualitatively similar to that shown in Table 3.5.

Figure 3.8. **Chile: Inflation persistence, 1983-2007**

In per cent



1. Sum of autoregressive coefficients in a linear model for quarterly inflation (rolling estimations).

Source: Author's calculation based on National Statistics Bureau.

Selected monetary policy issues under IT

The CBC's experience with IT has involved analysis, discussion and decisions on multiple policy issues. I analyse here four policy topics that have evolved in the last several years: the setting of the inflation target and the central bank's operational objective, the assumptions on future monetary policy stance included in forecasts and communications, the role that inflation expectations may have in the conduct of monetary policy under IT, and the exchange-rate regime and its interaction with monetary policymaking.

Target setting and operational instrument

There are three distinctive periods in the Chilean experience with setting the inflation target and the operational objective: the convergence phase (1990-99), 1999-2006 and 2007 onwards. As mentioned before, during the convergence phase, annual targets were announced in September of each year for the following December-December period's inflation rate.[5] During this

phase, the target and the operational objective were indistinguishable. Monetary policy decisions were in principle guided by the need to bring inflation to the December target. The operational objective, in this sense, was a fixed-moment mark. Furthermore, the official inflation forecast and the target were equal. Therefore, the precise inflation target set every year was a combination of what was considered achievable and a new step towards low inflation. Both range and point targets were announced at different moments. The target was announced strategically in the month before Congress began debating next year's budget. The government used the same target in the preparation of the budget submitted to Congress in September and when setting public-sector wages in November. Interestingly, for many years there was also a GDP growth target in the authorities' presentations.

In the steady-state phase of IT (after 1999), the first target was 2-4% for every month, not only December. Speeches and documents also considered that this target range "was centred at 3%". To achieve its goal, the CBC had an operational target to maintain projected inflation around 3% in a policy horizon of 12 to 24 months. In 2000, early in the steady-state phase, the CBC released a document explaining the rationale for these numbers.[6] Monetary policy lags were considered to be in line with the policy horizon. The document also explained why the chosen target was headline CPI (because alternative definitions would not have been as effective as an anchor, given the difficulty to communicate them to economic agents) and the role of a basic core inflation measure as an indicator of persistent inflation pressures. In this new target definition forecasts were not always equal to 3%, although published forecasts were always very close to this number over 24-month horizons.

As time passed, the long end of the 12-to-24-month horizon became more important in the CBC communication and decision-making process. For instance, in a few official monetary policy communiqués, the central bank plainly referred to the "24-month policy horizon". In the monetary policy report, the 12-month forecast was often quite different from 3%, whereas it was rarely different from 3% within the 24-month horizon.[7] The two-year horizon was the focal point of policy discussions and the assessment of market inflation expectations.

In early 2007, in an effort to make the entire monetary policy framework more transparent, the CBC released a new official document describing the objective, conduct, transmission mechanism, implementation and communication of monetary policy. This document emphasised both the subtle but important redefinition of the target and the change in the policy horizon. The target was redefined as keeping annual CPI inflation most of the time close to 3%, with a tolerance interval of ±1 percentage point, rather than a target

range. The change entailed two important elements. *First*, it aimed at strengthening 3% as the nominal anchor of the economy. *Second*, it recognised that, as had been the case, inflation could be transitorily outside the 2-4% range. The new target definition also made it clear that there were no discontinuities for the conduct of monetary policy at the edges of the target range. In addition, the document revisited the arguments for why a 3% target seemed appropriate for the Chilean economy.

The official policy horizon was extended and made a little less precise with the new definition of "around two years" instead of "12 to 24 months." To a large extent, this was nothing but a recognition of what had actually been done during the last few years. The definition also made it clear that the policy horizon was part of the operational target, which also included the maintenance of inflation forecasts at 3%. Furthermore, the document clarified that the policy horizon was the maximum period of time at which the CBC would try to bring inflation back to 3% under normal circumstances.

Monetary policy path and forecasts

When the CBC started to present its Monetary Policy Report, it implemented the standard practice at the time of assuming a fixed policy rate during the policy horizon (12 to 24 months at the time) and evaluating the inflation forecasts that emerged in that setting.[8] If the forecast was incompatible with the target, rates had to be adjusted. The communication of the forecast was quite open with respect to this procedure and explicit regarding the interest rate assumption.[9] By definition, board members did not need to agree on a future assumed path for monetary policy. Technically, however, as has been discussed extensively elsewhere, fixing the policy interest rate path entails several problems, particularly in forward-looking models. For instance, one implication of a fixed-rate assumption is that monetary policy has to jump after the policy horizon to anchor inflation, especially if inflation were to deviate significantly from the target without this jump. Another is that such monetary policy is assumed to be extremely persistent, and therefore to have quite powerful effects. Implicitly, therefore, the assumption restricted how far monetary policy could deviate from neutral and, therefore, it hindered the degree of activism that could be achieved.

During 2002, at times of aggressive rate cuts, which proved to be necessary with the benefit of hindsight, the CBC changed its internal procedures and communication strategy to accommodate monetary policy adjustments that did not need to last two full years. In other words, they were cuts expected to be reversed, at least partially, in less than two years' time. From a technical point of view, the staff implemented an "imperfect credibility assumption", whereby

agents were assumed to form monetary policy expectations according to a simple Taylor-type rule, despite the fact that the CBC announced a fixed monetary policy rate for two years. Thus, the yield curve and the exchange rate (and other relevant asset prices) would react to "shadow" future moving interest rates. Because the policy interest rate exerts by itself some effect on domestic demand, the fixed-rate assumption did retain a transmission mechanism to output and inflation and, thus, had some direct effect on forecasts. The communication of the forecasts was adapted to include an explicit statement that the policy rate was assumed constant for two years, but that all relevant asset prices would follow a path similar to the expected implicit one in current market prices.

The 2002 solution was a step forward in terms of freedom for monetary policy and some internal consistency, but a step back in terms of transparency and easiness of communication. Moreover, this solution implied rather implausible monetary policy shock responses in the core model used for forecasting and analysis. In particular, a policy shock in the form of an increase in the policy rate would depreciate the local currency, because the shadow interest rate from which expectations are formed would move in the opposite direction as an attempt to reverse the original shock. The same happened with the long-term interest rate. In September 2004, after internal discussions, the CBC decided to move to a full monetary policy rule to close its official forecast. A special document on CBC models explains some of the details, although it does not include the exact rule parameters, which have varied from time to time. The rule is based on the output gap and forecast of inflation deviations in the following few quarters.

Two caveats are in order on this subject. *First*, using policy rules in forecast discussions does not substitute for the rich and necessary discussion surrounding policy decisions. Policy rules are too blunt to answer the questions of when and by how much policy should be adjusted. They just provide benchmarks. Moreover, they cannot incorporate tactic considerations that are quite important in actual decision making, particularly with regard to timing. *Second*, the use of policy rules has to do with the temptation of postponing necessary decisions, just because future actions may appear to do the job. Discipline in keeping track of the exact assumptions becomes even more necessary.

Communication was also adjusted. Since 2004, the Monetary Policy Report has described the broad contours of the assumed policy path, using as a way of comparison the policy path implicit in the yield curve that is available on average two weeks prior to the statistical closing date. Usually, the assumption and the market-implied monetary policy paths are similar, and the

communication simply says so. On a few occasions, however, the paths have been different and the Report has indicated so, with mild effects on the yield curve at the time of disclosure.

One issue that has been somewhat problematic in a few cases has to do with the question of what to communicate regarding the implicit longer-term monetary policy rate. If one considers model-based forecasts, this rate depends critically on the assumed level of the neutral interest rate. Market-implied rates, in turn, also have an implicit neutral rate and most probably important risk premium terms. Given the uncertainty surrounding both elements, the CBC has described the behaviour of the "next few quarters" in cases where the implicit longer-term policy rates differ too much from assumed rates. Another issue that could arise is the risk of excess precision when the implied path considers a long pause. It is clear that a path with rate hikes or cuts is uncertain in terms of both timing and the magnitude of rate changes. However, when a central bank communicates a pause, it is much more explicit, maybe more so than desirable. Finally, it is worth noting that the CBC has been clear in its communications explaining that assuming a path for monetary policy rates in its forecasts is by no means a commitment. Policy actions are decided on a monthly basis and are always data-contingent.

Role of inflation expectations

It is now standard in any IT regime to follow private-sector expected inflation indicators as an intermediate variable. The CBC is no exception. The group of indicators includes breakeven inflation, both average and forward at different maturities, estimated from CBC nominal and CPI-indexed bonds; a CBC monthly survey including 35-40 analysts of the Chilean economy; a weekly CBC survey of banks and institutional investors' trading desks; and surveys of both households and firms. These indicators have played at least three different roles in the conduct of monetary policy. *First*, they are a very useful benchmark against which to compare internal inflation forecasts. Because of well-known technical reasons, it is not possible to simply target these expectations, so that the central bank's own forecasts are necessary. However, internal forecasts are also subject to error, so that benchmarks are particularly useful. That said, it should be mentioned that medium- and long-term inflation expectations have converged to the inflation target with increased credibility and are almost invariant to news, which increases the need for internal forecasts.

Second, by themselves, expected inflation indicators are measures of inflation. Particularly important are household and firm surveys, which are a source of information regarding whether or not inflation is perceived to be a problem. There is the presumption that second-round effects from supply

shocks may develop with more intensity if inflation is perceived to be high. *Third*, on technical grounds, expected inflation measures are useful to evaluate the real impulse of monetary policy. *Ex ante* real rates are easily computed on the basis of expected inflation, which in turn enriches the discussion of monetary policy (although it is not an issue that can be easily communicated).

Finally, expected inflation indicators allow central banks to evaluate their credibility at any point in time. Within an IT framework this is particularly important, because ultimately the nominal anchor reflects the public's confidence that the central bank will take action to ensure that inflation converges to the target. Medium- and long-term expected inflation precisely measures this confidence. Although it is not clear how these expectations are formed, they do influence the inflation dynamics in so far as they are a benchmark for actual price-setting behaviour.

The CBC faced a particularly challenging episode regarding the credibility of the target in late 2003 and early 2004. In the midst of an unprecedented low-inflation cycle, with negative year-on-year readings for a few months explained mainly by increased competition in the retail market, long-term inflation expectations started to decline appreciably below the target. In parallel, an incipient discussion emerged in the media regarding the convenience of lowering the target from the 2-4% range to one centred in 2% or even 1%. With the evaluation that these low inflation expectations posed the risk of having a protracted period of low inflation, the CBC decided to cut interest rates in two consecutive monetary policy meetings by 50 basis points each to 2.25%. In principle, the standard determinants of inflation regularly analysed in monetary policy discussions did not justify such a bold policy action (*i.e.* there was no major news about how much slack there was in the economy, wage pressures, exchange movements, etc.). However, the behaviour of expectations was particularly worrisome, and the CBC decided to defend the target.

In principle, the CBC could have also validated a new lower target. Two types of considerations made this option problematic. *First*, there are several reasons to have a 3% target in Chile.[10] Besides standard measurement problems, the zero bound restriction appeared particularly obvious in that juncture. Had the target been 2%, inflation would have been 1% or less, restricting the possibilities of monetary policy to achieve the needed stance. *Second*, it would have been an opportunistic adjustment, which would have risked future credibility if a shock with the opposite sign had to be confronted. Once the target starts to be adjusted after particular shocks, it becomes very difficult to discriminate under which conditions they are appropriate or not. Once a permanent target has been set, new adjustments should be carefully analysed and communicated, possibly with considerable time in advance. This is

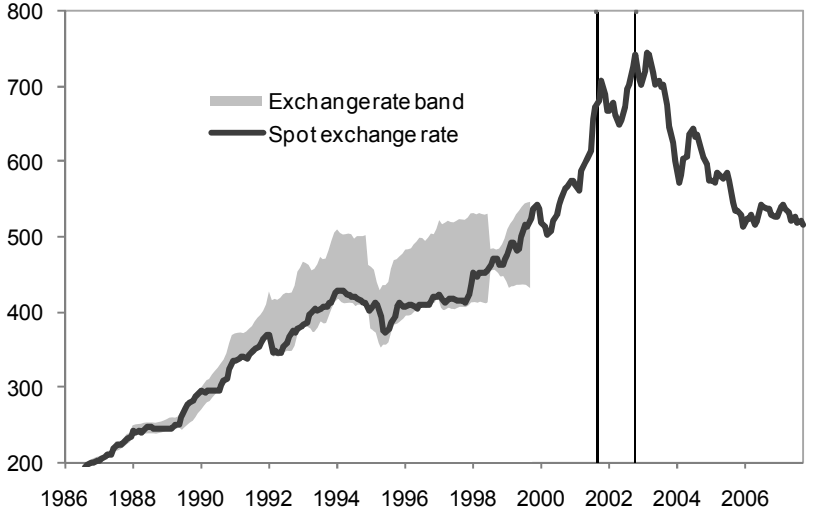
particularly important for economies that have, like Chile, a relevant portion of CPI-indexed instruments in the financial system.

The exchange rate

The exchange rate regime differed markedly between the two phases of IT. As mentioned above, the CBC maintained a target range during the 1990s and a floating-rate regime after 1999 (Figure 3.9). Their assessment and the transition between these regimes are fascinating topics by themselves and go beyond the scope of this chapter.[11] However, during the fully-fledged IT period there are at least three issues regarding the interactions of monetary and exchange-rate policies that deserve a few words: market interventions, the relevance of the exchange rate for inflation forecasts, including how to incorporate exchange-rate assumptions and views of its likely path within the formulation and communication of forecasts, and changes in the sensitivity of monetary policy to exchange-rate shocks.

Figure 3.9. **Chile: Exchange rate and target band, 1986-2007**

CLP per USD, the vertical lines show interventions during the floating regime



Source: Central Bank of Chile.

Together with letting the peso float, the CBC reserves the right to intervene in "exceptional circumstances": when there is an overreaction of the exchange

rate that could be damaging to the economy. Furthermore, when it intervenes, the CBC has to be comfortable that this action will have a good chance of moderating the overreaction.[12] An overreaction of the exchange rate could require movements in the policy interest rate in the opposite direction to that suggested by fluctuations in the output gap and their implied inflationary pressures. Therefore, interventions can be seen as a first line of defense during periods of inflationary (deflationary) pressures before adjusting monetary policy. The CBC has explicitly recognised that detecting an exchange-rate overreaction or overshooting is quite difficult. In the end, determining exceptional circumstances or whether the exchange rate is overreacting is a judgment call by the central bank's board. However, it is an informed call grounded on a thorough analysis based on different perspectives (see Caputo and Valdés, 2007, for a review of methodologies used in practice).

Between 2000 and 2007, the CBC intervened on two occasions: August 2001 and October 2002. The episodes coincided with financial turmoil stemming from the convertibility crisis in Argentina in 2001, further enhanced by the economic effects of the 11 September attacks and turbulence in Brazil around the presidential election of 2002. Interventions were implemented through a pre-announced package with a fixed four-month terms and maximum amounts to be used in spot transactions and the issuance of US dollar-indexed bonds. According to Tapia and Tokman (2004), the announcement itself had a relevant effect on the exchange rate.

On the issue of how to incorporate the exchange rate on inflation forecasting exercises, the CBC has used standard estimates from open-economy Phillips-curve equations. As has been the case elsewhere, different statistical approximations show that the pass-through coefficient has declined substantially during the past 10 to 15 years. Currently, the central forecasting model has an implicit pass-through coefficient of between 20% and 30% in a two-year horizon. More interestingly, perhaps, is the incorporation of assumptions about the path of the exchange rate in forecasting exercises. The nominal path has been completely endogenous, which is consistent with price setting. By contrast, the long-run real exchange rate is defined as an external input, after intense scrutiny. In particular, a variety of real exchange-rate models informs the decision on whether the current real exchange rate can be considered to be very different from fundamentals. If not, that same exchange rate is considered as the long-run one. The dynamic path, in turn, is determined through an uncovered interest parity relationship, with some degree of inertia. If the current real exchange rate differs from long-run estimates, then the long-run real exchange rate assumption incorporates an add-factor adjustment.

As regards the communication of the exchange-rate assumption, the CBC's Monetary Policy Report has presented the broad contours of the exercise described above. For example, in cases in which there has been no expected real exchange-rate adjustment, the Report has stated that, as a technical assumption, the real exchange rate would not change significantly and would therefore not affect the forecast. It has also reminded readers that in a floating-rate regime it is very likely that the exchange rate would move. In the few cases where the assumption has included a certain degree of real exchange-rate adjustment, the Report has incorporated it explicitly, albeit with little market reaction.

Finally, concerning the monetary policy reaction to exchange-rate innovations, the evidence shows that during this decade there has been very little interest rate reaction beyond the effects of the exchange rate on inflation and the output gap. Specifically, policy rule estimates show no reactions to the exchange rate, either real or nominal, once inflation and slack are taken into account. This contrasts with the experience of the 1990s, for which rule estimates show a statistically significant policy reaction to the exchange rate, albeit economically modest. For instance, Caputo *et al.* (2006) estimate on the basis of Bayesian methods a Stochastic Dynamic General Equilibrium model for the Chilean economy allowing for different monetary policy rules in 1990-99 and 2000-05. The results indicate that, although monetary policy reacted somewhat to real exchange-rate innovations in the second sample period, this effect was one-half the size of the one estimated for first sample period.[13] These findings are consistent with CBC statements. The Monetary Policy Report justifies interest-rate adjustments precisely as a reaction to inflation-forecast deviations from the target. The monetary policy communiqués and the Reports have also been consistent with this premise. This again contrasts with the experience of the 1990s, when there was an explicit (ceiling) target for a current-account deficit, which in turn translated into a target for the real exchange rate.

Conclusions

It is difficult to dispute the claim that IT has served Chile well. Key institutional developments and IT have together allowed the country to achieve sustainably low inflation. Furthermore, the 3% target has become an effective nominal anchor and monetary policy enjoys considerable credibility. Despite this success, it is difficult to know how much of the "great moderation" observed in Chile is due to IT. However, at the moment this paper is being written (October 2007), inflation increased substantially to around 6% (year on year), mainly due to a series of supply shocks. In this challenging environment, long-run nominal and break-even interest-rate differentials have not increased materially, demonstrating the importance of the anchor.

The Chilean experience also shows that IT is a monetary policy framework that is far from being rigid. On the contrary, it raises the possibility of self discovery, improvements and learning. We have discussed here four particular areas and issues in which the CBC has innovated. There have been others and most probably many others will come.

Notes

1. Céspedes and Valdés (2006) revisit the CBC's experience with autonomy.

2. This section draws from Céspedes *et al.* (2006).

3. See Marcel *et al.* (2001) for more information on the fiscal rule.

4. Ochoa (2008) estimates efficient frontiers for monetary policy in Chile and shows that both the frontiers and actual efficiency improved with IT.

5. The December reference became so entrenched that even today, after eight years of a rolling target, the press and some analysts evaluate the CBC's performance on the basis of the December (year-on-year) inflation rate.

6. See Central Bank of Chile (2000). The document had many features in common with that of the Bank of England describing the monetary policy regime in the United Kingdom.

7. Gredig *et al.* (2007) discuss from different angles the definition of the policy horizon and its rationale and evaluate these forecasts.

8. Before the Monetary Policy Reports, during Phase 1, the CBC used to publish the annual target in September but did not release a clear path for future monetary policy.

9. In contrast with the exchange-rate path assumption, that was not made explicit.

10. See Central Bank of Chile (2997) for more information.

11. See Morandé and Tapia (2002) for a description of the exchange-rate regime at the time of the target band and De Gregorio *et al.* (2005) for a description of the floating period.

12. See Box II.4 in the January 2003 *Monetary Policy Report* and Central Bank of Chile (2007).

13. They also find that in the second period a larger fraction of wages were adjusted following a passive rule based on the IT target.

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Chapter 4

The Czech Republic's inflation targeting experience

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Czech National Bank

This chapter discusses the experience of the Czech Republic with inflation targeting (IT). The Czech Republic was the first transition economy to adopt IT. The author argues that IT was adopted only after other monetary policy regimes had failed. An important feature of the Czech regime is the need to build an exit strategy into the policy framework, given the country's expected entry into the euro zone, although no date has yet been announced. The problem of exiting from a monetary policy regime has so far been faced by countries with fixed exchange-rate regimes (including currency boards), rather than IT.

* The views expressed in this chapter are those of the author and do not necessarily represent those of the Czech National Bank.

Introduction

The Czech National Bank (CNB) introduced inflation targeting (IT) in December 1997. This change in the Czech monetary policy strategy came six months after an episode of exchange-rate turbulence, which put an end to a fixed exchange-rate regime in May 1997. In this regard, the CNB acted similarly to other central banks in adopting IT only after other monetary policy strategies had failed. The main difference is that the CNB was the first central bank to introduce IT in a transition economy.

This pioneering step was regarded by the outside world as risky and led to a debate on whether or not central banks in transition economies, or developing economies more broadly, could operate IT with the same success as central banks in developed economies. International institutions pointed out that transition economies did not meet some of the key conditions for successful IT. There were also doubts about whether or not a central bank in a transition economy could adopt a monetary regime that, unlike a fixed exchange-rate system, is not based on imported credibility, but on the central bank's ability to build its own credibility.

Looking back, one can say that the Czech experience with IT during in 1997-07 shows that this strategy can indeed be followed successfully by transition/developing economies. The first evidence in favour of this conclusion is the stable macroeconomic environment in which the Czech economy has been able to develop in recent years. Before the introduction of IT (1993-97), average inflation was 11.5%, against 2.9% for the IT period (1998-2007[1]). Average GDP growth was 2.6% before IT and is slightly higher, at 3.6%, over the IT period. The second piece of evidence comes from the growing number of central banks in transition economies to have introduced IT over the last decade (Jeffery and Gerlach, 2002), coupled with a change in the view of international institutions regarding the appropriateness of IT in these economies (IMF, 2006; Masson *et al.*, 1997).

This article sets out to describe the Czech IT experience during 1997-2007 and to pass on that experience to central banks in developing countries that have implemented IT later than the CNB and might thus gain useful information from the CNB's experience.

The six phases of IT in the Czech Republic

The history of the Czech IT regime can be broken down into six phases: *i*) the preparation and introduction of the strategy (1997); *ii*) the embryonic phase, which is associated with the beginning of disinflation and the

establishment of the individual components of the policy regime (1998-2001); *iii*) the advanced phase, which is associated with the end of disinflation and fine-tuning of the main elements of IT (2002-05); *iv*) implementation of IT with a horizontal inflation target (2006-09); *v*) implementation of IT and preparations for adopting the euro (2010-"Year T"); and *vi*) exit from IT upon adoption of the euro ("Year T"[2]). Table 4.1 and Figure 4.1 provide key information on the inflation targets and inflation performance in each phase. Figure 4.2 depicts the basic data on the monetary policy setting and other economic policies that have strongly affected inflation outturns.

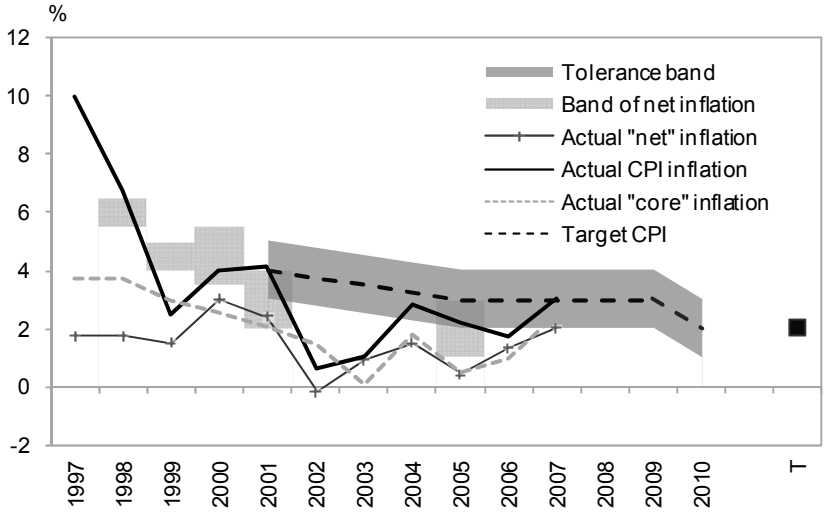
Table 4.1. **Czech Republic: Specification of inflation targets**

	Phase of IT	Type of target	Date of announcement	Index
1997	I. Preparation and introduction			
1998	II. Embryonic phase – beginning of desinflation	Interval, target only for December 1999	December 1997	Net inflation
1999		Interval, target only for December 1999	November 1998	Net inflation
2000		Interval, target only for December 2000	December 1997	Net inflation
2001		Interval, target only for December 1999	April 2000	Net inflation
2002	III. Advanced phase – end of desinflation	Descending corridor for 2002-05	April 2001	CPI inflation
2003			April 2001	CPI inflation
2004			April 2001	CPI inflation
2005			April 1999 (net)/ April 2001 (CPI)	CPI inflation
2006	IV. Stabilisation of inflation – horizontal target	Point target with uncertainty interval, horizontal target	April l2004	CPI inflation
2007			April l2004	CPI inflation
2008			April l2004	CPI inflation
2009			April l2004	CPI inflation
2010 -T	V. Preparation for euro – ECB-like target	Point target with uncertainty interval, horizontal target	March 2007	CPI inflation
Year T	VI. Adoption of euro – exit phase	ECB price stability target	T	HCPI inflation

1. Two targets were subsequently announced for 2005. In 1999 target was announced for net inflation. In 2001, new target was announced for CPI inflation. Hence, the 1999 target was never used.

Source: Czech National Bank.

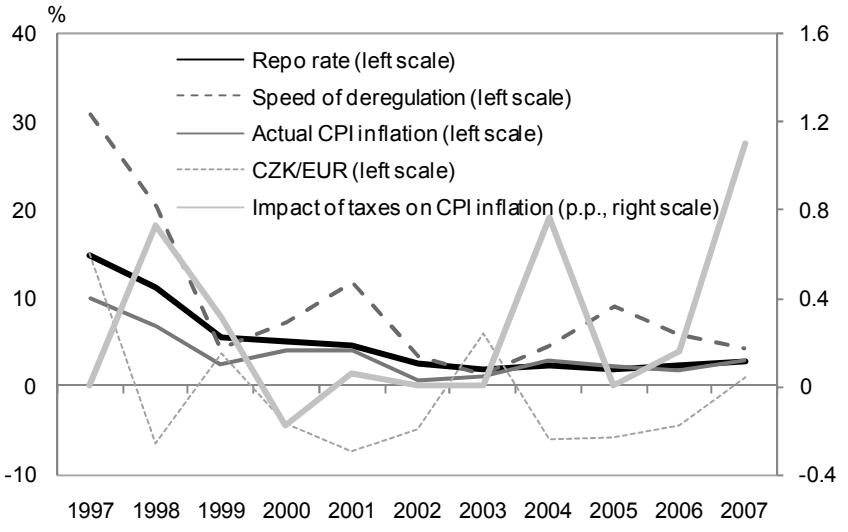
Figure 4.1. **Czech Republic: Inflation targets and inflation, 1997-T[1]**



1. The date of euro adoption is not yet known; it is therefore expressed as T. From T onwards, the inflation target will be replaced by the ECB´s definition of price stability (inflation below but close to 2%).

Source: Czech National Bank.

Figure 4.2. **Czech Republic: Monetary policy settings and other economic policies, 1997-2007**



Source: Czech National Bank.

Introduction of IT

The CNB adopted IT at the end of 1997 after the May 1997 exchange-rate crisis. This move was preceded by a six-month preparation period during which alternative monetary policy strategies were evaluated. As indicated by studies from that time (Hrnčíř and Šmídková, 1998), there were four options: *i*) to re-introduce the fixed exchange-rate regime on which monetary policy had been based in the first half of the 1990s; *ii*) to adopt money targeting, which had also been used in the Czech Republic in the 1990s, *iii*) to pursue a flexible strategy with no explicit target along the lines of the U.S. Federal Reserve's policy framework on the basis of a constitutional mandate ("just do it"); and *iv*) to adopt IT.

The CNB chose the fourth option. One of the primary reasons for this decision, as in the case of numerous other central banks (Vickers, 1998), was the well-known drawbacks of fixed exchange-rate regimes and money targeting. Moreover, it was apparent that the credibility of Czech monetary policy was not yet comparable to that of the United States', so it was inappropriate to pursue a flexible strategy. IT seemed to be the most appropriate of the four possible regimes, even taking into account the risks arising from the differences between

transition and developed economies. These risks were emphasised in particular by international institutions (IMF, 1998). Some authors also argued that Czech monetary policy might not be sufficiently credible for successful implementation of a strategy which, unlike the fixed exchange-rate system, is not based on imported credibility, and that currency-board arrangements were coming back into fashion (Enoch and Gulde, 1998).

The CNB introduced IT by announcing two inflation targets, both specified in terms of "net inflation" (CNB, 1997).[3] The one-year target was intended to help anchor inflation expectations in the short term, while the three-year target, which was lower than the one-year one, was meant to kick off a disinflation process. Net inflation was chosen in order to prevent monetary policy decision-making from being influenced by deregulation and the tax changes that were part of the transition process. Deregulation, measured by changes in regulated prices, was large in scale (Figure 4.2). The introduction of IT also required the CNB to announce that it would enhance the transparency of monetary policy decision-making and start publishing inflation reports. This announcement was accompanied by a communication campaign to explain the new strategy. A comparison of actual inflation with the inflation targets in place when IT was introduced reveals that the disinflation strategy was pretty ambitious, but disinflation was spread out over time with the aid of the two targets (Figure 4.1).

The embryonic phase of IT

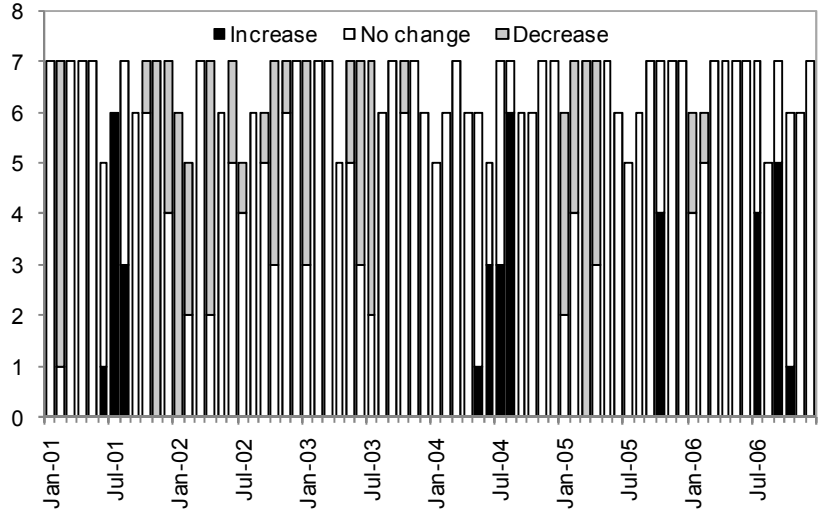
The embryonic phase of IT, which took place essentially during 1998-2001, was aimed at establishing the credibility of the new policy regime and all its essential components, and at getting disinflation under way. Credibility was achieved relatively quickly owing to highly visible disinflation, which proceeded faster than signalled by the first two targets for net inflation. The inflation targets were undershot in the early phase. In 1998, the CNB announced another short-term target for net inflation for 1999. In 1999, it announced a medium-term target for 2005, which was later recast as a target for CPI inflation. In 2000, it again announced a short-term target for 2001. In 2001, the CNB announced a change to CPI inflation targeting (as of 2002) in order to anchor expectations for the entire CPI. CPI inflation was crucial for numerous decisions, most notably wage bargaining. At the same time, the CNB replaced a combination of short- and medium-term inflation targets by a descending-band target.

The CNB began the embryonic phase with a forecasting system based primarily on expert knowledge and partial econometric estimates. It was not until IT was up and running that work started on building a fully-fledged

forecasting system centred on a calibrated model. All decision-making reference materials prepared by CNB experts were submitted to the CNB Board in internal monthly documents called situation reports.

From the outset of IT the CNB has been a very transparent central bank. Right from the beginning in April 1998 it started publishing quarterly inflation reports based on the internal situation reports. Minutes of board meetings on monetary policy issues started to be published in January 1998. These meetings usually took place once a month, the minutes being issued 12 days after each meeting. From the start, both of these primary communication documents were published in two languages, Czech and English, so that the domestic and foreign public and participants in international financial markets could follow the discussions. In 2001, the CNB announced that full internal transcripts of monetary policy meetings would be disclosed along with the relevant situation reports six years after each meeting (CNB, 2001a). In 2001, the CNB also started disclosing the ratios of board members' votes (before then, it had only reported whether decisions had been approved unanimously or by a majority vote). This move allowed analysts and market participants to better estimate future interest-rate movements, as it revealed the level of agreement on the current interest-rate settings (Figure 4.3).

Figure 4.3. **Czech Republic: Voting ratios on monetary policy rates, 2001-06**



1. In some cases, not all board members were present, hence the number of votes fluctuates between 7 (full participation) and 4 (minimum required participation).

Source: Czech National Bank.

During the embryonic phase, the policy interest rate fell from 12 to 5% per year, the koruna appreciated modestly against the euro at 4% per year on average, and deregulation proceeded at a high, albeit slowing, pace, with regulated prices rising by 10% on average. CPI inflation fell from 7 to 4%, net inflation fluctuated between 1.5 and 3%, and core inflation, which was viewed as the relevant indicator of demand-pull inflation, decreased from 4 to 2%. The pace of disinflation was frequently discussed during this phase, but according to several studies inflation fell to close to the optimum rate at the time (Mahadeva and Šmídková, 2000).

The advanced phase of IT

The advanced phase of IT (which took place primarily during 2002-05) was meant to complete the disinflation process, anchor inflation expectations at a low level and fine-tune all the essential institutional underpinnings of the monetary regime. A new inflation target, taking the form of a descending band, was implemented in January 2002. It was specified in terms of CPI inflation. As the disinflation process continued at a relatively fast pace, the target was undershot throughout the period, except for the final year, when inflation was affected by a tax increase in the previous year and by faster deregulation (Figure 4.2).

The implementation of a fully-fledged forecasting system took several years. The system was not launched until IT had been in place for four years (Coats *et al.*, 2003). The CNB started working with the fully-fledged forecasting system in 2002. At its core was a quarterly projection model (QPM) covering the key macroeconomic linkages between monetary policy, the output gap, the exchange rate and inflation. Alongside the QPM, the CNB started using a complementary expert-empirical system for short-term forecasts and also modified the structure of its internal situation reports to incorporate model forecasts. The limited number of macroeconomic linkages covered by the QPM meant that the monetary policy debate, which often covered a wide range of economic variables, could not be based entirely on model forecasts. This was one of the reasons why the CNB started to work on a new, more sophisticated forecasting model in 2003 (Beneš *et al*., 2005). The CNB also further enhanced its transparency. Since 2002 the inflation reports have featured a numerical unconditional forecast of macroeconomic developments. The publication gap of the minutes of board meetings on monetary policy issues was shortened in 2005 from 12 to 8 days after each meeting.

The advanced phase of IT coincided with a further decline in the policy interest rate, albeit at a far more moderate pace than in the embryonic phase (from 3 to 2%), a continuing modest appreciation of the koruna against the euro

(3% on average), and a volatile, often pro-cyclical, speed of deregulation (at 5% on average). CPI inflation fell further from 4 to 2%, and core inflation fluctuated between 0-1.5%. The disinflation process was more or less complete, as reflected in the CNB's 2004 announcement of a new horizontal target for 2006 (CNB, 2004).

IT with a horizontal inflation target

The current phase, which for the purposes of this chapter will cover the 2006-09 period, is one of inflation stabilisation and gradual refinement of the individual components of the monetary regime to reflect new information from economic theory and practice. The new inflation target was set for an indefinite period, with a tolerance band of $\pm$1 percentage point. So far, CPI inflation outturns have fluctuating just below the target, but mostly above the lower bound (Figure 4.1).

In this phase, work is under way on a new version of the forecast model, which is expected to become the core of the forecasting system. The process of enhancing transparency is also ongoing. In 2007, the CNB announced that it would start disclosing the individual board member votes in 2008 in addition to the voting ratios (CNB, 2007). At the same time, it announced that it would lower the horizontal target to 2% in 2010, in preparation for adopting the euro. This IT phase has so far been characterised by a moderate rise in the policy rate from 2 to 3%, a continuing modest appreciation of the koruna against the euro at 2% on average, and a modest speed of deregulation of around 5%. CPI inflation has been fluctuating between 2-3%, and core inflation has edged up to 1-2%.

IT towards adopting the Euro

An important specific feature of the Czech IT regime compared to other countries, such as Canada, New Zealand and Israel, is the need to eventually gear the policy framework for preparing to adopt the euro. The Czech Republic has been a member of the European Union since 2004; therefore, at some point it is expected to adopt the single currency. Although the exact date is not yet known, it can be assumed that preparations will begin after 2010. According to the Czech government and the CNB, preparations should last two to three years (Czech Ministry of Finance, 2006). The CNB has already announced a lowering of the inflation target for 2010. The new target should be in line with the current interpretation of the Maastricht criteria, which must be satisfied before the euro can be adopted. Among other things, the criteria require low inflation and exchange-rate stability.

Exit phase

Another specific feature of the Czech IT regime compared to other countries is its clearly defined exit route. On adopting the euro, the Czech economy will cease to be stabilised by means of IT as currently implemented by the CNB, and its macroeconomic framework will be shaped by the monetary and exchange-rate policy of the euro area as a whole. The problem of exiting from a monetary policy regime has so far been faced mostly by countries with fixed exchange-rate regimes (including currency boards), rather than IT countries (Portugal, 2007). That notwithstanding, we mention the issue here, because it is among the (often implicit) considerations during the introduction of a new monetary policy regime.

Components of the IT regime

The Czech IT regime has three key components: the specification of the inflation target, the internal framework for monetary policymaking and the communication strategy (which determines the degree of transparency of monetary policy).

Specification of the inflation targets

When specifying an inflation target, several decisions need to be made, including on the target level and horizon and on how to deal with uncertainties associated with monetary policy decisions. In general, one can choose between a descending target and a horizontal one, with closed- or open-ended horizons, between a point inflation target with a system of escape clauses or a target range, and between targeting all or only a sub-set of the consumer price index (Haldane, 1995). Each specification has its pros and cons, so it is natural for a central bank to change the definition of the target when the economic circumstances change, therefore altering the balance of advantages and disadvantages of alternative specifications.

To begin with, as described above, the CNB used descending targets, which indicated its intended disinflation speed, and time-limited targets, which signalled the estimated timeframe for disinflation. Subsequently, it switched to a horizontal target with an open-ended horizon, which better suited the central bank's goal of stabilising inflation. The uncertainty associated with monetary policy decisions was initially dealt with by means of target ranges, which emphasised the considerable uncertainty surrounding the volatility of inflation in the disinflation process, and also by targeting net inflation (rather than the entire CPI), which reflected the uncertainty associated with the end of transition and with the impact of economic policies on inflation. A list of *ex ante* escape

clauses was added subsequently (CNB, 2001b). As some of the uncertainties gradually diminished, the CNB switched to point targets accompanied by a signal interval only, and to targeting the entire CPI.

In some studies, the institutional arrangements for setting the inflation target are regarded as part of the specification process. This specification can be carried out by the central bank, the government or the two acting together. There are cases around the world (Heenan *et al*., 2006) where the central bank (*e.g.* Chile) and the executive branch of government each specify an inflation target (*e.g.* United Kingdom). In the case of the CNB, the targets were set by the central bank alone on some occasions, as in 1998, or together with the government, as in 1999. However, informal consultations have taken place when setting the targets, which have been used for economic analyses by both the central bank and the government. The formal features of this institutional set-up have therefore not played a major role in monetary policymaking.

The monetary policy decision-making framework

While the specification of the inflation target attracts the attention of the financial community, decisions on the main characteristics of the monetary policymaking framework tend to be important primarily for the internal running of the central bank. The only part of this framework that usually attracts the attention of market participants and analysts is the forecasting model, which can be compared with the models of other central banks or with academic models (Robertson, 2000). However, the framework is made up of several components. In addition to the model that generates the central forecasts, there is the method for dealing with uncertainty, the format of reference materials, the organisation of the discussion, and, finally, the adoption of actual decisions to change rates (Šmídková, 2005).

As in the case of the models used by other inflation-targeting central banks, the CNB's forecasting system has gone through several phases. As described earlier, the aggregated model has been refined and expanded and the latest academic research findings have been taken on board. The first generation of the forecasting system lasted four years, and the estimate for the second generation is six years. The uncertainty associated with monetary policymaking has been reflected since the outset in several elements of the framework. Internally, a verbal account of particular risks has always been provided in the situation reports. The individual votes on policy rate changes have also played an important role, because board members have not always reached consensus on their assessments of the economic situation (Figure 4.3) and have thus in fact estimated the risks associated with the forecast through the method of averaging

alternative views by voting. This method is often used by managers when faced with uncertainty (Šmídková, 2005).

The methods for dealing with uncertainty have gradually been expanded to include, for example, the use of alternative scenarios and interval forecasts. Externally, uncertainty has been communicated through the specification of the target (see above). Monthly situation reports and updates of those reports in the case of the extraordinary board meetings held in the embryonic phase of IT have served as reference documents. These reports contain information that is similar to that provided in the inflation reports, while delving into some issues in greater detail. An increasing emphasis has been placed over time in the situation and inflation reports on the inflation forecast and risk estimates. The monetary policy meetings have a fixed format. Following a presentation of the situation report by CNB experts, the CNB Board, which has seven members, each one with an independent vote, meets in a closed session and, after holding a discussion that is later made public in the minutes, votes on rates. In the event of a tied vote, the governor casts the deciding vote. The outcome of the meeting is disclosed in a press release and at a news conference.

Communication strategy

The communication strategies of IT central banks tend to be based on a combination of several tools: press releases/news conferences, and inflation reports and minutes of meetings, usually accompanied by interviews with individual board/committee members (Šmídková, 2005). These tools involve direct communication with both the general public and the financial community. To meet the needs of the academic community, some central banks also later release their internal reference documents, forecasting model equations and detailed transcripts of monetary policy meetings. The central bank's institutional partners are another key target group. This group typically includes the institution that conferred the status of independence to the central bank, be it the government or the legislature (Šmídková and Tůma, 1999).

The CNB employs all the above communication tools, making it one of the most transparent central banks in the world (Fracasso *et al.*, 2003). The degree of transparency has been high from the beginning of IT, and the range of tools used has gradually been expanded, as described above. Interest-rate decisions are now announced in a press release and explained at a news conference, and further details are provided eight days after the meeting in the form of minutes and quarterly through the inflation reports (Šmídková and Bulíř, 2007). Reference documents and a detailed transcript of the meeting are published subsequently. The inflation report is also presented by CNB representatives

twice a year in the Czech parliament, which is a partner institution of the central bank.

Concluding remarks

The CNB's experience with IT may be of interest to other central banks in emerging-market economies that are considering the introduction of this monetary regime or have introduced it more recently than the CNB. The key facts relate primarily to the conditions for successful implementation of IT, the essential characteristics of the policy regime and its flexibility.

Not all the conditions need to be met before introducing IT

A whole range of conditions have been identified in various studies as essential for the successful implementation of IT in a developing economy. In the CNB's case, many of these conditions were satisfied; for instance, a lack of fiscal dominance and a relatively well developed financial market. But there were conditions that were not met, such as the availability of an adequate forecasting model and technical know-how at the central bank. Nevertheless, IT has proved to be a success in terms of disinflation and later as an inflation-stabilising strategy. The CNB's experience proves that not all the conditions need to be met before IT is introduced. Some of them may in fact be difficult to meet, because there is insufficient motivation to satisfy them in the absence of IT. This is the case, for example, of a central bank which, like the CNB in 1997, is switching from a fixed exchange-rate regime to IT. In a fixed exchange-rate system, the central bank does not have a strong incentive to set up an extensive, inflation-centred forecasting system, as monetary policymaking focuses on interest-rate changes and interventions in the foreign-exchange market needed to maintain the exchange-rate peg.

Key features to be addressed when introducing and refining IT

The introduction of IT is always combined with the announcement of an inflation target. Implementation of the strategy is often referred to as inflation-forecast targeting, because by changing the policy interest rate the central bank tries to keep the inflation forecast in line with the inflation target. Another key feature of IT is transparency. It is therefore the inflation target, the forecasting model and the inflation report that frequently take centre stage during the introduction and refinement of the IT regime. However, IT has numerous characteristics that need to be considered. The CNB experience demonstrates that it is important to fully appreciate from the outset the role of *ex ante* escape clauses as a mechanism enabling the central bank to communicate to the public why it may intentionally not meet the inflation target

in the event of large shocks. It is also crucial from the outset to introduce into the decision-making process elements that reflect the uncertainty associated with the central forecast. References to alternative scenarios, for instance, can be very useful in this regard. Moreover, it is good to bear in mind from the start that the academic community will be interested in studying internal reference documents and detailed minutes of meetings at some subsequent point in time. Consequently, it is useful to set from the outset an appropriate format for these internal documents and a mechanism for approving their final versions.

Changes need to be made as and when necessary

IT can give the impression of being quite a rigid policy framework. The inflation target is usually presented in the academic literature as a horizontal point target that does not change over time. Likewise, the issues of changing the forecasting model or gradually enhancing the transparency of the monetary policy decision-making process over time are rarely discussed in the academic literature. The CNB's experience clearly demonstrates that IT is in practice a framework in progress, allowing changes to be made to its individual components as and when necessary. The three most prominent examples in the Czech experience are the changes to the inflation target, the forecasting model and the communication strategy. The specification of the inflation target has changed fairly often over time – once every three years on average. These changes have had no bearing on the credibility of IT, because they have always reflected changes in the conditions in which the CNB implements monetary policy; therefore, they have not been viewed as opportunistic. Such changes in conditions occurred, for example, after the effects of the first wave of deregulation had worn off and after accession to the European Union, which entailed an obligation to adopt the Euro at some point in the future. The forecasting system has changed as the CNB's know-how has expanded, and also as new ideas have emerged from the academic world, such as the use of DSGE models. The CNB's communication strategy has put emphasis on gradually enhancing transparency. Expansions of the set of information available to the public and earlier publication of certain documents have been announced relatively frequently, on average once every eighteen months.

Notes

1. CNB inflation and GDP forecast used to approximate data for 2007.

2. No specific euro adoption date has been set as yet (Czech Ministry of Finance, 2006), so it is referred to as "T" in this chapter.

3. Net inflation is CPI inflation adjusted for deregulations and other administrative measures.

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Chapter 5

Monetary policy in emerging markets: The case of Indonesia

Hartadi A. Sarwono,

Bank Indonesia

This chapter discusses the Indonesian experience with inflation targeting (IT). The author emphasises rapid structural changes in post-crisis Indonesia as an important feature of the country's monetary regime. The need to deal with fiscal dominance and relatively shallow financial markets are additional important challenges for the monetary authorities, especially against a backdrop of exchange-rate volatility and sudden shifts in capital inflows. The author argues that, due to these characteristics of the Indonesian regime, policy co-ordination between the monetary authorities and the government at large needs to be enhanced. This co-ordination is particularly important to minimise the inflationary pressures associated with a large share of administered prices (which are set by the government) in the consumer price index and volatile food prices.

Introduction

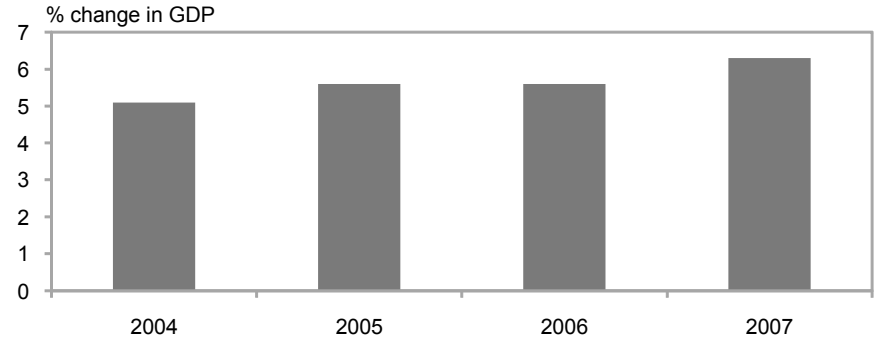
Conducting monetary policy in emerging markets is not only about setting a target for the exchange rate, inflation or another monetary aggregate and then deciding on the appropriate level of the interest rate as a policy response. As recent analysis and experience have shown, institutional factors both within and outside the central bank's control play an important role in the pursuit of monetary-policy objectives. It is evident, therefore, that in a large number of developing and transition economies, fiscal dominance and poor financial infrastructure severely constrain the scope for independent monetary policymaking. For most of these countries, monetary policy instrument independence would require comprehensive public-sector, banking and financial reforms. Even in developing countries with well-functioning financial markets, moderate-to-low inflation and no symptoms of fiscal dominance, the effectiveness of independent monetary policy depends on the exchange-rate regime and the extent of capital mobility (Masson *et al.*, 1998). Moreover, credibility, transparency and communication with the public about policy goals and operational strategies are also important elements of a successful policy strategy.

Recently, inflation targeting (IT) has become a popular monetary policy framework for the pursuit of price stability. IT is based on a clear commitment to a quantitative inflation target as the primary objective of monetary policy, supported by a high degree of transparency and accountability in policy formulation and implementation. Many central banks, including those in emerging-market economies, have explicitly adopted this policy framework. By explicitly setting a numerical target and placing emphasis on inflation forecasts, those central banks are able to justify their actions to the general public. The performance of inflation targeters has so far been impressive. The International Monetary Fund (IMF) has even recommended the adoption of IT and central bank independence to a number of countries in Asia following the financial crisis in late 1990s.

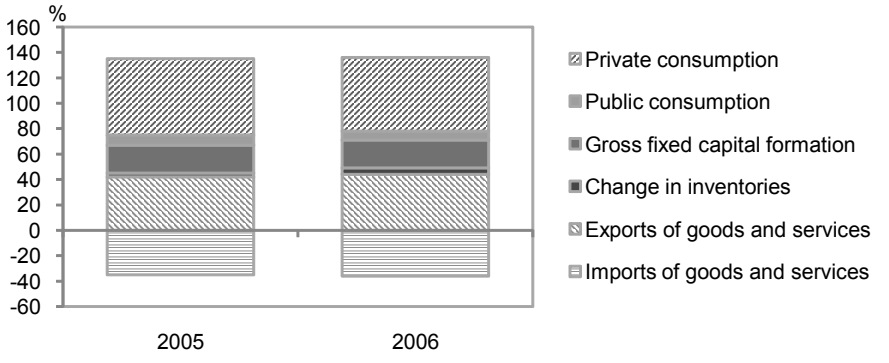
It is clear, however, that the adoption of IT is not a panacea. Post-crisis Indonesia is a good case study (Figure 5.1). While the adoption of this monetary policy framework provides a good tool for pursuing and maintaining macroeconomic stability, creating synergies among other macroeconomic and real-sector policies is also needed to bolster economic stability and to accelerate sustainable growth in countries that are confronted with various external shocks. Agreement among government, central bank and the legislature in determining policy options is crucial. It is also evident that a prompt, bold and consistent policy response must identify the major policy issues, if effective policy responses are expected.

Figure 5.1. **Indonesia: Post-crisis performance, 2004-07**

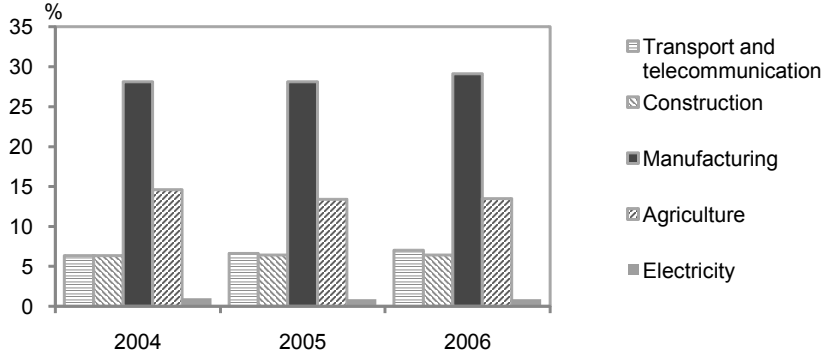
A. Sustainable economic growth



B. Sources of growth: Demand side



C. Sources of growth: Supply side



Source: Bank Indonesia.

This chapter examines the practice and promise of IT in Indonesia. It also considers the challenge of implementing such a framework in an economy that is small and open to capital movements. Of particular concern is the relationship between exchange-rate movements and the recent unpredictability of global capital flows. The chapter also places the monetary policy framework in the context of rapid structural changes in post-crisis Indonesia.

Indonesia's monetary policy framework: A brief history

Indonesia's experience during the recent crisis offers invaluable lessons on the role of the central bank in the economy and its institutional setting. It was this experience, together with recent global trends towards reforming the central bank's role to focus on stabilising prices, that prompted the approval by parliament of the new central bank law in 1999 (Law No. 23/1999). The law states that Bank Indonesia's (BI) objective is to achieve and maintain the stability of the rupiah. The new law provides an important basic framework for monetary policymaking. The central bank was granted full autonomy in setting the inflation target (goal independence) and to use monetary instruments in pursuit of this target (instrument independence). The law also gives BI, as an independent state institution, formal autonomy from government. Other parties are prohibited from being involved in any manner in the implementation of BI's tasks, and BI is obliged to refuse or to disregard any form of involvement by any parties.

According to the new law, BI has to set an inflation target every year. Although it is not explicitly stated in the law, the setting of an inflation target, together with supporting institutional arrangements, places BI's monetary policy regime within an IT framework. By definition, IT is a framework for the conduct of monetary policy characterised by the public announcement of official quantitative targets for the inflation rate over one or more time horizons (Bernanke *et al.*, 1999). With the mandate of the new law, BI started to announce its annual inflation targets at the beginning of 2000. A monthly board meeting has also been conducted to review and set the monetary policy stance and direction. The results of these meetings have been communicated widely to the public through various media, including press releases and conferences, seminars with academics and other stakeholders, as well as through the BI website. For accountability, quarterly reports are submitted to parliament, including assessments of monetary policy, and the state of the banking and payment systems, which are under BI's purview.

The target is set for CPI inflation. For 2000 and 2001, the targets excluded prices that are set by government and those affected by its incomes policies. For example, the targets were 3-5% for 2000 and 4-6% for 2001. In addition, BI

forecasted the impacts of administered prices and incomes policies on inflation, which for 2000 and 2001 were 2% and 2-2.5%, respectively. Therefore, adding these two components, the BI forecasts of total CPI inflation amounted to 5-7% and 6-8.5% for 2000 and 2001, respectively (Table 5.1). For 2002, in light of difficulties in its communication strategy with the public, the target was set for total CPI inflation at 9-10%, while the central bank used core inflation as a basis for formulating monetary policy. In addition to the annual target, starting in 2002 the central bank also announced its commitment to bring CPI inflation down to 6-7% within five years as a medium-term inflation objective.

Table 5.1. **Indonesia: Macroeconomic indicators, 2000-04**

	CPI target (%)	Economic growth assumption (%)	Base money growth target (%)	Rupiah exchange rate per USD (average)	Actual base money growth (%)	Actual CPI inflation (%)
2000	5.0-7.0	3.0-4.0	8.30	8.238	23.40	9.53
2001	6.0-8.5	5	11.0-12.0	10.255	18.30	12.53
3002	9.0-10.0	3.5-4.0	14,0-15.0	9.353	0.30	10.03
2003	8.0-10.0	3.5-4.0	13	8.593	10.30	5.06
2004	4.5-6.5	4.0-5.0	13.0-14.5	8.940	15.14	6.40

Source: Bank Indonesia.

It should be emphasised, however, that the policy framework adopted in the early 2000s was not formal, fully-fledged IT. Rather, it was simply a monetary policy framework with an explicit target for inflation. During the stabilisation period under the IMF-supported programme, BI adopted base money as the operational target, as well as an anchor to achieve the ultimate inflation target. Furthermore, at the same time BI also monitored various aggregates, as well as the interest rates.

Triggered by strong public sentiment with respect to the independence of the central bank, the law was amended at the beginning of 2004 (Law No. 3/2004). Accordingly, the central bank is no longer allowed to set the inflation target. The previous goal and instrument independence has therefore been reduced to only instrument independence. Although the government is now responsible for setting the inflation target, this development is not a setback. It can be argued on the basis of democratic accountability that the government is better equipped to represent the public (through the electoral process) than the central bank, so that the government has a clear mandate to set the target for the benefit of the people. In addition to this argument, goal dependence is relevant for the case of Indonesia, where the inflation outcomes

depend heavily on the supply side of the economy, which cannot be controlled only by monetary policy (see below). By setting the target, the government is expected to make its contribution through supply-side policies.

With the amendment to the BI Law in early 2004 and following BI's recommendation, the government set annual and medium-term targets for CPI inflation at 6% (±1%) in 2005, 5.5% (±1%) in 2006 and 5% (±1%) in 2007. These targets were set in the context of gradual disinflation with the objective of achieving 3% over the long term, an inflation rate that is consistent with those prevailing in other emerging-market economies. A severe oil-price shock in 2005 forced the government to cut back the existing oil subsidy, which resulted in the doubling of domestic oil prices during the year. Attainment of the inflation target was therefore unrealistic in the sense that monetary policy would need to be too tight to bring inflation back to its targeted level. The government then revised the targets to 8 and 6% for 2006 and 2007, respectively, and set it at 5% for 2008.

The amendment of the BI Law did not cover the operational framework for monetary policymaking. Over time, however, BI noticed a number of problems in the use of base money as its operational target. These included difficulties in achieving the targets and the poor signals these targets conveyed to the market about the direction of monetary policy, which could endanger attainment of the ultimate policy objective of price stability. As a result, BI adopted a fully-fledged IT framework in July 2005.

The implementation of fully-fledged IT

Adoption of formal IT in July 2005 was based on the argument that the financial environment was appropriate and that the framework for so-called "inflation targeting light" was facing a considerable credibility problem. The new framework included four new major elements; namely, *i*) the use of an interest rate, the BI Rate, as the policy reference rate, *ii*) the implementation of anticipative (forward-looking) monetary policymaking, *iii*) the development of an enhanced, transparent communication strategy, and *iv*) improved policy co-ordination with government. These elements were aimed at achieving price stability in support of sustainable growth and strengthening social welfare.

IT places inflation as the overriding policy objective and nominal anchor for the conduct of monetary policy. In this regard, BI is to apply a forward-looking strategy by directing its current monetary policy towards

achieving the medium-term inflation target. Within this new policy framework, the interest rate is used as the signal of BI's stance on monetary policy and the target for monetary operations, instead of base money. There are four reasons underlying the change in the policy framework. *First*, the relationship between base money and inflation or economic growth is becoming increasingly unstable, and even subject to reverse causality due to instability in the demand for money, as well as uncertainty on the magnitude of the money multiplier and velocity parameters. *Second*, the signalling of monetary policy to the public has been hindered not only because of the public's difficulty to understand the concept of base money in general, but also due to perceptions that BI uses two nominal anchors (*i.e.* base money and inflation). *Third*, the monetary policy response tends to be backward-looking and more difficult to implement, considering a time lag between changes in the instrument and inflation. Finally, the operational target for base money is more difficult to achieve due to the dominant role and unpredictable behaviour of money demand in Indonesia. Base money comprises 61% of money supply, of which 85% is held by the public, while the excess reserve that is controllable using the monetary instrument is only 8% of base money.

Taking into account these shortcomings, the use of base money as a policy instrument would most likely increase interest-rate volatility. It can be excessively high in the event of a monetary contraction and too low during an expansion. In the case of a contraction, the policy rate might need to be increased significantly in order to absorb excess liquidity in the banking system. This could have an adverse effect on the banking system and the real economy through the interest rate and bank balance-sheet channels of monetary transmission. Furthermore, increased interest-rate volatility would imply an excessively high or low real interest rate. The latter may exacerbate the risk of currency substitution, therefore eventually increasing inflationary pressures. The volatility of the interest-rate differential with respect to global rates could also increase. A very low interest-rate differential would discourage short-term capital inflows and exert pressure on the exchange rate and thus on inflation. On the other hand, the role of the interest rate in post-crisis Indonesia is empirically more important than that of base money growth in influencing the exchange rate and inflation. It also provides a clearer signal of the monetary policy stance than base money growth.

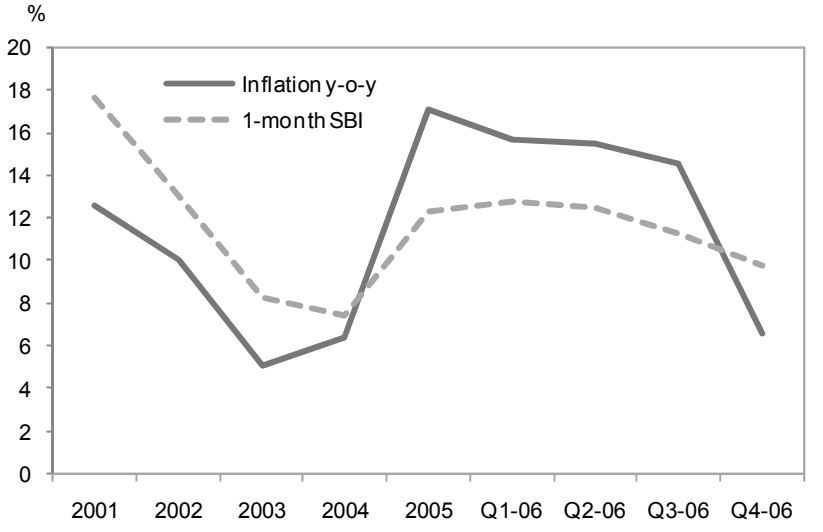
Within the new framework, which was adopted in July 2005, the BI Rate is used as the monetary policy instrument and operational target. The BI Rate is a policy interest rate with tenor of one month, which is periodically announced by the central bank for a certain period and designed to signal its monetary policy moves to the public and market participants. The BI Rate is the rate of return on

the Bank Indonesia Certificate (SBI), which is the main instrument for liquidity management in open-market operations. The operational framework for achieving the desired level of the BI Rate includes weekly open-market operations (OMO). To enhance the effectiveness of liquidity management, daily Fine-Tuning Operations (FTO) are carried out using the one-month SBI and government bonds as instruments.

The setting of the BI Rate through open-market operations is due to a number of reasons. *First*, the one-month SBI has long been used as a benchmark security by banks and market participants. *Second*, the use of the one-month SBI as an operational target reinforces the signalling of monetary police responses. *Third*, with a significant strengthening of the banking and financial sectors, the role of SBI in transmitting monetary policy moves to the financial sector and the economy has been strengthened. However, the use of the one-month SBI rate as the policy interest rate is a temporary measure. BI is now in the process of replacing this rate by the overnight interbank money market rate as its policy instrument.

Monetary policy is conducted through gradual changes in the BI Rate, so that monetary policy signals remain clear to the public. The incremental change of the BI rate is 25 basis points (Figure 5.2). The policy rate is set at monthly board meetings. Decisions are based on analyses, forecasts and policy recommendations discussed at the meetings. A wide range of data, such as model-based projections, leading indicators, surveys, anecdotal information, expert opinions, risk assessment and uncertainties, as well as empirical research, are used in the meetings. Short-term assessments of monetary conditions are carried out at weekly board meetings. Other strategic monetary measures, such as changes in reserve requirements, regulations on foreign-exchange transactions, and changes to the monetary operational framework, are taken in special weekly board meeting.

Figure 5.2. **Indonesia: Inflation and interest rates, 2001-06**

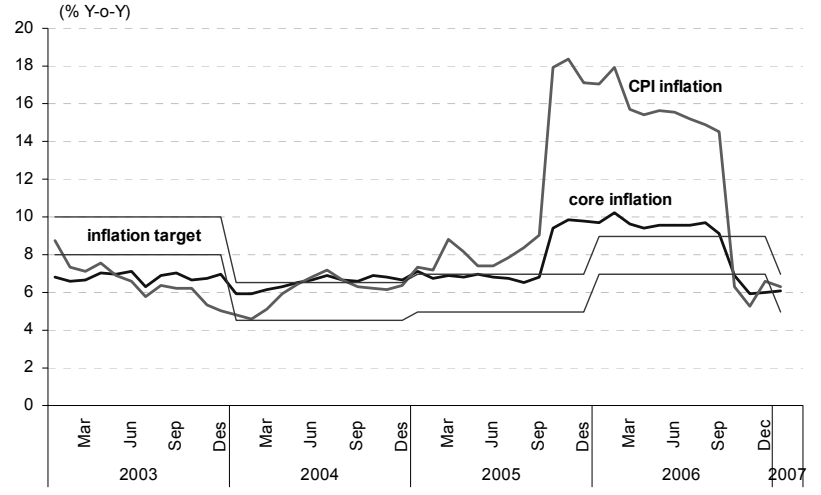


Source: Bank Indonesia.

Monetary policy is communicated periodically through media instruments, such as press and investor conferences, websites and the publication of the Monetary Policy Report (MPR). The objective is to create and form public expectations about economic and inflation forecasts. As for accountability, BI is required to submit annual and quarterly reports on policy implementation to parliament and the executive branch of government. These reports are discussed in parliament as part of the annual evaluation of BI's performance, as well as that of its board. Should parliament require further explanations concerning BI's operations, including an assessment of its performance, the central bank is required to comply.

If the inflation target is missed (Figure 5.3), the government and BI are required to explain openly to parliament and the public the reasons for deviating from the targets no later than February of the following year. These requirements can be interpreted as stemming from the fact that the achievement of inflation targets is the joint responsibility of BI and the government, since the characteristics of inflation are not related to monetary factors alone, but are also affected by government policy in administered and food price development.

Figure 5.3. **Indonesia: Inflation: Outturns and targets, 2003-07**



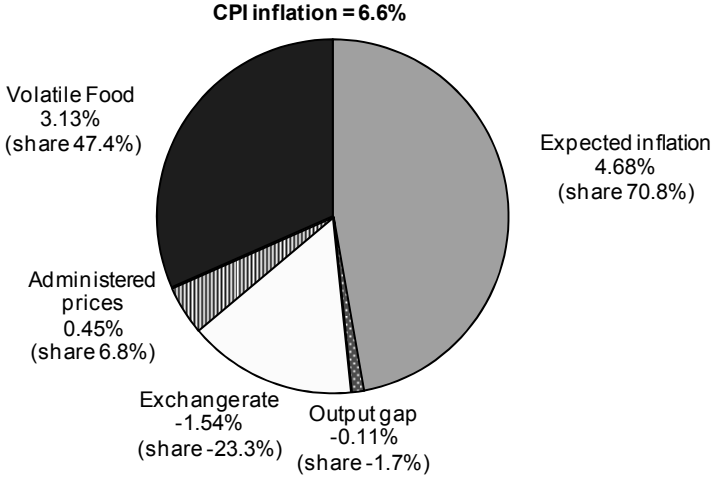
Source: Bank Indonesia.

Limitation of interest-rate responses and co-ordination with government

Indonesia's high, volatile inflation could call for a very high interest-rate response to bring inflation down through the aggregate demand channel of monetary transmission. Such high, volatile inflation might be caused by several factors: *i*) a dominance of adaptive inflation expectations, as indicated from surveys and internal research, *ii*) an ongoing transition process towards the government's target of elimination of price subsidies, and *iii*) price-setting mechanisms characterised by downward price rigidities and upward price flexibility in response to cost hikes. In addition, inflation volatility also reflects some supply-side shocks associated with both production and distribution.

Because of these characteristics of Indonesia's inflationary process, the interest rate alone cannot be effective in bringing inflation to its desired level. The conduct of monetary policy therefore calls for enhanced policy co-ordination with government. Co-ordination is important especially in minimising inflationary pressures arising from administered prices and volatile food items (Figure 5.4). These two factors can easily affect other determinants of inflation, namely expected inflation. Due to a long history of high and volatile inflation, the latter factor plays the most important role in the inflationary process. Consequently, using monetary policy to combat high and stubborn core inflation becomes particularly challenging.

Figure 5.4. **Indonesia: Decomposition of inflation, 2006**



Source: Bank Indonesia.

For that reason, BI and the government set up an Inflation Control Taskforce, whose members are from various line ministries. The primary objectives of this Taskforce include to propose the inflation target to be set, to evaluate the sources of inflationary pressure and their impact on the achievement of the inflation target, to recommend policy options for achieving the inflation target, and to disseminate information on the inflation target and the policy efforts to achieve it, so that market expectations can be anchored around the inflation target.

The Inflation Management Team (IMT) was established in 2004 to develop a comprehensive and integrated policy roadmap to tackle inflation. This roadmap was set after the Team identified the sources of inflationary pressure and recognised that only a concerted policy effort would be effective in controlling inflation. The roadmap contains detailed policies recommendations for the short and medium-to-long terms. It consists of policy outlines that have already been, or are planned to be, put in place to achieve the inflation target. Furthermore, the roadmap can be used as a monitoring and policy evaluation instrument; more generally, it is essential for creating sound policy synergies to achieve the targets set by the National Medium-Term Development Plan. The policy options contemplated in the roadmap focus on fostering supply and improving distribution in response to inflationary pressures induced by volatile

commodity (food) prices. One such measure is to monitor and safeguard the distribution of strategic commodities, such as rice. Also, the recommendations emphasise restraint in terms of both first- and second-round effects of raising administered prices. Moreover, the roadmap is being used to influence the process of expectations formation, so as to move away from adaptive (as is currently the case) towards forward-looking inflation expectations.

The implementation of the roadmap calls for policy co-ordination between the government and the central bank. This is necessary to gradually limit inflationary pressures without triggering excessive adverse shocks to economic growth and unemployment. The policy package includes monetary policies to administer aggregate demand and stabilise the exchange rate; fiscal policies to foster economic capacity building, to ease demand by maintaining fiscal sustainability, and to co-ordinate policies concerning administered prices; and some sectoral policies to improve production primarily through enhanced productivity, building production capacity, fostering an expansion of supply and ensuring the continued distribution of goods and services.

Conducting monetary policy with an open capital account

It is widely accepted that a substantial degree of integration into the global financial system has benefited economies in many ways. Nonetheless, it has also complicated the task of policymakers in pursuing and maintaining macroeconomic stability. In theory, the policy implication of this reality is complicated by the need to deal with capital flow reversals, while maintaining monetary independence and balancing pressures on the exchange rate – the so-called "impossible trinity". The challenge for IT seems to be greater in small open economies, such as Indonesia, which are vulnerable to external shocks, most likely transmitted through exchange-rate fluctuations. Policy options to deal with these challenges are limited. It is very unfortunate that the early stage of IT has coincided with mounting uncertainties about global capital flows.

It is obvious that the growing global imbalances add a new dimension to the already complicated issue of managing capital flows. Although some policy measures have been introduced, the risks of a disorderly adjustment are still clouding the global financial outlook. A disruptive adjustment could have substantial detrimental effects on the global economy and financial system, especially for emerging-market economies. With slow progress in resolving global imbalances, uncertainties are likely to remain a challenge for market participants and policymakers, as well as for the conduct of monetary policy.

The recent surge in private inflows has been reflected primarily in portfolio investments, whereas FDI has been relatively more stable. Managing these

short-term capital inflows poses a particular challenge for the monetary authority, since this type of investment is susceptible to swings in international sentiment, changes in interest-rate differentials and expectations about currency movements. Even if there is no substantial development in an economy, swings in capital flows can take place if risk appetite changes. All countries in the region aimed at reducing their external vulnerabilities and protecting themselves from sudden reversal of capital flows. The preferred first line of defence has been a large accumulation of foreign-exchange reserves.

The accumulation of international reserves can be argued to exacerbate global imbalances. But, for a small open economy in Asia, the fear of sudden capital reversals is not irrational. The Asian financial crises provided an important lesson on how sharp reversals in capital flows may take place at an unimaginable speed. These abrupt reversals put exchange rates under pressure, which may result in financial crises, as evidenced by the experience of Indonesia. This fear is rooted not only in the past experience of the Asian crisis, but also in our recent experience. To illustrate, prior to October 2005, when the authorities took some clear and strong policy measures, the fiscal and monetary authorities were perceived as unable to deal with the problem of a mounting fiscal deficit and rising inflation expectations. Capital fled the country and the rupiah depreciated sharply. Only after a bold policy action to significantly reduce the oil subsidy and tighten monetary policy did market sentiment recover.

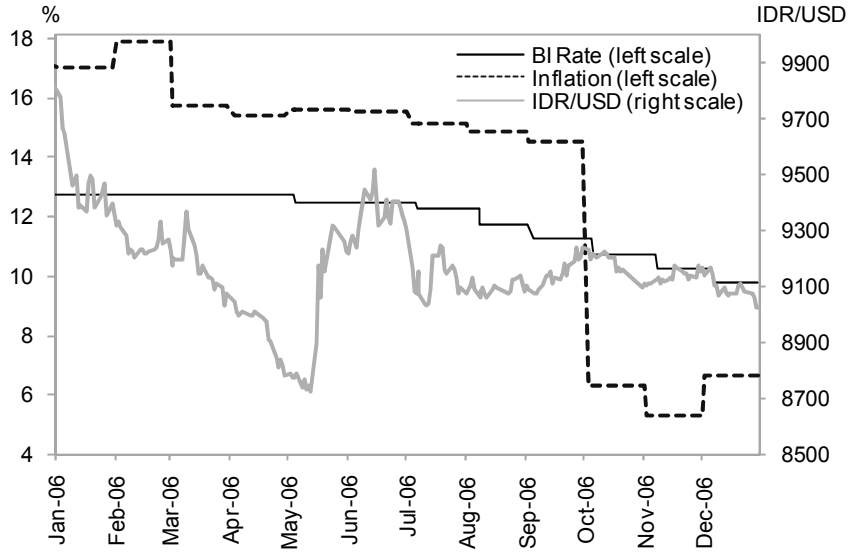
Against a background of ample global liquidity and search for yield, capital inflows have surged since late 2005, clearly indicating a regain of market confidence. Additional policy measures were taken in the first quarter of 2006 to ensure economic stability, especially a fall in inflationary expectations. As confidence was restored, which was reflected in further capital inflows, a strengthening rupiah and falling inflation expectations, BI started to ease monetary policy cautiously in May by lowering its policy rate by 25 basis points, accompanied by some measures to stabilise the exchange rate. The outlook was positive; in particular, the exchange rate reached a two-year high of 8 735 rupiah per US dollar on May 12, making the rupiah the world's best performing currency at the time. Indonesia, however, did not escape the emerging-market sell-off of mid-May and early-June, which was associated with an increase in global financial market volatility owing to a reassessment by fund managers of their risk appetite. After sizeable portfolio inflows and a substantial increase in international reserves, financial-market developments in May and June demonstrated just how easily these flows can be reversed. In Indonesia's shallow market, even relatively modest shifts in capital flows can generate large swings in asset price.

Looking at more fundamental indicators, BI was of the view that global, rather than Indonesia-specific factors, were at play. However, to err on the side of caution, BI reacted by not reducing the policy rate in its June board meeting (a decrease had been widely expected before the turmoil started) and intervening in a very limited scale in the foreign-exchange market to smooth intra-day volatility in the exchange rate. All in all, a more sensitive global financial market is a key challenge facing monetary authorities when setting monetary policy. Swing in capital flows are a major concern. The fear of a disorderly adjustment of global imbalances is obviously a major contributor. Global excess liquidity adds to the financial risk, and swings in oil prices put extra pressure on the stability of capital flows.

As for policy implications, the conventional wisdom is of course to have strong macro-economic fundamentals, a flexible exchange rate and a robust financial system with good supervision. But these are not easy achievements for small emerging-market economies, such as Indonesia. Emerging markets have to remain open so as to allow them to reap the benefits of private capital inflows and international trade. One possibility would be to impose well designed controls to limit destabilising short-term inflows without discouraging long-term flows. But such controls have proved difficult to design and implement in practice. BI would therefore prefer to exercise prudence in maintaining macroeconomic stability. Still in this context, the resilience of our domestic economy should be strengthened and financial markets deepened to fend off excessive speculations arising from disruptive capital flows. To this end, specific and temporary measures designed to maintain exchange-rate stability and to limit speculation are justified so as to allow countries to pursue macroeconomic stability. But, this does not mean that the Indonesian authorities would abandon their commitment to open, market-based policies. On the contrary, stable and non-disruptive capital only flows to countries or regions with a track record of stability.

In an environment of heightened uncertainty about global capital flows, exchange-rate movements during the post-crisis period have been more sensitive to risk premia (Figure 5.5). This explains why the exchange rate is not included explicitly in our policy reaction function. Instead, the central bank reacts to the effects of exchange-rate movements on the output gap and forecasts of core inflation gap forecasts. Increasing the interest rate may have the positive effect of avoiding a depreciation through the exchange-rate pass-through of the aggregate demand channel. However, given the low responsiveness of the exchange rate to interest rate changes, the resulting interest rate hike may even be more harmful to economic growth through the other aggregate demand channels of monetary transmission.

Figure 5.5. **Indonesia: Trends in inflation, exchange rate and interest rate, 2006**



Source: Bank Indonesia.

Lessons to be learned and policy implications

In addition to the deviation between inflation forecasts and the target, the rapid adjustment of the Indonesian economy should be taken into consideration in formulating monetary policy. At the same time, the dynamism of the global economy could rapidly affect the domestic economy; hence, immediate and consistent policy responses are required. Several examples in recent years showed how fluctuations in financial markets can take place if policies lack credibility. Financial markets are now more sensitive and its "punishment" of bad policies seems more severe than in the past.

In an uncertain environment, it is not easy to design good policy responses to deal with external shocks. Policymakers have to react to these shocks, as well as taking account of domestic concerns about poverty and unemployment, which have often constrained choices over optimal policies. Furthermore, the ability of the Indonesian economy to effectively absorb external shocks is still constrained by somewhat shallow domestic financial markets.

Policy reactions should be swift to mitigate any overreaction by market players. For instance, the sudden capital flow reversals by foreign investors and their effect on domestic players, which substantially weakened the rupiah in

mid-2005, as mentioned above, could have been muted, if clearer policy signals could have been given and if the market had captured those signals. Internally, BI had aimed at a pre-emptive monetary policy response, but the markets had a different view on its timing and magnitude. Therefore, we take the view that any policy has to be communicated more intensively to stakeholders both in financial markets and in the real economy.

The recent shocks in global oil prices and weaker demand are not new to Indonesia. Nonetheless, their impact on the exchange rate, inflation and the current-account balance has been different than in the past. Agents' expectations have played an important role in the effectiveness of policy, as partially reflected in a general anticipation of a prolonged policy decision-making process (inside-lag). Changes in agents' behaviour in response to policies have been most visible through risk perception in the foreign-exchange market. From a monetary policy perspective, anchoring expectations seems to have become easier after implementation of the new monetary framework using the interest rate as BI's operational instrument. This instrument is much easier to understand, and policy responses are swifter in comparison with the previous monetary regime based on base-money targeting.

In terms of monetary policy design and implementation, improvements are to be made in BI's research strategies to achieve price stability, to develop models for economic and inflation projections, and to monitor various economic and financial indicators. Bolstering monetary operations will be achieved through improvements in liquidity projections, development of money and foreign-exchange markets, monetary instruments and strengthened monetary policy signals. The dilemma of Indonesia's monetary policy response associated with high inflation and ongoing recovery under restricted sources of growth enhances the importance of policy credibility. Boosting monetary policy discipline, transparency and communication is expected to help to reduce inflation persistence and the cost of disinflation. Efforts to strengthen the credibility of monetary policy, including through the use of the BI Rate and enhanced policy communication, are expected to contribute to a better role for BI in striking a balance between disinflation and economic recovery, as it will improve the effectiveness of monetary transmission.

Macroeconomic policies would also be more effective if supported by sufficient institutional capacity outside the central bank. At the central government level, recent experience indicates that administrative constraints on the fiscal front have resulted in sluggish government spending due to delays in investment plans and a newly adjusted budget format. Therefore, enhancing the spending capacity of both the central and local governments should become a priority. Moreover, a slow implementation of structural reform has slowed the

accumulation of capital, as reflected in supply-side rigidities. This explains Indonesia's steep Phillips curve, which makes the design of monetary policy more difficult, as supply does not respond to stimuli provided by monetary policy. In addition, microeconomic risk and structural distortions in the economy, which underscore supply-side rigidity, have caused the economy to be more vulnerable to external shocks and inflationary pressures. In accordance with the mandate given by law, BI can only contribute to the economy through its efforts to maintain macroeconomic and financial stability. Still, the achievement of such a mandate will largely depend on co-ordination with other authorities, co-operation with various parties, and the help and support of various stakeholders.

Maintaining prudent fiscal and monetary policies should also be accompanied by financial market reform. The market is currently too thin and fragile to withstand global financial uncertainty. The most notable weakness in Indonesia's microeconomic fundamentals is the vulnerability of the financial sector and the banking industry, in particular. The recent experience taught us the importance of diversifying the sources of capital and financing. One important measure to achieve this objective has been the efforts to develop a domestic bond market to foster financial diversification and stability by mobilising domestic savings to provide new financing sources for investment. In Indonesia, as much as in most of East Asia, the banking sector has been and continuous to be a major source of domestic financing. Capital markets are at an embryonic phase of development. The financial sector is now in better shape, but much still needs to be done. The effort to build a sound and stable financial system is now of strategic importance and will remain a key part of building an efficient market economy. In this respect, strong financial infrastructure supported by sufficient regulation and supervision is the principal requirement for integrating the domestic market into the global financial system.

A closing remark: 2007 and beyond

2007 is the tenth anniversary of the multi-dimensional crisis that devastated all aspects of our nation's life. Ten years is a long period for a nation to recover. Macroeconomic conditions are now expected to remain stable and will become the primary foundation to achieve higher growth, provided that microeconomic risk and distortions in the real sector can be minimised, and the investment climate improves significantly.

Economic growth is projected to reach 6% in 2007 (within a range of 5.7-6.3%), which exceeds growth in 2005 and 2006. With respect to the projections, we have to reiterate that distortions and the unfavourable investment climate are the primary constraints that could retard a balanced

economic recovery in 2007. From our perspective, these constraints could affect the array of measures taken by BI to achieve and preserve macroeconomic stability. The economy would become more vulnerable and less able to mitigate the range of domestic and external shocks. Our monetary policy stance would tend to be particularly cautious, especially in the presence of shocks that may exacerbate risks to price stability.

Bearing in mind the limitations of what a central bank can do, BI sees the benefits of the following policy strategy. From the standpoint of monetary policy, the implementation of IT has been a strategic step that must be taken by BI to maintain market confidence on macroeconomic and overall financial stability. A number of issues related to capital flows, exchange rates and the interest rate within a liberal capital-account regime and a floating exchange-rate environment should be placed in the context of global economic adjustments and the kind of macro-monetary policy responses that would be appropriate to deal with them. In this context, policies that provide incentives for long-term capital flows should be given priority over policies that "punish" short-term capital flows. In addition, to support financial market development and to improve monetary policy effectiveness, BI also sees the need to improve the operational structure of monetary policy in particular and to expand and deepen the domestic financial sector in general.

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Chapter 6

South Africa's experience with monetary policy within an inflation-targeting policy framework

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This chapter discusses the South African experience with inflation targeting (IT). The author describes the institutional underpinnings of monetary policymaking in South Africa, including the instruments that have been put in place since introduction of IT to strengthen the central bank's communication with market participants and the public in general. On discussing the main features of the South African regime, he contends that monetary policy has become more forward-looking following the introduction of IT.

Introduction

The evidence in favour of choosing inflation targeting (IT) as the framework for monetary policymaking has become very persuasive in the case of industrialised, non-industrialised and emerging-market/developing economies. There is increasing consensus that central banks that adopt an IT-based monetary policy framework contribute to improving their countries' economic performance by reducing uncertainty about economic policies. Many countries, including South Africa, have in recent years questioned what should replace monetary aggregates or exchange rates as anchors for monetary policy, hence IT has been the flavour of numerous central banks in recent times. This chapter will briefly outline how IT has worked in South Africa and the extent to which this monetary policy framework has lived up to expectations since it was introduced in February 2000.

The inflation target in South Africa

The monetary policy framework of the South African Reserve Bank (SARB) comprises an inflation target that is set by the government. A target range was announced by the Minister of Finance for the first time in February 2000. At that time actual inflation fluctuated around 7%. An important decision that had to be taken in setting the targets for the years subsequent to 2002 was whether a target for one year should be announced, or whether a multi-year path should be specified instead. It was decided to set annual targets without a specific indication of the full disinflation path. This would allow policymakers slightly more flexibility in setting the monetary policy stance. The objective was to bring inflation down to acceptable levels, while implicitly recognising that an excessively fast reduction in inflation to within the target range through high interest rates, would have had high costs in terms of output foregone.

The target has been altered several times since February 2000. The initial target range was set as an annual average rate of increase in the CPIX (the consumer price index excluding mortgage interest costs) of 3-6% for the calendar year of 2002. This range was maintained for 2003, while a range of 3-5% was announced for 2004 and 2005. In October 2002, when it became clear that the inflation target would be missed for a fairly protracted period due to a sharp depreciation of the exchange rate and a number of other exogenous shocks, it was agreed that the target range would once again be 3-6% for 2004. In February 2003, the target range for 2005 was maintained at 3-6%. In November 2003 it was decided to discontinue the average calendar-year specification for the target, because it complicated the implementation of IT and could lead to inconsistencies in monetary policy, adding to interest-rate

volatility and leading to ineffective management of inflation expectations. The annual average was then replaced by a continuous target of 3-6% for the period beyond 2006. This revision potentially reduced the interest-rate volatility that might have ensued from de facto progressively shortening the target horizon towards the end of each year in a dispensation where annual average inflation is targeted.

Autonomy of the South African Reserve Bank

Subsequently to the introduction of IT, a joint National Treasury/SARB Inflation Targeting Technical Committee was established to maintain regular contact and to consult on technical issues relating to the monetary policy framework. This committee serves as an advisory body to both the Minister of Finance and the Governor of the Bank. The final decision on the inflation target regime is reached at cabinet level. Decisions relating to the implementation of monetary policy remain under the purview of the SARB; in other words, full instrument independence is maintained by the Bank.

The Monetary Policy Committee (MPC)

The MPC currently has seven members: the SARB Governor, two Deputy Governors and four senior central bank officials. The MPC will be expanded again to eight members when the vacant position of a Deputy Governor is filled. Meetings are held on even months of the year, but there is continuous monitoring of economic developments, particularly those that impact on monetary policy. Unscheduled meetings may be called if the need arises, as it was the case in January 2002.

The MPC cycle begins in earnest, approximately two to three weeks prior to the scheduled meeting, when MPC members meet with the Macro Models Unit of the Bank's Research Department and provide inputs to be used in generating economic forecasts. The first day of the scheduled MPC meeting starts with presentations on items of topical interest that are prepared on an *ad hoc* basis, usually at the request of the MPC. A review of economic and financial developments then follows, which entails presentations on different aspects of the economy prepared by various departments of the SARB and presented by senior staff members. The following morning begins with a summary of the discussions of the previous day, followed by a discussion of the monetary policy stance by the committee members only. In general, decisions are taken by consensus or with a majority view, without a formal vote. Once the decision is taken, the statement to be issued is finalised and is released to the press at the same time as the Governor reads the statement live on national television.

The inflation forecast

An important implication of the introduction of IT in South Africa was that monetary policy had to become more explicitly forward-looking. Like in most inflation targeters, monetary policy decisions in South Africa are made on the basis of current and expected developments in a number of variables, which are also the main drivers of the SARB's forecasting models. The MPC monitors a number of factors that influence inflation, including changes in wage settlements, productivity and unit labour cost; the output gap; money supply and credit extension; exchange-rate developments and the prices of imports including oil; and administered prices. There is no target for any of these variables other than CPIX, which is the benchmark for monetary policy decisions. Clearly, greater emphasis is now placed on the inflation forecast than before the introduction of IT.

The MPC uses a fan chart to assess the risks inherent in the forecast and to communicate to the public the uncertainties that lie ahead. The SARB publishes the current fan chart in the six-monthly *Monetary Policy Review*. The fan chart allows the MPC to focus its discussions on the potential future upside and downside risks and, more particularly, on the possible effect of these risks on inflation.

The explanation clause

A letter to the Governor of the SARB from the Minister of Finance at the inception of IT contained an "escape clause" suggesting that failure to meet the inflation target would not be considered in breach of the central bank's commitment, if it were due to an uncontrollable ("exogenous") shock of a temporary nature. It would nevertheless require a full explanation on the part of the SARB. Such a deviation from the target could occur, for example, due to the first-round effects of a sudden rise in oil prices or a drought affecting food prices, over which monetary policy has little immediate influence. The escape clause was designed to create more transparency about the discretion the central bank must use in these circumstances.

In November 2003, the SARB in consultation with the National Treasury rephrased the escape clause to achieve greater flexibility and clarity into a forward-looking "explanation clause" that reads as follows: "When the economy is buffeted by a supply side shock similar to those envisaged by the original escape clause that will take inflation outside the target range (*e.g.* an oil price shock, a drought, a natural disaster, or financial contagion affecting the currency), at the subsequent meeting of the Monetary Policy Committee, the SARB will fully inform the public of the nature of the 'shock', the anticipated

impact on CPIX inflation and the monetary policy response to ensure that inflation returns to the target and the timeframe over which this will occur" (Medium Term Budget Policy Statement, 2003).

Assessing the performance of IT in South Africa

In assessing the current policy framework, it is important to ask whether or not it has made a difference. Mishkin and Schmidt-Hebbel (2007) show that IT does indeed make a difference, as inferred from panel evidence for IT countries and a control group of high-achieving industrial countries that do not target inflation. They also acknowledge the importance of controlling for various factors when comparing these countries. It is important to acknowledge at the outset that other important factors also need to be taken into account when assessing the performance of IT in South Africa. For example, government has established a sound and sustainable macroeconomic platform over the past decade by improving tax administration, steadfastly abiding by expenditure limits and moderating the level of government debt. The greatly improved government finances and better co-ordination between monetary and fiscal policies have provided the solid foundations required for the favourable evolution of key macroeconomic indicators in South Africa.

The evolution of key macroeconomic indicators

The explicit forward-looking nature of IT has resulted in far greater stability in real and nominal interest rates in South Africa. This is reflected in their less vigorous response to events, such as the oil price shocks in recent years, and sizeable exchange-rate movements in 2000 and 2001. Excessive focus on or targeting of these variables would probably have resulted in greater variability in interest rates.

Recent analysis of whether IT has reduced interest rate and output volatility also examines how policy has reacted to external and domestic shocks. Indeed, South Africa could not escape the inflationary consequences of the sharp depreciation of the rand at the end of 2001 or the impact of high international crude oil prices. In their findings, Aron and Muellbauer (2006) argue that, since the introduction of IT in South Africa in February 2000, the volatility of headline CPI inflation initially rose substantially, given the weight of the mortgage component of the CPI and the decrease in the volatility of nominal interest rates. Although the volatility of output growth remained very similar to that observed in the four-year period prior to introduction of IT, the growth rate improved significantly. This can be regarded as a significant achievement, given the shocks that hit the economy during the IT period: the tail-end of the 1998 exchange-rate shock and the policy response to it, and the

exchange-rate shock of 2001, as well as shocks to South Africa's most important trading partners.

The credibility of monetary policy

An analysis of inflation expectations before and after adoption of IT reveals that there has been convergence to the target, and that monetary policy credibility has improved significantly. The survey of inflation expectations that is conducted on behalf of the SARB by the Bureau for Economic Research (BER) of the University of Stellenbosch asks households, trade unions, businesses and financial analysts what their expectations are for average CPIX and CPI inflation in the forthcoming calendar year and for the year thereafter. Examining these expectations since the introduction of the survey of inflation expectations reveals that they have generally remained within the target range over time, and agents' expectations have indeed converged. This is encouraging evidence in favour of improved monetary policy credibility in South Africa.

Monetary policy transparency

In recent years governments have increasingly granted independence to central banks but have also been requiring more accountability for their actions. At the same time, the trend towards greater transparency and openness of central banks has improved accountability. In its experience with IT, South Africa has observed that greater policy transparency has positively influenced the effectiveness of monetary policy by assisting in anchoring agents' inflation expectations around a credible target. The view is that this in turn assists in increasing the predictability of interest rate policy, as well as lowering interest rate volatility, and therefore uncertainty in the economy.

The Bank's transparency has improved greatly under IT. The SARB has placed increased emphasis on transparency, since the adoption of the IT framework.[1] In previous policy regimes in South Africa there was no explicit benchmark against which the performance of the central bank could be assessed objectively, but under IT the government sets a specific target range for a particular price index to be achieved within a specific timeframe. Adoption of IT has been accompanied by major improvements in the SARB's communication with the public and markets. Examples are the biannual Monetary Policy Review, the monetary policy statements and the national and regional Monetary Policy Forums. The Governor holds regular consultations with the Minister of Finance, as directed by the Constitution and required for sound macroeconomic policy co-ordination. He also has periodic discussions with members of the Parliament Portfolio and Select Committees on Finance.

Inflation forecast errors

The Bank's forecasters regularly examine their performance in order to improve their forecasting capacity, models and modelling techniques, and to examine their understanding of the workings of the South African economy. This practice is followed by most inflation tagerters, since monetary policy is in essence forward-looking, and models and forecasts play an important role in the policy formulation process. The accuracy of the forecasts of CPIX inflation, when using the Bank's models, is compared with alternative forecasts; including a naive forecast, forecasts by individual agencies and the Reuters Consensus Forecast.

The SARB forecast on the basis of its core model has consistently performed better than those of the other 22 individual agencies included in the Reuters Consensus Forecast with respect to the one-, two- and three-quarter-ahead forecast period. SARB forecasts rank fourth with respect to the four-quarter-ahead forecast period. Comparisons of the inflation forecast errors across the different horizons reveal that, on average, no other forecasting agency has consistently produced more accurate inflation forecasts than the SARB in the period May 2003 to December 2005. Furthermore, the analysis shows that the Reuters Consensus Forecast performs generally better when compared to most individual forecasters.

Remaining policy challenges

CPIX inflation remained within the 3-6% target range from September 2003 to March 2007. In April 2007 the CPIX inflation rate breached the upper limit of the inflation target range and remained above the upper limit in subsequent months. It is projected to return to within the inflation target range in the course of 2008; currently monetary policy is relatively tight to ensure this outcome, leading to discomfort of and criticism by interest rate sensitive debtors. Review of the target range may be necessary; ultimately, the inflation rate will have to approach the level of inflation in South Africa's major trading partners. As Van der Merwe (2004) argues: "If a country's inflation rate is significantly higher than those of its most trading partners or competitors it could result in a loss of price competitiveness over time and generally unstable economic conditions".

A number of aspects have been proposed by Aron and Muellbauer (2006) as being important to further improving IT in South Africa, including publishing more detailed economic forecasts and annual evaluations of forecast errors; publishing (non-attributed) minutes of Monetary Policy Committee (MPC) meetings; giving a more detailed assessment of future economic

conditions in the MPC's monetary policy statement; and explicit future policy inclinations in MPC statements. Central banks in emerging-market economies and developing countries most certainly have to ensure that the conduct of monetary policy is entirely consistent with international best practices. Although some of the aforementioned proposals and/or challenges are still deemed quite controversial in certain countries, a few of these proposals have already been, or are in the process of being, scheduled for review and consideration by the MPC.

Monetary policy challenges were debated at a seminar on IT held at the SARB in 2006 in the context of regional integration in the Southern African Development Community (SADC). Studies and important themes that were discussed included macroeconomic convergence in the SADC region, SADC country experiences with different monetary policy regimes, and IT in theory and practice. There was a large measure of agreement that sound monetary, fiscal, financial and structural policies are all essential pillars of economic success, with the effective conduct of monetary policy critical to every country's economic performance and prospects.

Conclusion

There have been important gains in the performance of monetary policy in South Africa since adoption of IT. The SARB's targeted measure of inflation remained within the inflation target range of 3-6% for 43 successive months to March 2007 before breaching it. Despite the fact that the past few years have been characterised by significant volatility and external shocks, inflation and output volatility have declined, with a substantial improvement in the growth rate of the South African economy since 2002. The elimination in 2003 of its large oversold international liquidity position has also reduced the vulnerability of the Bank. The SARB continued to accumulate foreign-exchange reserves for reducing short-term exchange-rate instability, and thus inflation and interest rate volatility.

Increased macroeconomic stability in South Africa will contribute to sustained financial stability and, if an increasing number of individual developing-country governments and their central banks succeed in delivering greater macroeconomic and financial stability in the years ahead, the performance of the global economy as a whole will improve significantly.

Note

1. For further discussion see Arora (2007).

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Chapter 7

From exchange-rate stabilisation to inflation targeting: Turkey's quest for price stability

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This chapter discusses the experience of Turkey with inflation targeting (IT). The author explains how the monetary policy regime was changed in response to the collapse of the exchange-rate peg in 2001 and how inflation targeting was adopted. She discusses how the preconditions for formal IT were fulfilled, and how these achievements helped to lower inflation at single digits. The move to formal IT in 2006, as well as the institutional changes it entailed, is also discussed in the chapter, as well as the successes and challenges the monetary authorities were confronted with within this new policy regime. The chapter concludes with an assessment of the lessons to be drawn from Turkey's experience with IT.

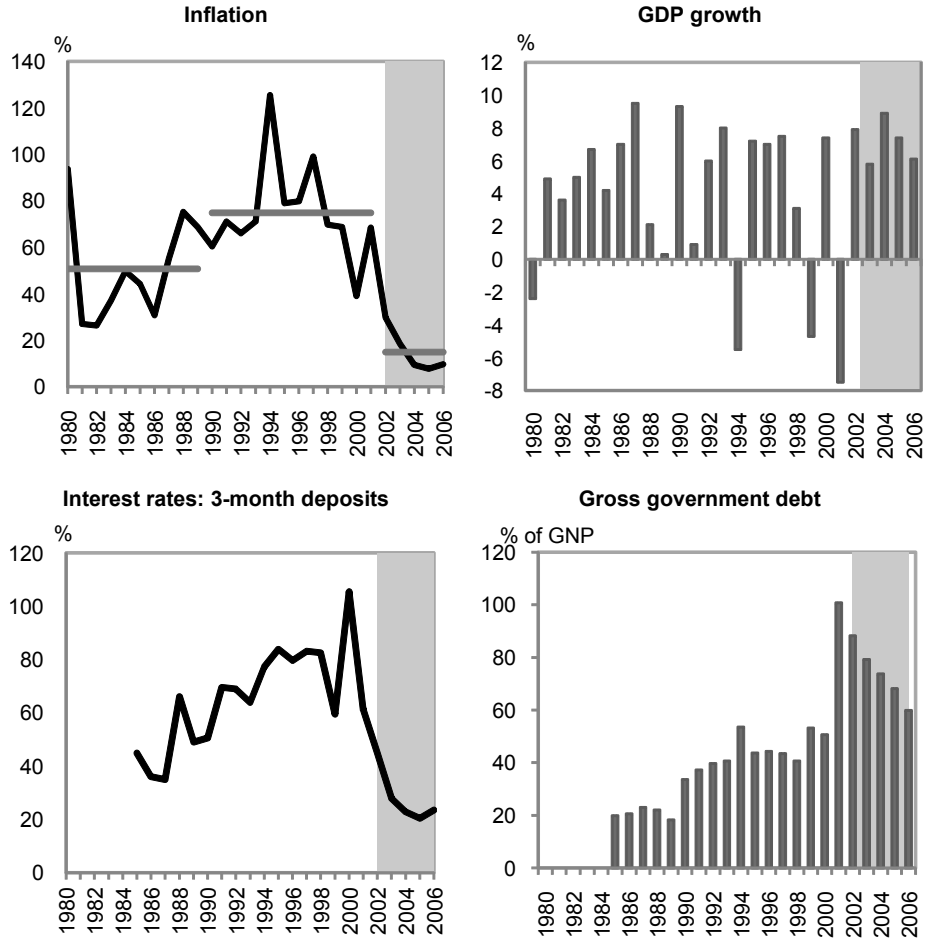
* The views expressed in this chapter are the author's own and do not necessarily reflect those of the Central Bank of Turkey. I would like to thank Mark Griffiths and Yusuf Soner Baskaya for their invaluable comments. The usual disclaimer applies.

Introduction

For almost two decades, Turkey suffered from chronically high inflation, persistent fiscal imbalances, financial volatility and wide swings in economic activity. Large budget deficits during the 1990s resulted in a rapid increase in government indebtedness and sharp rises in real interest rates (Figure 7.1), which hurt private investment and led to an unsustainable debt dynamics. The economy also seemed stuck in an inflationary trap: persistently high inflation, together with a series of failed attempts at stabilisation, kept expected inflation high, which in turn was priced into high nominal interest rates. This meant that, even if the authorities somehow succeeded in disinflation, the result would be a large increase in real interest rates *ex post*. This would increase the already high ratio of government debt to GNP, raising concerns that the debt would have to be monetised and inflated away, thereby undermining the stabilisation attempts. Despite this difficult starting point, the years since 2001 have witnessed a rapid improvement in Turkey's economic performance. Growth has been strong and far more stable than in the past. Although the exchange rate has remained volatile, a trend of steady depreciation has been reversed, and the government debt ratio has fallen below 60% of GNP.

This chapter examines one aspect of this transformation: the gradual adoption of inflation targeting (IT), and how this policy move has helped to lower inflation. The chapter explains, *first*, how the monetary policy setting was changed in response to the collapse of the fixed exchange-rate regime during the February 2001 crisis, and IT adopted. *Second*, it discusses how the preconditions for formal IT were put in place, and how these achievements helped to lower inflation to single digits. *Third*, it describes the move to formal IT in 2006, and the institutional changes it entailed, as well as the successes and difficulties monetary policy faced within this new policy regime through 2007. The chapter concludes with an assessment of the lessons to be drawn from Turkey's experience with IT and highlights some of the challenges ahead.

Figure 7.1. **Turkey: Key macroeconomic indicators, 1980-2006**



Source: TURKSTAT, Turkish Treasury and Central Bank of Turkey.

The 2001 crisis and the adoption of implicit IT

The government formed after the 1999 elections put in place a new economic programme aimed at reducing inflation and enhancing the economy's growth prospects. Although the programme included a tight fiscal stance and new structural reforms, its centrepiece was an exchange-rate crawling peg to reduce inflation. In a sense, this was a quasi-currency board, since the programme included strict limits on the central bank's creation of net domestic assets: the money supply was endogenous and driven by the balance of

payments and changes in net foreign assets.[1] During 2000 the programme seemed to be succeeding in achieving its goals: the primary budget surplus increased to 3% of GDP, and both inflation and interest rates fell (which helped debt sustainability) as the exchange-rate anchor gained credibility.

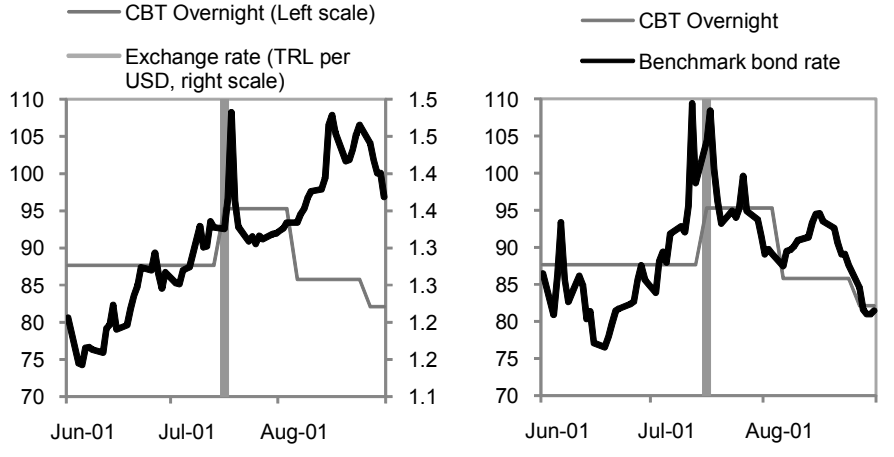
However, these achievements were short-lived. The programme was abandoned in February 2001, resulting in a severe economic crisis. During 2000, although inflation fell, it did so by less than the rate at which the exchange rate had been set to depreciate according to the crawling peg, resulting in a real appreciation of the lira. Together with the increase in domestic demand (resulting from the drop in real interest rates), this real appreciation caused the current account deficit to widen, raising questions about the sustainability of the crawling peg. But the proximate cause of the programme's failure lay in the financial system. A number of banks speculated on the success of the programme by borrowing short or in foreign currency and investing the proceeds in higher-yield longer-term lira-denominated government bonds, taking large open positions. When short-term interest rates had to be increased to defend the peg, the liquidity (and solvency) of these banks came into question. Faced with this tension, eventually the peg had to be abandoned.[2]

The resulting crisis forced Turkey to implement another "new" economic programme. This new programme shared many features of the previous one: improving the fiscal position, pursuing disinflation and implementing structural reforms in support of rapid, sustainable economic growth. However, the collapse of the exchange rate (and the increase in inflation that would follow), the weakness of the financial system and the increase in government debt (due to the impact of the exchange-rate depreciation on foreign currency-denominated debt, the recognition of losses in the financial system and the period of high nominal interest rates needed to defend the peg) meant that the initial conditions for this "new" programme were even less favourable. To increase the chances of success, macroeconomic policies needed to be strengthened significantly.

Monetary policy had to be re-oriented, but no option seemed attractive. Following the 2001 crisis and the collapse of the lira, the exchange rate could no longer be used as a credible anchor. Money supply targeting faced the traditional shortcomings of instability in the demand for money and in the relationship between the growth of money supply and inflation. In addition, similarly to transition economies, potential price shocks, such as corrections in administered prices and tax reform, as well as the likely growth of the financial sector and new forms of financial intermediation, would exacerbate these problems (Jonas and Mishkin, 2003).

IT was the only remaining option, but the preconditions for its successful implementation were far from being fulfilled (CBT, 2002). This is due to a number of reasons. *First*, the inflation rate was very high, at 52% in May 2001, approaching 70% at the end of the year. In this case, the announcement of an inflation target would hardly be credible: no other country had introduced IT at such high inflation rates. *Second*, backward wage- and price-indexation was widespread and the pass-through from exchange-rate changes to prices was high. With higher inflation from an exchange-rate depreciation already in the pipeline, this was hardly an auspicious time to launch IT. *Third*, concerns over fiscal dominance, related to both the size of the government debt and the rollover problems caused by its short maturity, created doubts about the feasibility of using short-term interest rates to control inflation (Kara, 2006). Consistently, when the Central Bank of Turkey (CBT) increased its overnight rate in July 2001, the market reaction was extremely unfavourable: interest rates across all maturities increased and the lira depreciated (Figure 7.2). *Fourth*, financial-sector dominance, due to weaknesses in the banking system, also raised concerns that short-term interest rates would be constrained from being able to target inflation (Fraga *et al.*, 2003, discuss this issue in Brazil).

Figure 7.2. **Turkey: Market response to the overnight rate hikes of 16 July 2001**



Source: Central Bank of Turkey.

Against this background, the CBT implemented a two-pronged strategy for monetary policy, which it called "implicit IT". *First*, as an interim step for the remainder of 2001 and 2002, the CBT set targets for the growth of base money (CBT, 2002); for 2002 the target was 40%, roughly in line with the projected

increase in nominal GDP (35% inflation plus 5% real GDP growth). While there was the potential for errors in forecasting money demand, at high inflation rates these errors might be relatively small compared to the high money growth rate being targeted. Money demand instability might be more of a problem at low inflation rates. Despite their imperfections, the base money targets also satisfied the International Monetary Fund (IMF)-supported programme's need for a clear nominal anchor to reduce inflation. However, there was an understanding that the monetary targets could be revised if money demand proved to be volatile, as in the case where disinflation was successful and caused reverse currency substitution.

Second, in 2002 the CBT simultaneously started to implement "implicit IT", where it would set short-term interest rates based on expected inflation. The first such inflation target, at 35% by end 2002, was set jointly with the government.[3] This target would complement that for base money in the event of potential problems in forecasting money demand or the relationship between base money and inflation, therefore acting as an additional anchor. In line with this new approach and the aim to eventually move to formal IT, the CBT committed itself to improving the transparency of monetary policy by making its evaluations of inflation prospects available to the public. It also started to release the results of its new survey of inflation expectations, both as a useful source of information and as a check on its own forecasts of inflation.

Putting the preconditions for formal inflation targeting in place

This hybrid regime of base-money targets and implicit IT turned out to work surprisingly well. By the end of 2002 inflation had fallen to less than 30%, its lowest level since 1986 and well below the 35% target. However, this dual-anchor approach was really only intended as a temporary measure. The CBT's ultimate goal had always been to move to formal IT. The subsequent years were spent putting the preconditions for formal IT in place.

Central bank independence and a clear mandate for price stability

While a few countries have been able to manage without it, operational independence of the central bank, together with increased transparency concerning its policies and accountability for failure to achieve its goals, are preconditions for successful IT. Accordingly, immediately after the crisis, in May 2001 the Central Bank Law was amended to give the CBT full operational independence to pursue its primary mandate of achieving and maintaining price stability. The Law's main provisions (available at the CBT's website) are:

- Price stability was set as the CBT's primary goal, replacing its earlier mandate to manage monetary and credit policies to accommodate economic development.

- The CBT is required to report formally and regularly to the government on progress made in the pursuit of its inflation target. The governor is required to submit a report to the Council of Ministers on the operations of the bank and its monetary policy in April and October each year. The CBT is required to provide information on its operations to parliament's Planning and Budget Commission twice a year and to prepare regular reports on monetary policy and its implementation, as well as to disclose this information to the public. The frequency of these reports, their scope and procedures for disclosure are set by the CBT. The CBT is required to submit information to the government in writing and to inform the public of the reasons for missing any targets and the corrective measures it would take in this case (Central Bank Law, Article 42). The aim of these measures is to improve the central bank's transparency and accountability.

- Fixed terms were set not only for the governor and board members (as in the previous legislation), but also for the deputy governors to strengthen independence.

- A Monetary Policy Committee was created to advise the central bank on the design and implementation of monetary policy.

- Following a transition period that would expire in November 2001, the CBT was prohibited from lending directly to the Treasury (including purchases of government securities in the primary market). Given the government's difficult debt situation and its history of reliance on monetary financing, this goal would be challenging but essential to give the CBT monetary control.

Overcoming fiscal dominance

High government debt ratios can undermine the central bank's ability to use its main policy instrument, the short-term interest rate, to control inflation. According to the standard transmission mechanism, higher interest rates make domestic currency-denominated government debt more attractive, resulting in a stronger currency and lower inflation. This comes on top of the standard transmission mechanism in the banking sector through credit growth and domestic demand (although these are less potent in emerging-market

economies). However, in countries with high debt or debt that is of short-maturity, higher interest rates can also increase the probability of default. This makes domestic government debt less attractive, leading potentially to a real exchange-rate depreciation and higher inflation. Even for an independent central bank, high government debt, especially if linked to the short-term interest rate, constrains its ability to tighten monetary policy because of its impact on government solvency.[4]

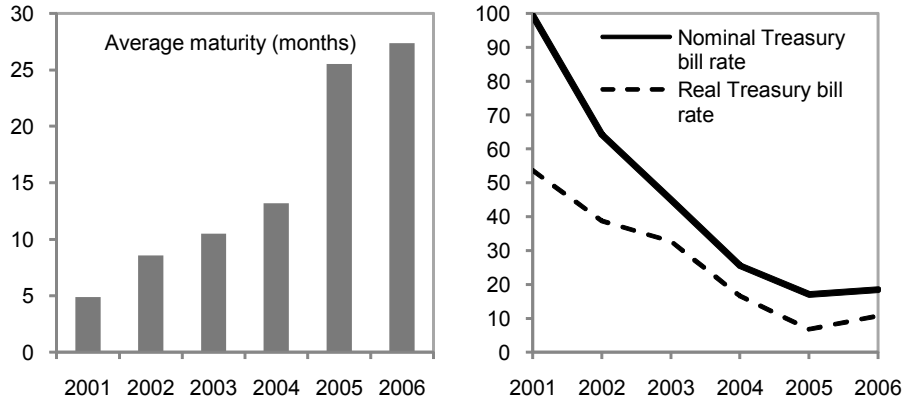
Following the 2001 crisis, the level and growth of public debt became Turkey's main source of macroeconomic vulnerability. Gross government debt rose to around 100% of GNP. The debt's short maturity implied high rollover rates and increased vulnerability to interest-rate shocks, and its large foreign-currency share resulted in greater exposure to exchange-rate shocks. These factors raised concern in domestic and international markets about debt sustainability and government solvency. Therefore, the adjustment programme focused on overcoming these debt problems. *First*, to address short-run liquidity needs, the government relied on extensive emergency financing from international institutions. *Second*, to achieve medium-term debt sustainability, the government increased its primary surplus target, first to 5.5% of GDP in 2001 and then to 6.5% of GDP from 2002. These ambitious targets were intended to signal a decisive break from the past (IMF, 2001).

The adjustment efforts ultimately proved successful in achieving debt sustainability and allaying concerns about fiscal dominance. After a period of strict commitment to the programme's monetary and fiscal targets, together with new structural reforms, the macroeconomic environment improved substantially. The combination of high primary surpluses, lower borrowing costs, currency appreciation and high growth reduced the gross public debt ratio to below 70% of GNP by the end of 2005.

In the end, the reduction in inflation also improved the government's fiscal position. Inflation expectations fell, which allowed Treasury bill rates to fall from 194% in March 2001 to 14% by end-2005. Lower inflation reduced inflation uncertainty. Together with the expectation of falling interest rates, this achievement allowed the government to extend the debt maturity and reduce rollover risk, so that the debt stock's average maturity increased from about five months to more than two years. Moreover, the composition of domestic debt (cash and non-cash) changed in favour of fixed-term lira-denominated government bonds, while the share of foreign exchange-linked (either denominated or indexed) securities decreased from 36 to 17% of the debt stock. Despite the tight fiscal policy, the economy recovered strongly from the 2001 recession, with growth averaging more than 7% per year since 2002. The usual negative trade-off between inflation and growth disappeared, as lower inflation

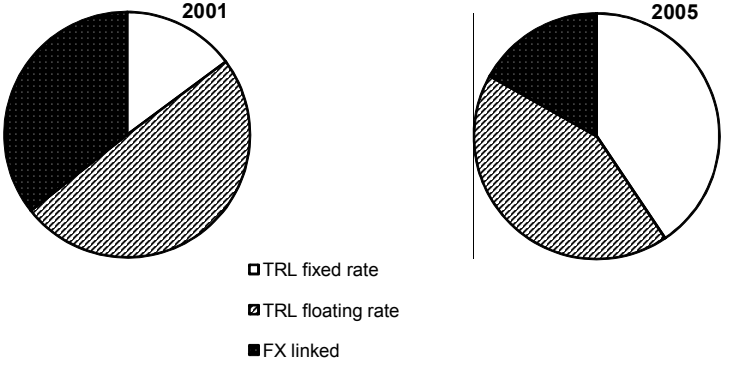
reduced economic uncertainty, lowered nominal interest rates and allowed financial intermediation (and credit) to expand (Figures 7.3 and 7.4).

Figure 7.3. **Turkey: Treasury bill maturities and interest rates, 2001-06**



Source: Turkish Treasury and Central Bank of Turkey.

Figure 7.4. **Turkey: Composition of government debt, 2001 and 2005**

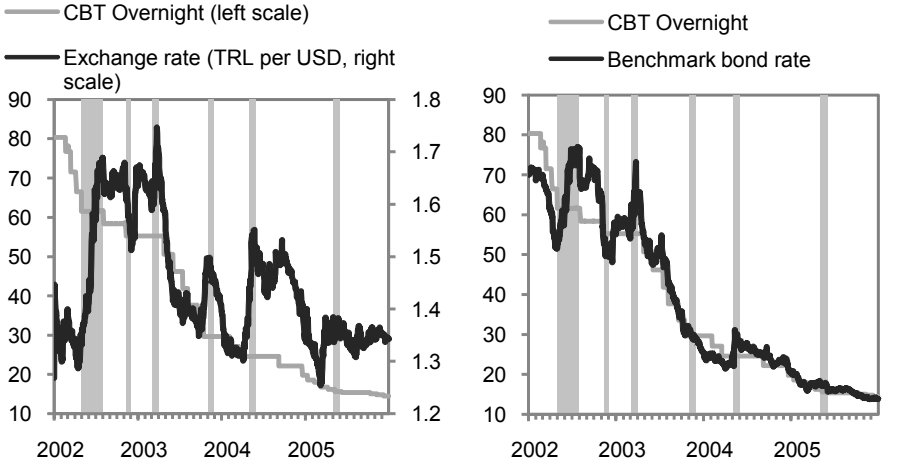


Source: Turkish Treasury.

Despite this trend towards a strong improvement in financial-market performance, there were many fluctuations along the way. However, these were all short-lived. It was understood that it would take time for the initial vulnerabilities to be addressed. Although macroeconomic policies were sound, and despite a strict commitment to economic reform, it would also take time to

persuade market participants, given Turkey's previous history of imprudent policies. As a result, financial markets remained vulnerable to shifts in sentiment and to international and domestic shocks (Çulha *et al.*, 2005; and Ersel and Özatay, 2006). The need to be conservative in the presence of such uncertainties and the difficulty of raising domestic interest rates in response to shocks were reflected in the generally cautious stance of monetary policy in the transition period before formal IT was adopted. The policy interest rate lagged movements in the secondary-market interest rate most of the time (Figure 7.5).

Figure 7.5. **Turkey: Exchange and interest rates, 2002-05**



1. Major political events are identified by the shaded areas: May-July 2002 (Prime Minister Ecevit in hospital), November 2002 (pre-electoral uncertainty), March 2003 (Iraq war), November 2003 (Istanbul bombings), May 2004 (political uncertainty over educational reform) and May 2005 (France's EU referendum).

Source: Central Bank of Turkey.

Inflation as the sole nominal anchor

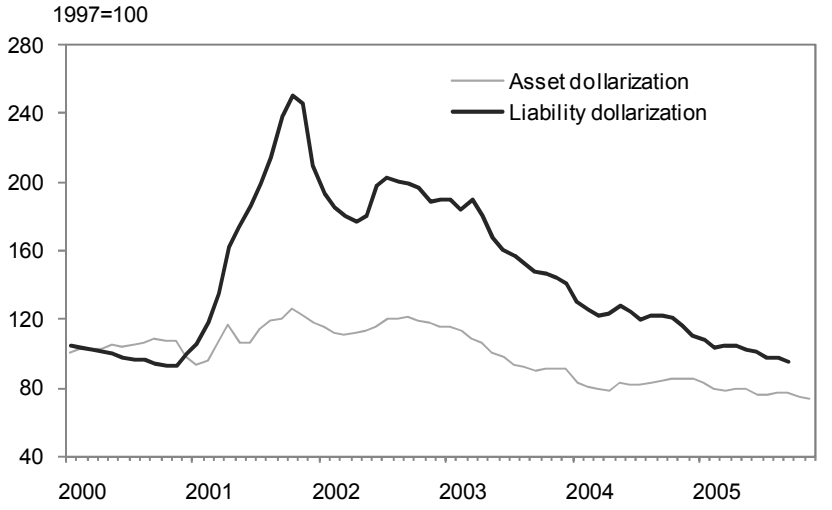
A high pass-through from exchange-rate changes to prices has made it difficult for monetary policy to avoid exchange-rate considerations. Prolonged economic uncertainty due to high, volatile inflation, together with frequent economic crises following failed stabilisation programmes, had led to widespread indexation in the economy, particularly to the exchange rate. Depreciation-inflation spirals became common. Exchange-rate changes were transmitted quickly to prices irrespective of whether shocks were permanent or

temporary. Automatic indexation became widespread among all components of the CPI, even for non-tradables (Başçı *et al.*, 2007).

However, the transition to formal IT and the shift to a floating exchange rate reduced the exchange-rate pass-through in terms of both speed and magnitude. Kara *et al.* (2007) compare the pass-through in the tradable and non-tradable sectors and how they have changed over time. They find evidence of a high pass-through even to non-tradable inflation and interpret this finding as a sign of comprehensive indexation during the pre-floating period. Following the move to a floating exchange rate, they find evidence of less pervasive indexation, with a more pronounced reduction in the pass-through to non-tradable inflation in comparison with inflation in tradables. In another study, Kara and Öğünç (2005) find that, before the float, most of the pass-through was completed within four to five months, a duration that increased to approximately one year in the floating period. The magnitude of the pass-through also fell from 60% in the period of a quasi-fixed exchange rate to 30% in the floating period.

Reflecting the legacy of high, persistent inflation, together with the impact of the 2001 devaluation, Turkey has been a highly dollarised economy (Reinhart *et al.*, 2003). However, implementation of prudent macroeconomic policies and the resulting stable macroeconomic environment during the transition to IT led to a decrease in dollarisation (Yılmaz, 2006). From 2001 to end-2005, the ratio of foreign-currency deposits to total deposits decreased from 55 to 34%, while the share of foreign-currency loans in total loans of the banking sector fell from almost 50 to less than 20%. The share of foreign currency-denominated and indexed bonds in domestic government debt fell from 36 to 17%. In a related study, Akıncı *et al.* (2005) construct composite asset and liability dollarisation indices, which also indicate a sharp reduction in dollarisation (Figure 7.6).

Figure 7.6. **Turkey: Asset and liability dollarisation, 2000-05**



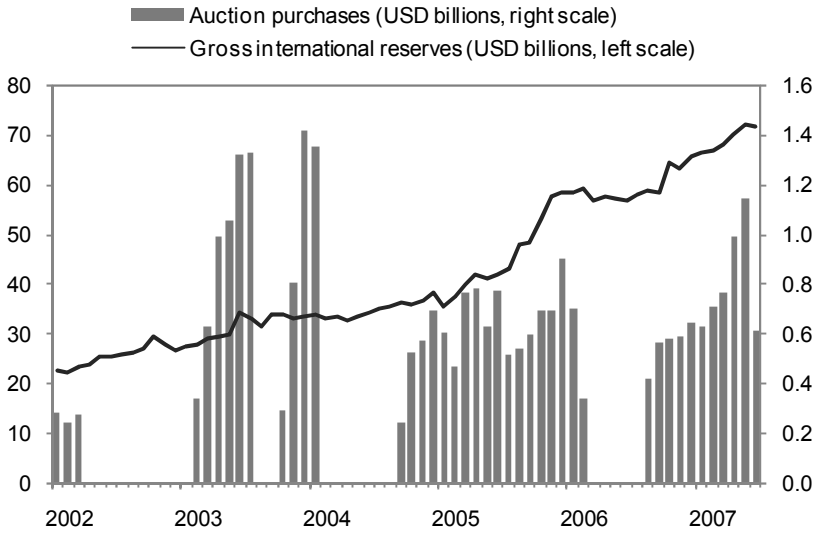
Source: Akıncı *et al.* (2005).

This progress in improving the credibility of the lira, finally making it a reliable store of value, and in reducing the exchange-rate pass-through helped to free the CBT from exchange-rate considerations when setting interest rates. However, while the CBT was committed to the float, it could not refrain completely from intervening in the foreign-exchange market. In fact, according to the design of the adjustment programme, it had to intervene. During the crisis, the CBT was supposed to on-lend the funds received from the IMF and the World Bank to the Treasury, which would then make payments in lira (for example, to help roll over domestic government debt), easing the Treasury's financing needs. To sterilise the resulting increase in the money supply, the CBT then had to sell foreign exchange in the spot market (CBT, 2002a). Conversely, once the crisis subsided and the programme started to work, capital inflows returned and currency substitution started to reverse, creating excess supply of foreign exchange. The CBT then needed to use these inflows to rebuild its gross international reserves to repay international creditors, to reduce its reliance on remittances and, by showing that short-term foreign debt payments coming due could be made, to improve investor confidence. But, again, the CBT could only acquire foreign exchange through spot-market interventions. Finally, while committed to a floating exchange rate, from the outset the CBT stood ready to buy and sell foreign exchange to prevent excess volatility in the foreign-exchange market (CBT, 2002a; and CBT, 2006c).

The policy question at the time was how to make these two different types of intervention consistent with the floating exchange-rate regime. As for the interventions required by the adjustment programme, the CBT pre-announced foreign-exchange auctions: foreign-exchange sales in 2001 and purchases from 2002 onwards. Pre-announcing these operations in auctions removed any discretionary element. As regards the second type of intervention, to smooth exchange-rate volatility, at first there was quite limited room for such operations, but as the programme succeeded, they became more prominent. However, the important point is that such interventions were meant to be carried out for purely smoothing purposes and, unlike the first type of pre-announced interventions, they were not to be made continuously in one direction. In this way, the CBT was able to reconcile interventions with a floating exchange rate.

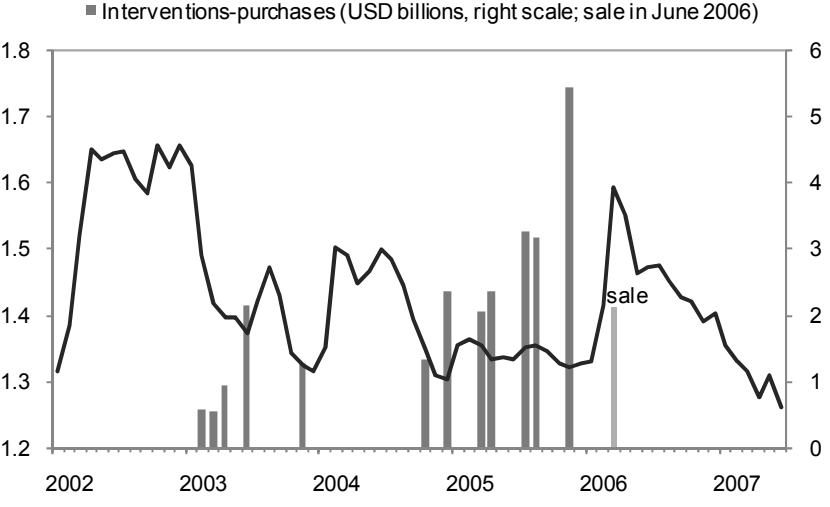
This strategy allowed the CBT to accumulate substantial foreign-exchange reserves. From 1 April 2002 onwards the CBT conducted a series of pre-announced daily foreign-exchange purchase auctions, interrupted only in times of unfavourable market conditions (CBT, 2002b). Discretionary interventions have been much less frequent and mostly through purchases of foreign exchange: smoothing operations in response to excess volatility caused by the improving economic outlook, as well as the favourable global liquidity conditions. All in all, from 2002 to end-2005 the CBT purchased around USD 40 billion in foreign exchange, with discretionary interventions accounting for almost one-half of these purchases. CBT's gross international reserves more than doubled from USD 20 billion in early 2002 to USD 48 billion by December 2005 (with further increases to more than USD 70 billion by 2007) (Figures 7.7 and 7.8).

Figure 7.7. **Turkey: International reserve holdings, 2002-07**



Source: Central Bank of Turkey.

Figure 7.8. **Turkey: Foreign-exchange interventions, 2002-07**



Source: Central Bank of Turkey.

Overcoming financial dominance

The existence of weak and over-leveraged financial systems in emerging-market economies constrains the conduct of monetary policy. Fears that monetary tightening may cause a financial crisis make it difficult for monetary policy to be conducted with the sole objective of attaining the inflation target. Fraga *et al.* (2003) call this phenomenon "financial dominance".

A strengthening of the banking system and the establishment of more effective institutions to regulate and supervise it has been a key element of the reforms introduced since 2001; achieving this objective is therefore also one of the main preconditions for successful IT. Before the 2000-01 financial crisis, the Turkish banking system had channelled resources to finance a rising public-sector debt at high real interest rates. The corporate sector had a similar incentive to buy government bonds, rather than investing in productive assets. In addition, public banks faced the challenge of dealing with huge subsidised loans to state enterprises, the so-called "duty losses".

Against this background of a fragile financial system, the exchange rate-based stabilisation programme exacerbated the underlying problems of large open positions and maturity mismatches. Structural weaknesses, especially in the public banks, accompanied by a steady erosion of solvency in private banks, led to a growing number of takeovers by the Savings Deposit Insurance Fund (SDIF).[5] Increasing funding needs to cover accumulated large losses forced these banks into large-scale overnight funding, which made them particularly susceptible to liquidity and interest-rate shocks. After the period of high interest rates and exchange-rate devaluations, a financial crisis erupted, leading to severe capital losses in the banking and corporate sectors, bankruptcies and the accumulation of substantial non-performing loans. The resulting weaknesses in the financial system constrained the CBT's ability to use monetary policy to meet the inflation target, as an increase in interest rates could worsen these problems.

In response to the crisis, the stabilisation programme aimed at eliminating those weaknesses by: *i*) restructuring the state banks to restore financial-market stability, *ii*) solving the problems of the banks taken over by the SDIF to prevent them from contaminating the rest of the financial sector and to limit fiscal pressures, and *iii*) providing a healthy regulatory and supervisory environment for private banks surviving the crisis. To this end, the Treasury issued floating-rate notes to the public and SDIF banks to cover their duty losses and recapitalisation needs. These securities were sold directly to the CBT or through repurchase agreements, and the proceeds were used to finance overnight borrowing requirements. Furthermore, the Treasury issued foreign

exchange-linked bonds to close private banks' open positions (BRSA, 2001a and 2001b; OECD, 2002). Finally, as a temporary measure, a blanket deposit guarantee was introduced to maintain public confidence in the banking system.

The bank restructuring programme soon produced impressive results. The banking system was recapitalised, duty losses of the public banks were eliminated and new duty losses were prevented. For the private banking sector, measures were put in place to ensure that they met capital adequacy requirements and to prevent repeated recourse by weak banks to public money for recapitalisation. The independent banking regulator, the Banking Regulatory and Supervisory Agency (BRSA), which had only become operational just before the crisis, was given enhanced powers.[6] A tightening of regulations and a modernisation of accounting rules enhanced the BRSA's policy effectiveness (OECD, 2002). The establishment of the BRSA, and a perception by banks and the public that its operations were carried out with technical competence, independence, fairness, transparency and authority, were essential for restoring confidence in the financial system.

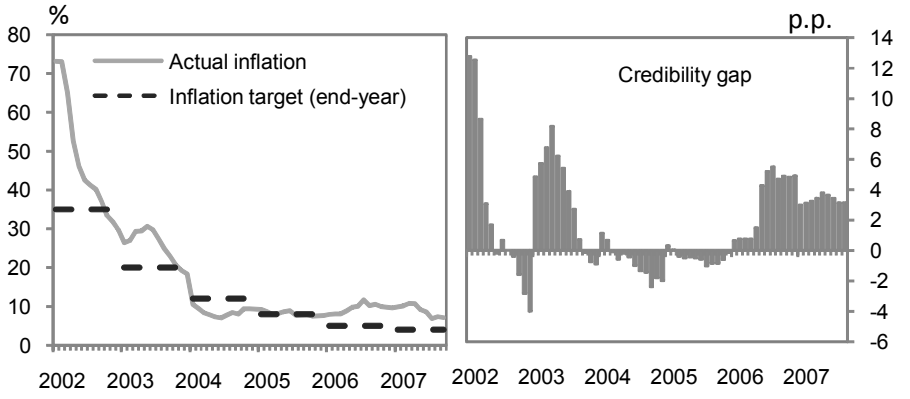
Creating the IT infrastructure

The CBT used the transition period to formal IT to refine its analysis of inflation and to improve its communications. It developed a core quarterly macroeconomic model as a part of its Forecasting and Policy Analysis System (FPAS). The aim was not just to have technical tools with which to make forecasts, but also to introduce institutional changes to improve decision-making. These included: *i*) setting up a broad economic database, *ii*) making regular briefings to decision-makers on conjunctural assessments, *iii*) producing regular reports, such as the restructured Monetary Policy Report (a precursor to the Inflation Report), and *iv*) providing improved inflation forecasts. The core model, being the main part of FPAS, provided a common language in which CBT staff and management could discuss the economic situation and the appropriate monetary policy responses. In addition, the CBT established its own expectations survey and published new leading indicators.

The launch of formal IT

These preparations strengthened the CBT's credibility and helped to lower inflation expectations in line with the inflation target. The CBT's "credibility gap", defined as the difference between the public's expectations of end-of-year inflation and the target rate, narrowed markedly. In fact, from 2002 to 2004 inflation ended the year *below* the official target, which again helped build the central bank's reputation for fighting inflation (Figure 7.9).

Figure 7.9. **Turkey: Inflation and the CBT's credibility gap, 2002-07**



Source: TURKSTAT and Central Bank of Turkey.

While this track record suggests that formal IT was ready to be introduced already in 2005, outside factors suggested postponing implementation for one more year. *First*, in 2005 the Turkish Statistics Agency launched a revised consumer price index (with base year 2003) with both a different compilation method and basket coverage. The new index behaved quite differently from the previous one, and time was needed to incorporate this new information into the analysis of inflation and to set a revised path for the inflation target. *Second*, uncertainties over the success of the January 2005 currency reform (when six zeros were dropped from the domestic currency) and its impact on money demand also recommended caution.

Despite this postponement, the CBT announced that 2005 would be the final preparatory year and that formal IT would be introduced at the start of 2006. During 2005 additional steps were taken to move the day-to-day implementation of monetary policy closer to the IT framework (CBT, 2004). The main measures taken at the time were as follows: *i*) the Monetary Policy Committee (MPC) began to meet at pre-announced dates and times, *ii*) interest rate decisions began to be published at 9 a.m. the following business day, and *iii*) commentaries highlighting the factors affecting decisions over short-term money-market interest rates began to be published within two business days of the MPC meeting. These announcements also provided signals about the future course of interest-rate decisions, making monetary policy more predictable. However, there was still scope for improving transparency. The CBT still did not publish any medium-term path for inflation, which would have been useful to assess the central bank's performance in reducing inflation. Nor did it

provide full information on the timing of the policy change or rationale of its interest rate decisions, such as by publishing an Inflation Report or the minutes of MPC meetings.

In line with its commitment, in January 2006 the CBT implemented formal IT with the following main elements (CBT, 2005):

- **Inflation target and the target horizon**. The inflation target was set as a "point" target for the end-year inflation rate. This was an accurate measure of the cost of living, monitored broadly and easy to communicate. In line with the introduction in 2006 of a three-year budget framework, and to be consistent with the macroeconomic framework underlying the Pre-Accession Economic Programme, the target path was defined over a three-year horizon. The end-year target was set at 5% for 2006, falling to 4% in 2007 and 2008.

- **Deviation from the target and accountability**. The CBT also announced a path for inflation consistent with the end-year target. A tolerance band of ±2 percentage points was also introduced to help measure the CBT's performance. At the end of each quarter, if actual inflation was forecasted to fall outside the bands, the CBT would be required to write an open letter to the government (which would be made public) explaining the reasons for breaching the target, together with the policy measures it would take to ensure that inflation would return to the target in the medium term. However, the CBT emphasised that its goal was the point target: the tolerance band was only used to assess performance and to improve communication of monetary policy.

- **Conditions for revising the targets**. The CBT highlighted its commitment to the pre-announced inflation target. Although temporary shocks might call for revisions in inflation forecasts, these would not require a change in the inflation target. For instance, in the event of a one-off adjustment in indirect taxes, the inflation outlook would most likely deviate from the target in the short run; therefore, the CBT would not meet the early performance criteria on the target path. However, the impact of the adjustment would die out in the one-year-ahead inflation forecasts. As a result, a change in the medium-term target would not be required. Instead, the short-term forecasts would be adjusted accordingly, and the CBT would inform the government as well as the public by publishing open letters disclosing the reasons for the short-term target breaches. In this case, the points of reference for economic agents would be the inflation

forecasts for the short term and the inflation target for the medium term. Abrupt changes leading to permanent deviations from the target path might require revisions, if the medium-term targets were deemed to be no longer valid. But, in such cases, the new target would be set in conjunction with the government, as required by law.

- **The IT regime and IMF conditionality**. Consistent with the shift to IT, the targets in the IMF programme were revised. The performance criterion for base money and the indicative target for net domestic assets were replaced by "inflation consultation criteria". Accordingly, if inflation were to remain below or above the target-consistent path by one or more percentage points (inner-band), there would be negotiations with IMF staff during each quarterly review. The CBT would inform the public of the reasons for the deviation through its regular reports. If inflation were to fall outside the target-consistent path by two or more percentage points (outer-band), this would be considered a violation of programme conditionality, and the CBT would be required to announce measures to be taken in line with the principles of the programme. In other words, as required by the CBT Law (Article 42), the CBT would submit a written document to the government, which would be presented to the IMF as a part of programme conditionality. Finally, given the programme's focus on safeguarding the balance of payments, the target for net international reserves was retained.

- **Inflation Report and forecasts**. A new quarterly Inflation Report became the main tool for communicating monetary policy decisions to the public. Compared to its predecessor (the Monetary Policy Report), the Inflation Report's main distinguishing feature was the inclusion of the CBT's inflation forecasts and explanations of any revisions to those forecasts. The Report would also contain signals of likely future policies, making monetary policy more predictable and thereby enhancing transparency and accountability. The Report would also feature a section on the discussion of possible risks to the outlook and their impact on the inflation forecast.

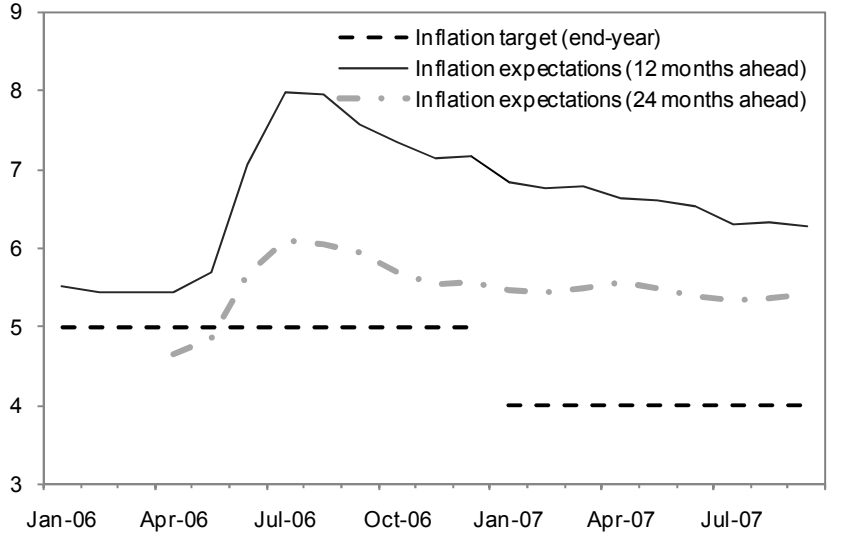
- **Decision-making process**. The MPC took responsibility for setting interest rates. Although the MPC had met monthly since 2001, it only had an advisory role. Under formal IT, however, MPC members would vote on interest rate decisions. A number of administrative reforms were introduced too. Meeting dates were pre-announced and shifted to the middle of the month. The meeting itself would be held in

two sessions: the first session included briefings by CBT staff and the Treasury; MPC members would vote in the second closed session. The decision and its rationale would be announced in a press release to be issued in the evening following the meeting and posted on the CBT's website.

Formal IT (2006-07)

Formal IT had a difficult start. Already in the first quarter of 2006 the decline in inflation came to a halt. The immediate cause was a combination of supply shocks: rising oil prices, higher prices of tobacco and unprocessed food, and an increase in gold prices. But from May 2006 market sentiment started to worsen, with global liquidity conditions tightening, triggering capital outflows in many emerging markets. Turkey's EMBI spread increased by around 150 basis points. Fluctuations in financial markets led non-residents to sell government securities and demand foreign currency, as a result of which the lira depreciated against the US dollar by more than 20%. The widening current-account deficit, as well as domestic uncertainties (some also mentioned the delayed appointment of a new CBT governor) may also have been a factor. Inflation expectations worsened and the credibility gap widened (Figure 7.10).

Figure 7.10. **Turkey: Inflation expectations, 2006-07**



Source: Central Bank of Turkey.

Together with these supply shocks, a depreciation of the domestic currency led to a deterioration in inflation expectations. These developments indicated that the impact might be more than just a relative price adjustment. In response, the CBT acted decisively by holding an extraordinary MPC meeting on 7 June in which it raised the policy rate by 175 basis points. The decision was well received and helped to calm markets. In its regular 20 June meeting, the MPC concluded that there had been no new information and decided to leave the rate unchanged. However, in the following days markets turned more unstable and inflation expectations deteriorated sharply. In response, the MPC held another extraordinary meeting on 25 June. Although the MPC believed that the market instability did not reflect fundamentals, it did have the potential for further worsening expectations and thus threaten the medium-term inflation targets. The MPC therefore increased interest rates by another 225 basis points: a combined 400 basis-point increase during June.

The CBT tightened further by withdrawing excess liquidity through a combination of one- and two-week deposit purchase auctions and foreign-exchange sales (through both discretionary interventions and auctions). It also raised its lending rate by 600 basis points (CBT, 2006a). However, these efforts could not prevent inflation from exceeding the ceiling of the tolerance band in the second quarter, as well as in the consecutive quarters of 2006. The CBT responded by sending open letters to the government explaining the reasons for the target breaches and the policy measures that it had taken and would still take to bring inflation back down to the medium-term target. It also issued revised forecasts showing that the medium-term targets could be achieved through a cautious monetary policy stance accompanied by prudent fiscal and incomes policies in line with the inflation targets and management of expectations.

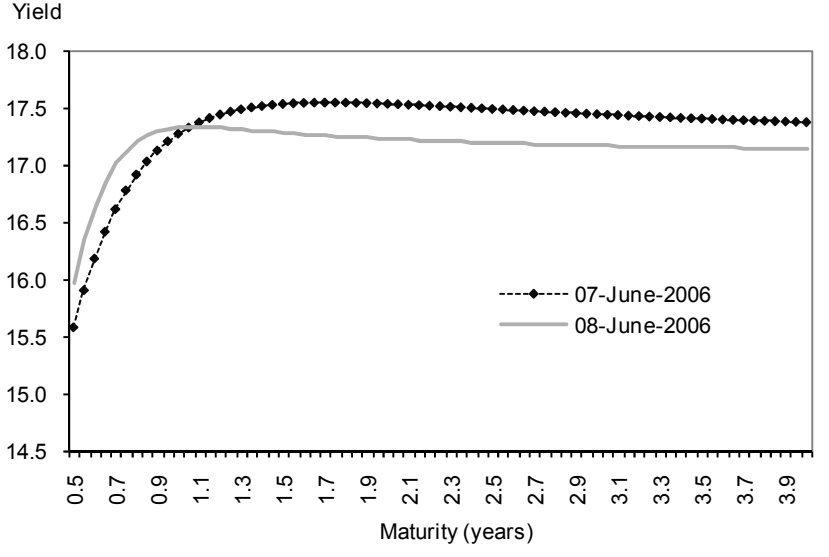
Financial conditions improved in the remainder of the year. Risks of high inflation in the industrial countries eased, allowing the United States Federal Reserve Bank to keep interest rates on hold. There were also signs of a partial "correction" in unprocessed food prices. Nevertheless, in subsequent meetings the MPC concluded that these developments were not strong enough to offset the high underlying inflation trend compared with the medium-term targets. The MPC also highlighted upside risks in food and commodity prices, as well as uncertain global liquidity conditions. Therefore, the MPC kept its policy rate on hold for the remainder of the year and retained its tightening bias in its statements.

Parallel to the these developments, in its subsequent open letters to the government (CBT, 2006b and 2007a), the CBT noted that the monetary tightening since June 2006 had been successful in containing any further

deterioration in inflation and medium-term inflation expectations. By the end of September 2006, inflation had fallen to 10.6% and to single digits by end-December, although it remained above the medium-term target of 4%. The accumulated impact of the various cost-push shocks, combined with a delayed exchange-rate pass-through, kept inflation at high levels. But the non-accommodative monetary stance was expected to slow demand and to bring inflation down to its target by the end of the first quarter of 2008. However, by referring to upside risks to the baseline inflation projection, such as a weaker-than-envisaged slowdown in aggregate demand, a possible deterioration in global financial market sentiment and higher-than-expected inflation inertia, the CBT made it clear in its letters that it would conduct monetary policy with a tightening bias in the period ahead.

The policy response in June was the first increase in the policy rate in almost five years. Back in 2001, when fiscal dominance concerns prevailed, a similar response had backfired: the exchange rate depreciated, and secondary-market rates increased by almost 600 basis points. But, with the preconditions for IT now in place, markets reacted positively to these actions, which signalled the seriousness of the CBT's disinflation effort and its strong commitment to its medium-term targets. The long-end of the yield curve shifted down, the worsening of inflation expectations stopped, and the exchange rate appreciated in line with more standard monetary transmission mechanisms (Figure 7.11).

Figure 7.11. **Turkey: Yield curve developments (7-8 June 2006)**

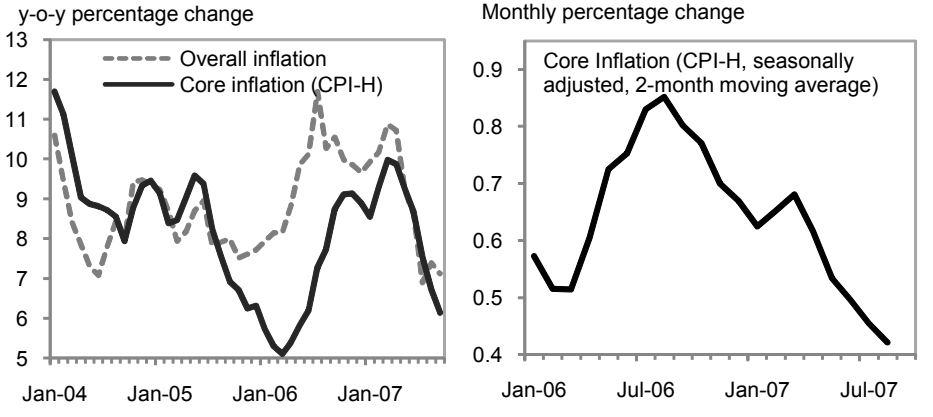


Source: Akıncı *et al.* (2006).

Despite the overshooting of the end-2006 target, the medium-term inflation targets were not revised. Although other countries, such as Brazil in 2003, had revised their inflation targets in the face of similar external shocks, the CBT believed that increasing the end-2007 target might have adverse effects on inflation expectations and adjustments in nominal wages, and might also undermine the credibility of future policy commitments. With the lagged impact of interest rates on inflation (estimated at roughly six quarters), the 2007 target also seemed attainable, especially given the tightening bias of 2006. The CBT and the government therefore reaffirmed the 4% inflation target for 2007 and extended it through 2009 (CBT, 2006c).

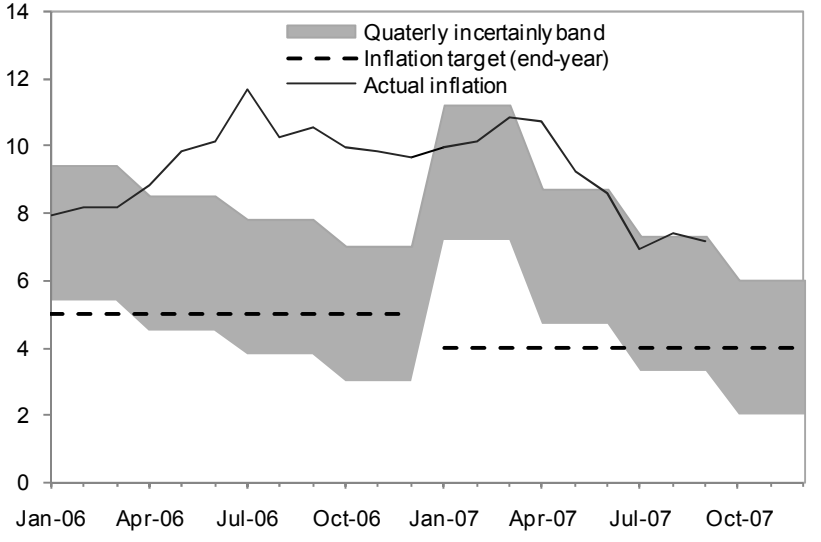
Disinflation continued in 2007. The monetary tightening that started in mid-2006 led to a slowdown in domestic demand (mostly lower spending on consumer durables), while net exports increased. Despite rising oil prices and high food prices, inflation in durable goods and services fell considerably. Core inflation also started to fall. Headline inflation fell to 8.6% by the end of the second quarter and to 7.1% by the end of the third quarter, just within the uncertainty bands (Figures 7.12 and 7.13).

Figure 7.12. **Turkey: Headline and core inflation, 2004-07**



Source: TURKSTAT and Central Bank of Turkey.

Figure 7.13. **Turkey: Inflation performance under IT, 2006-07**



Source: TURKSTAT and Central Bank of Turkey.

Despite these favourable developments, through the first half of 2007 the MPC decided to maintain its cautious policy stance, keeping the policy rate unchanged. Its decision was guided by possible upside risks: *i*) the gap between inflation expectations and the inflation targets, *ii*) increases in oil and other commodity prices, and *iii*) stickiness in services-price inflation (CBT, 2007b). However, in its July and August meetings the MPC noted more favourable developments in services-price inflation and mentioned the possibility of a measured easing starting in the last quarter of the year. However, the timing and extent of any policy easing would remain data-dependent, reflecting any new information regarding external demand, public expenditures and other determinants of the medium-term inflation outlook (CBT, 2007c and 2007d).

The CBT finally cut the policy rate in September 2007, somewhat earlier than markets had anticipated, by 25 basis points to 17.25%. It based this decision on the continuous decline in inflation (owing to the earlier strong monetary tightening) and faster-than-expected services-price disinflation. It also noted that the tightening of international credit conditions might result in a slowdown in world demand, which would also reduce future inflation. While domestic demand was expected to recover moderately in the second half of the year, the MPC also expected that this recovery would be constrained by the planned containment of public expenditures needed to meet the 2007 budget

target. While the rate cut decision was taken to signal the start of a policy easing, the MPC also noted that further cuts would be cautious and measured. Major risks to the medium-term inflation outlook included volatile unprocessed food prices, continued oil price increases and stickiness in inflation expectations. Therefore, any further easing would again be data-dependent, reflecting new information related to global liquidity conditions, external demand, public expenditures and other determinants of the medium-term inflation outlook (CBT, 2007e; Yılmaz, 2007).

Conclusion and challenges ahead

Since the 2000-01 crisis the Turkish economy has experienced a remarkable transformation. This is due mainly to a strict commitment to the stabilisation programme based on tight fiscal and monetary policies, accompanied by a comprehensive structural reform agenda. Inflation has fallen to its lowest levels in the last three decades, nominal and real interest rates have declined sharply, and the economy has grown rapidly. The public debt ratio has declined significantly, easing concerns over debt sustainability. This transformation has also witnessed the gradual adoption of fully-fledged IT. Although the initial economic conditions were difficult, as the prospects for the economy improved the preconditions for IT were put in place, readying the CBT to act under the new regime. By 2006, concerns over fiscal and financial dominance had largely eased and exchange-rate considerations had lessened; the CBT was institutionally well-prepared and technically well-equipped for IT.

At first sight, the early years of formal IT might not be considered auspicious, because the previous disinflation trend had been reversed. The inflation target was missed in 2006 and is likely to be missed again in 2007. However, during this difficult period the CBT's decisive actions signalled its strict commitment to its medium-term inflation targets. Prospects for disinflation therefore improved, as evidenced by an improvement in actual and expected inflation trends. The CBT has also communicated its policy actions clearly, using many platforms, which has enhanced transparency, accountability and predictability of monetary policy.

Turkey's experience with IT is short but quite intense. Therefore, it provides several lessons for future inflation-targeters, especially those in emerging-market economies. Freedom from the constraints imposed by fiscal and financial dominance is a key for successful IT, as shown by the contrasting experiences of 2001 and 2006. Whether decisive monetary policy action succeeds or fails in achieving price stability depends very much on this freedom. Moreover, policy implementation under IT should be considered as a continuous process, which policymakers will need to strengthen over time. In

this spirit, enhancing communication with the public will bolster the framework for monetary policy.

Notes

1. The programme also included a pre-announced exit strategy from the peg. Starting from 1 July 2001, the exchange-rate bands were to widen at a rate of 15 percentage points per annum, measured from floor to ceiling. The total width of the band would thus reach 7.5% by end-December 2001, 15% by end-June 2002 and 22.5% by end-December 2002 (Erçel, 1999). This process would eventually be accompanied by the introduction of IT. It is not clear whether knowledge of this pre-announced exit strategy may have weakened the credibility of the crawling peg, when it later came under pressure.

2. See Akyüz and Boratav (2001), Alper (2001) and Özatay and Sak (2002) for detailed accounts of the 2000-01 financial crisis.

3. The targets were first announced in late 2001 in Turkey's Eighth Five-Year Development Plan (2001-05) and in the 2002 Annual Programme.

4. See Blanchard (2004) and Favero and Giavazzi (2004) for the case of Brazil. For Turkey, see Aktaş *et al.* (2005), who estimate default risks for the period 1999-2003, and Özatay (2005) for a model showing the importance of fiscal discipline (and market expectations that it would be maintained) for attaining a good equilibrium.

5. Thirteen banks were taken over between 1997-2001 and ten in 2000-01.

6. The BRSA regulates and supervises the private banking sector. It was set up in June 1999 with the enactment of Banking Law No. 4 389 and started its operations in September 2000, when it became the sole authorised agency for banking-sector regulation and supervision.

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List of acronyms

ADF	Augmented Dickey-Fuller Test
AR	Autoregressive Model
BCB	Central Bank of Brazil (*Banco Central do Brasil*)
BER	Bureau for Economic Research
BI	Bank Indonesia
BIS	Bank for International Settlements
BRSA	Banking Regulatory and Supervisory Agency
CBC	Central Bank of Chile
CBT	Central Bank of Turkey
CDT	Colombian Interest Rate (*Certificado de Depósito a Término*)
CETES	Mexican Interest Rate (*Certificados de la Tesorería de la Federación*)
CMN	Brazilian National Monetary Council (*Conselho Monetário Nacional*)
CNB	Czech National Bank
COPOM	Brazilian Monetary Policy Committee (*Comitê de Política Monetária*)
CPI	Consumer Price Index
CPIX	Consumer Price Index (excluding mortgage interest costs)
DSGE	Dynamic Stochastic General Equilibrium
EMBI	Emerging Market Bond Index
FAVAR	Factor-Augmented Vector Autoregressive Model
FDI	Foreign Direct Investment
FIML	Full Information Maximum Likelihood
FPAS	Forecasting and Policy Analysis System
FTO	Fine-Tuning Operations
GDP	Gross Domestic Product
GNP	Gross National Product
IGP-DI	Brazilian General Price Index (*Índice Geral de Preços - Disponibilidade Interna*)

IMACEC	Chilean Monthly Economic Activity Index (*Indicador Mensual de Actividad Económica*)
IMF	International Monetary Fund
IMT	Inflation Management Team
INPC	Mexican Consumer Price Index (*Índice Nacional de Precios al Consumidor*)
IPC	Chilean and Colombian Consumer Price Indices (*Índice de Precios al Consumidor*)
IPCA	Brazilian Consumer Price Index (*Índice Nacional de Preços ao Consumidor*)
IRF	Impulse Response Functions
IT	Inflation Targeting
M-GARCH	Multivariate Generalised Autoregressive Conditional Heteroskedasticity Model
MPC	Monetary Policy Committee
MPR	Monetary Policy Report
OMO	Open-Market Operations
PP	Phillips-Perron Test
QPM	Quarterly Projection Model
SADC	Southern African Development Community
SARB	South African Reserve Bank
SBI	Bank Indonesia Certificates (*Sertifikat Bank Indonesia*)
SDIF	Savings Deposit Insurance Fund
SEE	Survey of Economic Expectations
SELIC	Brazilian Policy Interest Rate
SIC	Schwarz Information Criterion
TJLP	Brazilian Long-Term Interest Rate (*Taxa de Juros de Longo Prazo*)
TPM	Chilean Policy Interest Rate (*Tasa de Política Monetaria*)
TR	Brazilian Reference Interest Rate (*Taxa Referencial de Juros*)
UF	Chilean *Unidad de Fomento*
VAR	Vector Autoregressive Model
VMA	Vector Moving Average

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