Banco Central de Chile
Documentos de Trabajo

Central Bank of Chile
Working Papers

N° 116

Noviembre 2001

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Mario I. Blejer   Alfredo M. Leone   Pau Rabanal   Gerd Schwartz

BANCO CENTRAL DE CHILE

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INFLATION TARGETING IN THE CONTEXT OF IMF-SUPPORTED ADJUSTMENT PROGRAMS

Mario I. Blejer
International Monetary Fund

Alfredo M. Leone
International Monetary Fund

Pau Rabanal
International Monetary Fund

Gerd Schwartz
International Monetary Fund

Resumen
Este trabajo analiza la manera en que un régimen de metas de inflación se relaciona con la condicionalidad establecida en los programas de asistencia del FMI. En particular, con su inserción dentro de los criterios de desempeño asociados a esa condicionalidad. El trabajo analiza el caso de Brasil, el primer país en un programa del FMI en adoptar una meta de inflación, y las lecciones que de esta experiencia pueden obtenerse. En su última sección, se evalúa la idea de utilizar reglas de Taylor para evaluar el desempeño inflacionario. Las simulaciones que entrega la regla no son muy similares a las tasas efectivas de política, aunque se aproximan cuando se incorpora la inflación esperada en vez de la corriente.

Abstract
This paper analyzes how an inflation targeting regimes relate with the conditioning established in the IMF assistance programs, and, in particular, with its inclusion within the performance criteria associated with that conditioning. The paper analyzes the Brazil's case, the first country in an IMF program to adopt an inflation target, and the lessons that can be derived from this experience. In its last section, we evaluate the idea of using Taylor rules to assess the inflationary performance. Simulations generated by the rule produces are not very similar to the effective policy rates, although differences diminish when expected inflation replaces current inflation within the rule.

Inflation Targeting in the Context of IMF-Supported Adjustment Programs

Mario I. Blejer
International Monetary Fund

Alfredo M. Leone
International Monetary Fund

Pau Rabanal
International Monetary Fund

Gerd Schwartz
International Monetary Fund

For the last few years, the staff of the International Monetary Fund (IMF) has been engaged in assessing the functioning and effectiveness of inflation targeting in IMF member countries that have adopted this scheme as their monetary policy anchor. This involvement was restricted to the IMF's surveillance function, however, because the first countries to embrace inflation targets were industrialized economies. The assessments therefore constituted part of the macroeconomic analysis performed during the regular annual consultations between the IMF and its member countries, and they were not associated with IMF lending operations.

A number of emerging market economies have recently abandoned their fixed exchange rate regimes and moved toward a flexible exchange rate system with an explicit inflation-targeting framework for monetary policy. This made it increasingly likely that the IMF would be called on to provide financial assistance to a country that is using, or

has decided to adopt, explicit inflation targets as the key component of its monetary policy framework. Indeed, the IMF faced just this situation in mid-January 1999, when the Brazilian authorities announced their intention of implementing a formal inflation-targeting framework shortly after adopting a floating exchange rate regime. In the months that followed, the framework was implemented in the context of the ongoing IMF-supported adjustment program.

These developments posed particular analytical and practical challenges in terms of the operational procedures of the IMF in its financial relations with its member countries. The challenge resulted from the need to reconcile the inflation-targeting framework with the conceptual and practical aspects of conditionality. Conditionality is the device used by the IMF in its financial programs to establish safeguards that increase the certainty that its resources are used only temporarily. This, in turn, implies the adoption of so-called performance criteria, that is, formal quantitative targets on a number of variables defined jointly by the member country and the IMF. The evolution of these variables is subject to verification, and the fulfillment of these criteria is the condition for disbursement. In the monetary policy area, performance criteria in Fund programs have traditionally been set in terms of specific quantitative limits on the evolution of certain monetary variables. Typically, a floor is set for the level of net international reserves (NIR) and a ceiling is established on the net domestic assets (NDA) of the central bank.

At first glance, therefore, the inflation-targeting framework, by the very nature of its operating procedures, appears to be incompatible with the traditional monetary conditionality framework usually embodied in Fund-supported adjustment programs. This is so because the actual implementation of inflation targeting is largely based on the premise that an independent central bank can use its various instruments at its own discretion, in the proportions considered appropriate in each particular circumstance, to ensure the attainment of its inflation goal. This clashes with a scheme that sets an explicit and somewhat rigorous quantitative objective for key monetary variables.

Because each member country has the prerogative to adopt the monetary policy framework of its choice, the IMF faced the question of whether and how to adapt monetary conditionality to the specific features of monetary policy under inflation targeting. In principle, inflation targeting can be accommodated within the traditional structure of monetary conditionality in Fund-supported adjustment programs, given that this conditionality focuses primarily on a program's balance-of-payments objective. At the same time, it may be desirable to modify and supplement traditional monetary conditionality by introducing features that reflect

the specific functioning of the inflation-targeting framework.[1]

    This paper considers the issues that arise from the implementation of inflation targeting in the context of the conditionality embodied in Fund-supported adjustment programs and discusses a number of options for adapting monetary conditionality to these particular cases. The next section reviews the role of monetary conditionality in Fund-supported adjustment programs. Section 2 outlines traditional monetary policy conditionality and analyzes the practical problems that may arise in the context of inflation targeting. Section 3 then explores different options for implementing and strengthening monetary policy conditionality in the context of inflation targeting. Section 4 shows how monetary conditionality was adapted to inflation targeting in the context of the stand-by arrangement with Brazil, and section 5 tests how alternatives such as simple Taylor rules would have fared during the first year of inflation targeting in Brazil. Finally, the paper presents some preliminary conclusions, which are largely intended to stimulate further discussion.

1. FUND-SUPPORTED ADJUSTMENT PROGRAMS: THE ROLE OF CONDITIONALITY

    In Fund-supported adjustment programs (or Fund programs), conditionality refers to the linkage between the achievement of a set of policy objectives and the continuous access to IMF resources.[2] The policy objectives are agreed between the IMF and the authorities of the member countries, and while these objectives vary, attaining a sustainable balance-of-payments position is the paramount target of every Fund program. Conditionality thus provides a safeguard for the IMF's financial resources. The specification of the policy objectives and the calibration of the quantitative targets should ensure that the need for such financing is only temporary and that the borrowed funds will be repaid. Put another way, conditionality provides a yardstick for evaluating whether the policies that are being carried out are moving the country toward the achievement of the policy objectives, in particular a sustainable external balance. By doing so, conditionality also ensures the temporary use of the IMF's resources.

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    1. A number of internal documents were prepared and discussed within the IMF to clarify the various aspects of this approach. This paper reflects some of the considerations and arguments raised in those discussions.

    2. The word conditionality does not appear in the IMF's Articles of Agreement, and the concept evolved in stages. See Gold (1979) for a discussion of the legal aspects of the development of IMF conditionality. Guitián (1981) discusses the evolution of Fund conditionality from an economic perspective.

The effective implementation of conditionality does not involve day-to-day monitoring of a country's macroeconomic policies, but rather requires a mechanism for assessing whether policies are on track for achieving their stated goals or whether they need to be adjusted in response to unanticipated shocks, changes in economic relationships, or other new information. The monitoring mechanism in Fund programs consists of a set of explicit criteria—particularly performance criteria, but also indicative targets and structural benchmarks—that must be met if a country wishes to make further drawings under the Fund program. These performance criteria typically refer to key macroeconomic variables that indicate whether macroeconomic policies are on track, including fiscal balances (such as overall or primary balances), indebtedness (for example, public sector debt, public external debt, and its short-term component), and monetary variables (such as NIR and NDA).[3] Fund programs may also include performance criteria related to certain structural reform measures (or structural benchmarks). While performance criteria permit a backward-looking assessment of policies, periodic program reviews, which are often carried out quarterly, provide for a forward-looking overall assessment of the Fund program vis-à-vis the government's macroeconomic policy objectives.

Quantitative macroeconomic performance criteria in Fund programs do not typically rely on a specific macroeconomic model. They do, however, make use of various balance-sheet identities that link monetary and fiscal variables with the balance of payments, which ensures that the Fund program is internally consistent. These performance criteria may best be thought of as signaling devices that flag a possible need for corrective action in case of deviations.

2. Monetary Conditionality: The Traditional Approach and its Implications for Inflation Targeting

Monetary policy conditionality is at the core of Fund program conditionality. As mentioned above, it has traditionally relied on two performance criteria: a ceiling on the central bank's NDA and a floor on its NIR.[4] This methodology evolved out of the concepts that arise from the so-called monetary approach to the balance of payments, and it has

3. NDA are usually defined to equal base money minus NIR.
4. While these have been by far the most common variables used in the design of monetary conditionality, other monetary aggregates have been targeted in many countries, and sub-ceilings for specific types of domestic assets have sometimes also been implemented.

been used under a variety of conditions and monetary policy frameworks. Its primary focus has always been to ensure that a Fund program leads to external sustainability rather than tight control over inflation. In this context, performance criteria that set a floor on NIR are designed to indicate whether a Fund program is likely to achieve its external objective. The ceiling on NDA serves as an additional protection, since it seeks to ensure that the external objective is not jeopardized by excessive credit expansion or by sterilized intervention, that is, by compensating unprogrammed NIR losses through additional credit creation. This framework is rooted in the assumptions that the demand for base money matters from a macroeconomic perspective and that it is stable and predictable.

In practice, the expected functioning of the NIR/NDA performance criteria would be as follows (see table 1 for an overview). An anticipated, or baseline, path for net international reserves is projected, and a floor for NIR is set at or somewhat below the baseline. At the same time, the NDA ceiling is established at a level that is consistent with the NIR baseline, in conjunction with the projected evolution of velocity. If a country's actual NIR start falling toward the agreed NIR floor— perhaps because of a sudden external shock—monetary policy needs to be tightened, usually through open market operations. The resulting increase in interest rates should stop further NIR losses. More generally, as long as actual NIR remain close to their baseline, the ceiling on NDA effectively limits base money expansion, thereby preventing monetary policies from putting additional pressure on the external balance and fueling inflation. The NIR/NDA mechanism thus sets off warning signals when NIR fall too low or when there is significant sterilization of unprogrammed sales of foreign exchange. However, the NIR/NDA framework does not prevent larger-than-programmed NIR increases from fueling monetary expansion and thus inflation.

It is within this context that the appropriateness of the traditional NIR/NDA framework under an inflation-targeting regime may be questioned. One may argue that since inflation targets go hand-in-hand with floating exchange rate regimes, floors on NIR have no place or are simply irrelevant.[5] However, while under inflation targeting the central bank would not be expected to use its NIR to stabilize the exchange rate per se, it may react to movements of the exchange rate to the extent that they threaten the inflation target. Most floats are not pure

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5. Of course, some inflation-targeting countries maintain (or at one time maintained) a managed float, sometimes even with exchange rate bands. This could lead to conflicting objectives between the inflation target and the exchange rate band.

Table 1. General Overview of the Functioning of the NIR/NDA Mechanism

	Net domestic assets (NDA)	
	Higher than programmed	*Lower than programmed*
Net international reserves (NIR)		
Higher than programmed	Usually reflects overexpansion of base money, even exceeding the nonsterilization of the higher-than-programmed NIR; it could also reflect a flawed initial projection of base money. Policy action: monetary policy tightening to reduce NDA.	The program targets have been met. No policy action needed.
Lower than programmed	Insufficient monetary; tightening NIR losses have been oversterilized. Policy action: monetary tightening to reduce NDA.	Loss of NIR can be sterilized as long as actual NDA is below the NDA ceiling; interest rates are most likely kept above the assumed baseline path to stem the NIR losses. No further sterilization of NIR losses is allowed once actual NDA reaches the NDA ceiling.

floats, so trade-offs between domestic objectives (that is, inflation) and external objectives (that is, external sustainability) may be unavoidable, at least conceptually. Even when the exchange rate is flexible, retaining a NIR floor simply reflects the fact that one important aspect of a Fund program is to safeguard external sustainability.

An NIR floor safeguards external sustainability independently of the monetary policy framework. Retaining an NDA ceiling in the context of inflation targeting, however, may seem somewhat more problematic. If the central bank targets inflation and the Fund program focuses on the quantity-based framework of NDA ceilings, then cases could arise in which the monetary objectives underlying these programs do not correspond with the relevant instruments for achieving the inflation targets. In addition, communication with the markets and the public regarding the stance of monetary policy could easily become outright confusing. This is an important concern, because inflation targeting, by its very nature, relies critically on the transparency of the central bank's policy actions. This general problem is compounded by the fact that inflation is not primarily a function of NDA or its components, and it is therefore unlikely to respond predictably or immediately to changes in NDA or base money.

Table 2. Monetary Conditionality with NDA and Inflation Targets

	Inflation target (IT)	
	Threatened	*Not threatened*
Actual NDA relative to program assumption		
Higher than programmed	NDA and IT give the same signal: tighten monetary policy.	NDA and IT give a different signal: NDA suggests tightening; IT suggests no tightening is needed.
Lower than programmed	NDA and IT give a different signal: IT suggests tightening; NDA suggests no tightening is needed.	NDA and IT give the same signal: no tightening of monetary policy is needed.

Hence, an NDA ceiling could easily set off false alarms and confuse markets when there is, in fact, no need to change monetary policy from the point of view of the inflation objective. For example, actual NDA could conceivably exceed the NDA ceiling, while both actual and projected inflation are still within their target. Should monetary policy be tightened in these circumstances, or should the NDA ceiling be revised upward? Since inflation is the target, an upward adjustment of the NDA ceiling seems to be the only appropriate course of action. Similarly, when actual NIR is running significantly above the NIR floor while base money is close to the projected baseline, monetary policies could only be eased to the extent that the inflation objective is not jeopardized. As shown in table 2, when inflation is the overriding objective, having an NDA ceiling may be considered somewhat superfluous or, at least, a nonbinding constraint.

3. OPTIONS FOR IMPLEMENTING AND STRENGTHENING MONETARY CONDITIONALITY UNDER INFLATION TARGETING

An increasing number of countries have abandoned fixed exchange rate regimes and moved toward formal inflation targeting. Given the potential inconsistencies that could arise in the context of Fund programs, monetary conditionality needed to be modified to reflect more closely the main parameters of decisionmaking under inflation targeting. Under inflation targeting, monetary conditionality should ideally be geared toward the evaluation of the monetary policy stance vis-à-vis the government's

announced inflation target. However, this would require an exceedingly good understanding of the transmission channels and the precise parameters of monetary policy.

Moreover, monetary conditionality should primarily apply to specific policy actions and policy instruments, since country authorities cannot commit to achieving a particular level of a variable over which they do not exercise some decisive degree of control. Monetary conditionality should therefore involve the parameters of a policy reaction function, that is, the summary forward-looking rule governing the policy responses to projected deviations of inflation from the inflation target. Following this reasoning, a conditionality device that could potentially be included in Fund programs under inflation targeting is an operational rule for reacting to actual or expected deviations from the targeted inflation path. This rule should ideally be a simple but robust reaction function that relates changes in an instrument (such as interest rates) to deviations of inflation from its target. In practice, however, it would be difficult, if not impossible, to specify the exact timing and size of the response parameter, for example, by how much and at what moment an interest rate should be adjusted when projected inflation deviates from its target by a given amount. Also, while a very specific reaction function may work in one program, it may not be sufficiently general and flexible to accommodate different approaches to inflation targeting. Given the IMF's commitment to providing equality of treatment to all its members, such a mechanism could possibly entail some problems of cross-country comparability.

Despite these limitations, and while it may not be possible to specify a precise and robust policy reaction function, it may still be useful to strengthen monetary policy conditionality by establishing a simple, forward-looking mechanism for gauging the monetary policy stance vis-à-vis the inflation target. Taylor rules for the short-term interest rate or McCallum rules for the monetary base, for example, are simple monetary policy rules that are quite flexible for encompassing a range of relevant information. A simple Taylor rule can be expressed as

$$r = r^* + \alpha\left(Y - Y^*\right) + \beta\left(\pi - \pi^*\right),$$

where r is the nominal short-term interest rate; r^* is an estimated nominal equilibrium interest rate that is consistent with the target inflation rate (that is, $r^* = \bar{r} + \pi^*$, with $\bar{r}$ being the equilibrium real interest rate and π^* being the relevant inflation target); Y is output; Y^* is capacity output; π is inflation (either actual or projected); and α and β are coefficients, with $\alpha \geq 0$ (typically between 0 and 0.5, depending on the

degree to which the output gap figures in the central bank's reaction function) and $\beta > 0$ (typically between 1.5 and 2, so that the nominal short-term interest rate moves significantly in response to deviations of inflation from the inflation target).[6] In an open economy, one could add a number of other variables to this rule, such as the external current account or the foreign output gap. The rule could also include other variables that reflect conditions in the domestic economy, such as the budgetary balance or other fiscal variables.

It is also feasible to include different inflation measures in a Taylor rule, as in the following rule:

$$r = r^* + \alpha\left[\gamma\left(\pi^a - \pi^*\right) + \left(1 - \gamma\right)\left(\pi^p - \pi^*\right)\right],$$

where π^a is actual inflation, π^p is projected inflation, and $0 < \gamma < 1$. One could include competing inflation projections in a similar fashion. Taylor rules are thus very flexible and can be specified to encompass a number of country-specific considerations.

Given that a key element in a Taylor rule is the parametric reaction to deviations between actual or projected inflation and the inflation target, an obvious weakness of such an approach is that the rule will not react to shocks to omitted variables. A Taylor rule will only show a reaction to an external shock if that shock is somehow included in the rule. A Taylor rule is thus likely to be of only limited use to policymakers facing real-time decisions, although it does serve as a simple and easily understood starting point for thinking about monetary policy.[7] Such considerations also apply for including a Taylor rule in a Fund program: it provides a rough check on the monetary policy stance. In practice, the exact specification of the rule would probably involve some trial and error. Specifying the rule somewhat cautiously could help reduce the likelihood of false alarms. For example, one might set $\bar{r}$, the equilibrium real interest rate that underlies r^*, slightly below the best available estimate based on historical data; this would add some limited flexibility for lowering interest rates.

In practical terms, the question of adapting monetary conditionality, beyond the incorporation of some sort of Taylor rule continues to turn on the question of the NIR/NDA framework. As discussed below in the context of the Brazilian program, the current view is that NIR floors are still necessary to safeguard the external objectives of the program, but NDA ceilings may not be the preferred choice for monetary conditionality. The

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6. See Taylor (1993) for the original formulation.
7. See, for example, Kozicki (1999) for a review.

ceiling on NDA could be justified in that it would probably prevent large departures from inflation objectives, but it may not provide adequate guidance for a monetary policy aimed at a more precise inflation target. The main objective of these quantitative limits in inflation target situations would be to reinforce the country's commitment to a flexible exchange rate policy and to limit sterilized foreign exchange market intervention and base money expansion when the external position is weak.[8]

Another element in the adaptation of conditionality should be the enhanced role of policy reviews, which should be broadened to include an assessment of monetary policy in the context of inflation targeting. This procedure should entail, but not be limited to, the agreement on a reaction function or the possible specification of a Taylor rule. The program would need to specify a quarterly inflation path consistent with the authorities' inflation targets; the reviewers would then compare current and projected inflation with these targets, and they would negotiate specific policy actions whenever the outlook suggested that inflation objectives were likely to be missed.

4. ADAPTING MONETARY CONDITIONALITY TO INFLATION TARGETING: THE CASE OF BRAZIL

Brazil was the first inflation-targeting country with a Fund-supported adjustment program, and it took some time to tailor the program to the floating exchange rate regime with a nominal inflation anchor. In part, this reflected the need to take into account the institutional constraints that require similar treatment across countries and, therefore, a high degree of comparability among Fund programs. The Fund program with Brazil initially relied on the standard monetary conditionality of an NIR floor and an NDA ceiling, although it introduced some interesting innovations. Thus the initial program in December 1998, which was introduced under a fixed exchange rate regime, relied mainly on a strict NDA ceiling for conditionality in the monetary area. The NDA ceilings were made less binding after Brazil adopted the inflation-targeting framework, and they were completely phased out in June 2000 when the inflation-targeting framework was fully established (see table 3). The initial program also included an NIR floor that was intentionally fixed at a low (or nonbinding) level to allow the Central Bank of Brazil to use part of its actual NIR to defend the fixed exchange rate, if needed.

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8. Such safeguards seem especially relevant when the authorities view exchange market pressures as essentially short lived.

Table 3. Brazil: Overview of Monetary Policy Conditionality under the Standby Arrangement, 1998–2000

Arrangement or review	NDMA ceiling	NIR floor	Inflation targets
Initial standby arrangement (December 1998)	NDA ceilings were specified on the basis of a specific sterilization rule, with a sterilization parameter that became more restrictive as NIR dropped further below the projected baseline path and toward the NIR floor.	Nonbinding performance criterion on NIR consisted of a low floor of US$20 billion.	None
First and second reviews (March 1999)	NDA ceilings were retained; they were specified using the projected baseline paths for the monetary base and NIR (with a small cushion).	No explicit NIR floor. An implicit NIR floor was specified in the form of maximum monthly intervention limits for the sale of international reserves by the Central Bank; these intervention limits were only partly cumulative, in that only a portion of any unused intervention room could be carried over to the next month.	None
Third review (July 1999)	NDA specified on the basis of the NIR floor rather than the NIR baseline, which abandoned the idea of sterilization of NIR losses if actual NIR were to drop below the NIR baseline as long as they remained above the NIR floor.	The NIR floor was specified with an overall intervention room of about US$3 billion relative to the NIR baseline.	Included a general consultation clause on the implementation of the inflation-targeting framework, but without reference to the specific numerical path.
Fourth review (November 1999)	The NDA ceiling was downgraded from a performance criterion to an indicative target; it continued being specified on the basis of the NIR floor.	The NIR floor was established with an intervention room of about US$2 billion relative to a fairly conservatively estimated NIR baseline.	Included a specific consultation clause on the inflation target, with a quarterly inflation path and a two-tiered consultation mechanism.
Fifth review (March 2000)	Refrained from establishing NDA ceilings beyond June 2000.	The NIR floor was established without strict reference to the estimated NIR baseline, but instead was fixed at a flat monthly level of US$25 billion.	The two-tiered quarterly consultation mechanism on inflation was retained

The NIR floor became the key instrument of conditionality during the first few reviews in 1999, within an environment in which uncertainty concerning the new nominal anchor was still considerably high. In July 1999, the NIR/NDA conditionality was supplemented with a general consultation mechanism on inflation targets. The program then incorporated a formal consultation band on inflation to supplement the floor on NIR in November 1999, less than six months after the inflation-targeting framework was adopted by the Brazilian authorities.

The progressive shift away from NDA ceilings following the adoption of the inflation-targeting framework reflected the need to adapt the program to the changes in the monetary policy regime. The shift also reflected the growing realization that base money did not play a significant role in the monetary transmission mechanism in Brazil.[9] Money demand in general, and the demand for base money in particular, were not very sensitive to interest rates in Brazil. Seasonalities, remonetization under the Real Plan, and the effects of tax changes were quantitatively more important and statistically more significant determinants of base money than variables like income or the interest rate.[10]

The formal consultation mechanism on inflation, which was introduced in the November 1999 review, was based on the annual central inflation target and the tolerance bands announced by the Brazilian

9. The main transmission channels of monetary policy are the exchange rate, wages, asset prices, and aggregate demand. In the case of Brazil, the economic conditions that have prevailed since the inflation-targeting framework was adopted in mid-1999 have been characterized by fairly high real interest rates, tight fiscal policy, relatively subdued aggregate demand, and negative real wage growth. The exchange rate appears to have been the main channel of transmission to inflation. This is consistent with recent findings that suggest that the unwinding of real exchange rate misalignments in the context of a depreciation is the most important determinant of inflation in developing economies (Goldfajn and Werlang, 2000; also see Schwartz, 1999, for the case of Brazil). Of course, the exchange rate itself is not a policy variable under a floating exchange rate regime. For a discussion of the transmission mechanism of monetary policy in Brazil, see Rabanal and Schwartz (2001b).

10. For establishing NDA ceilings, the demand for base money was estimated as the sum of its two parts: currency issued and reserves on demand deposits. Currency issued was usually estimated using a linear trend (to capture the ongoing remonetization of the economy), various seasonal dummies (for example, for December, January, and February), and lagged dependent variables. Demand deposits were usually estimated using seasonal dummies, dummies for tax effects (for example, changes in the tax on financial transactions and the nominal interest rate). Reserves on demand deposits were derived by applying an effective reserve rate to the projected level of demand deposits. In the short term, these projections fared quite well, but larger deviations from the econometric estimates occurred when seasonalities shifted (for example, when carnival fell in March instead of February) or when special factors (such as tax changes or the Y2K bug) did not have the anticipated effects.

Figure 1. Brazil: Twelve-Month Rate of Consumer Price Inflation (IPCA) and Inflation Targets

Percent
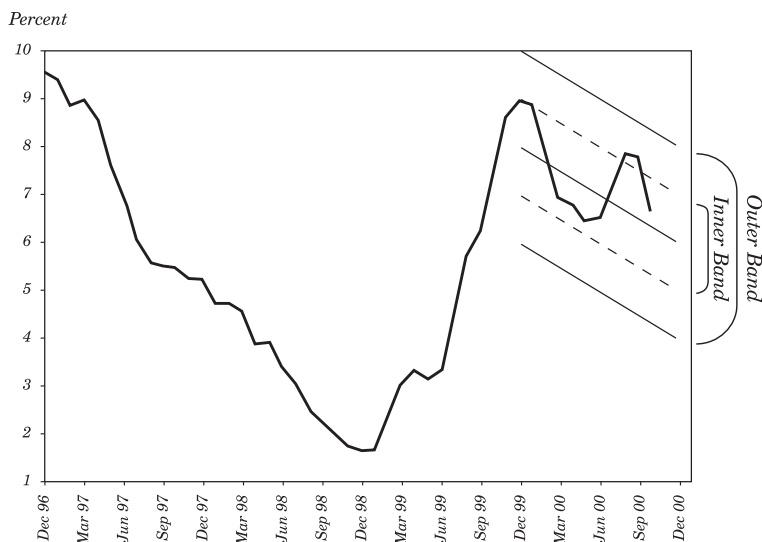
Source: Brazilian Institute for Geography and Statistics (IBGE); Banco Central do Brasil.

government.[11] The program established a simple linear quarterly path in which the central inflation target and the outer band surrounding the target decline by 0.5 percentage points each quarter. The program further established an inner consultation band of ± 1 percentage point around the target path, which follows exactly the same linear quarterly pattern as the target path and the outer band. This was the program's innovation in conditionality: the Brazilian authorities would informally consult with IMF staff on the appropriate policy response if the observed twelve-month rate of inflation were to go above the inner band; they would more formally consult with the IMF Executive Board on the appropriate policy response if the observed twelve-month inflation rate of the IPCA (a consumer price index) were to go above the outer band.

How has this mechanism worked so far? Figure 1 shows Brazil's actual inflation performance in relation to the consultation bands. The Central Bank met its official inflation targets for both year-end 1999 and year-end 2000. The Fund program's consultation mechanism on inflation was triggered in September 2000, when the twelve-month inflation

11. Specifically, 8 percent at year-end 1999 and 6 percent at year-end 2000, each with a tolerance band of ±2 percentage points (the outer band) around the central target.

rate of the IPCA reached 7.7 percent, thereby temporarily exceeding the 7.5 percent threshold requiring consultations with the Fund staff. This reflected a temporary surge in monthly inflation rates in July and August, due to unanticipated supply shocks that abated in September; core inflation had already remained relatively more subdued throughout the third quarter of 2000. As expected, and facilitated by the continued firm stance of monetary policy, the inflation rate of consumer prices declined in the fourth quarter of 2000, to match the official 6 percent target by year-end.
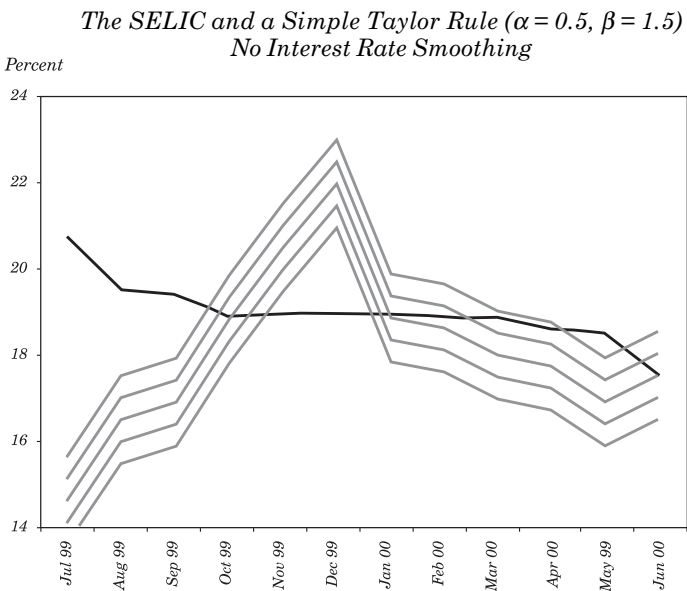
5. ACTUAL POLICIES AND TAYLOR RULES: A SIMULATION FOR BRAZIL

This section explores the usefulness of establishing simple Taylor rules to strengthen the monitoring of monetary policy in the context of a Fund program in a country operating under an inflation-targeting framework. The basic idea is simple: if a simple monetary policy rule can be shown to track actual policies fairly well, then it may be possible to use that rule to help evaluate the appropriateness of the current monetary policy stance vis-à-vis the inflation target. Using the experience of Brazil during its first year under inflation targeting as an example, we ask whether a simple Taylor rule—a rule of the type that could in principle be included in a Fund program—would have provided a useful assessment of the monetary policy stance.

Figures 2 and 3 show the actual interest rate, the SELIC rate, plotted against two alternative Taylor rules, with different values for the α and β parameters. In the first alternative, α, the parameter on the output gap, equals 0.5 and β, the parameter on the deviation of actual inflation from target, equals 1.5. The second version is an aggressive Taylor rule, featuring only the deviation of inflation from target ($\beta = 2$). Figure 3 differs from figure 2 in that it includes an interest smoothing parameter, ρ, which is set at 0.6.[12] In both figures, the actual twelve-month rate of inflation is initially used in the simple Taylor rule. The Taylor rule bands shown in these two figures are generated by different assumptions on the equilibrium real interest rate, $\bar{r}$, ranging from 10.5 percent to 12.5 percent. For the purpose of the simulations, the potential output growth rate was assumed to be 4 percent, although a lower potential growth rate (of 3 percent) resulted in only a slightly higher nominal interest rate.

12. The interest smoothing parameter introduces some inertia into the Taylor rule by mitigating the extent to which the central bank reacts to new information. See the appendix for further detail on the simulations that were carried out.

Figure 2. Brazil: Taylor Rules with Current Inflation

The SELIC and a Simple Taylor Rule (α = 0.5, β = 1.5)
No Interest Rate Smoothing

Percent

The SELIC and a Simple Taylor Rule (α = 0, β = 2)
No Interest Rate Smoothing

Percent

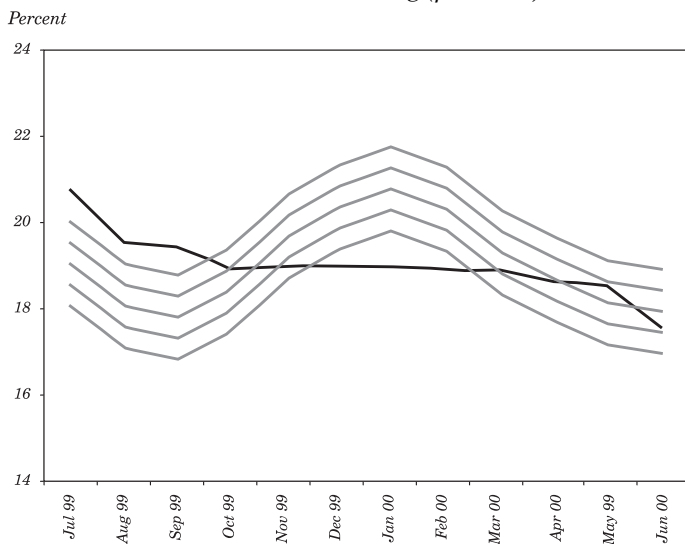Source: Banco Central do Brasil; authors' estimates.

Figure 3. Brazil: Taylor Rules with Current Inflation

The SELIC and a Simple Taylor Rule (α = 0.5, β = 1.5)
Interest Rate Smoothing (ρho = 0.6)
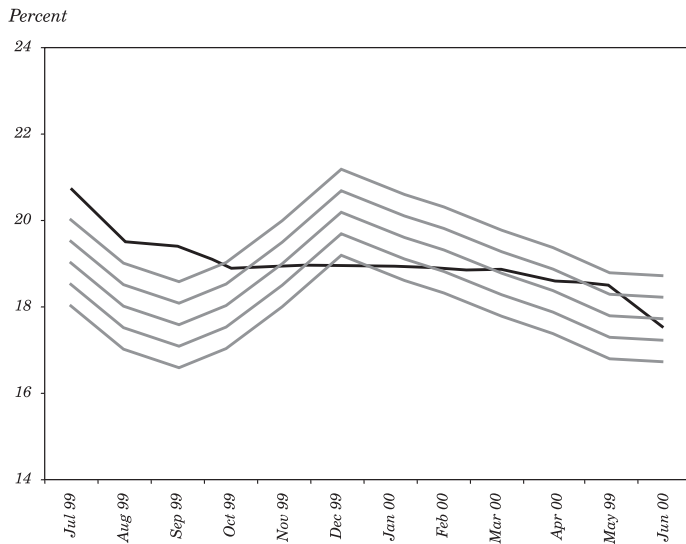
The SELIC and a Simple Taylor Rule (α = 0, β = 2)
Interest Rate Smoothing (ρho = 0.6)

Source: Banco Central do Brasil; authors' estimates.

Three periods are clearly distinguishable in both figures. In the first period, between July 1999 and September 1999, the Central Bank kept the annual overnight interest rate (or the SELIC rate) at a higher level than what a simple Taylor rule would have suggested; this basically reflects the relatively low pass-through that occurred in the first couple of months after the real was left to float. When the inflation-targeting framework was launched in July 1999, inflation was at a very moderate level, but it was expected to rise. Authorities were concerned about an increasing pass-through (given the existing transmission lags), as well as about establishing the Central Bank's reputation. They therefore initially adopted a tougher policy stance than what would have been indicated by a simple Taylor rule without expectational variables.

The second period runs from October 1999 to January-February 2000 and includes the inflation peak of December 2000. The Central Bank basically held interest rates steady throughout this period. In particular, the Bank did not raise the SELIC, as would have been suggested by a simple Taylor rule. The increase implied by a simple Taylor rule would have been particularly large without interest smoothing (figure 2), whereas it would not necessarily been so with interest smoothing (figure 3), depending on the value used for the equilibrium real interest rate, $\bar{r}$. Although inflation was higher than expected in the last quarter of 1999, the Brazilian authorities clearly perceived the situation as transitory. This view was supported by market surveys taken at the time. As a result, the actual SELIC was kept somewhat below the rate that our simple Taylor rule without expectational variables would have suggested.

The third period started in February-March 2000. In this period, inflation continued on a downward trend and remained in line with the inflation target. The reduction in inflation kept the actual SELIC within the bands of the Taylor rule. The actual SELIC remained basically unchanged at an annualized rate of 18.5 percent until June 2000, when a reduction of 100 basis points took place; a further reduction of 50 basis points (to an annualized rate of 17 percent) took place on 7 July.

The stabilization of consumer price inflation is actually quite remarkable given the presence of various factors that could have induced a temporary increase in prices, such as the increase in wholesale prices, the increase in import prices, the increase of minimum wages (and the discussion surrounding it), uncertainty about the behavior of the exchange rate in the context of more volatile international capital markets, and uncertainty stemming from the potential fiscal costs of some pending court rulings.

This simple exercise may be interpreted in different ways, which basically depend on how the Taylor rule is intended to be used. Simple, mechanistic rules are not useful in policymaking. The models used by the Central Bank of Brazil and other central banks are much more sophisticated, although they are still considered small-scale models.[13] At the same time, simple rules may provide a rough first evaluation of a policy stance. This is probably one of the reasons why the U.S. Federal Reserve Bank of St. Louis, for example, publishes the results of simple Taylor rules and McCallum rules in its monthly economic reports.[14] Simple Taylor rules may only be expected to perform satisfactorily in an environment in which relatively low inflation has already been achieved and in which the overall macroeconomic environment is fairly stable (for example, with continued tight fiscal polices and a stable exchange rate).

In a more unstable or uncertain environment, other variables should probably be included to make the Taylor rule more realistic. A more realistic Taylor rule would not necessarily involve a more complicated rule, however. Central banks do not only react to current levels of specific variables but also to their expected future levels—they are clearly forward looking. Since the different transmission channels of monetary policy are known to operate with some lags, all central banks forecast the behavior of inflation in one way or another.

Figures 4 and 5 again simulate a simple Taylor rule, but using market projections of inflation as derived from the Central Bank's daily survey on market expectations.[15] In these examples, the Taylor rule suggests that in the second period (from October 1999 to January-February 2000), the Central Bank did not need to react sharply to the pickup in inflation that occurred in the last quarter of 1999. While markets (and the Central Bank) initially may have been surprised by the inflationary outcome in the last three months of 1999, they perceived it as transitory. In early 2000 markets expected the real to appreciate in nominal terms; this was accompanied by expectations of a reduction of the inflation rate (or the pass-through). A Taylor rule that uses expected inflation thus seems to converge to the actual SELIC rate slightly faster than a rule that only uses the current inflation rate.

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13. See Bogdanski, Tombini, and Werlang (2000). Also see Rabanal and Schwartz (2001a) for a review of the inflation-forecasting performance of the small-scale model used by the Central Bank.

14. See the Federal Reserve Bank of St. Louis (1999–2000).

15. For the purpose of the Taylor rules, the expected inflation for a given month was generated by using the average expected inflation for that month, as shown in surveys carried out by the Central Bank in the immediately preceding month.

Figure 4. Brazil: Taylor Rules with Market Expectations of Inflation

The SELIC and a Simple Taylor rule ($\alpha = 0.5$, $\beta = 1.5$)
No Interest Rate Smoothing
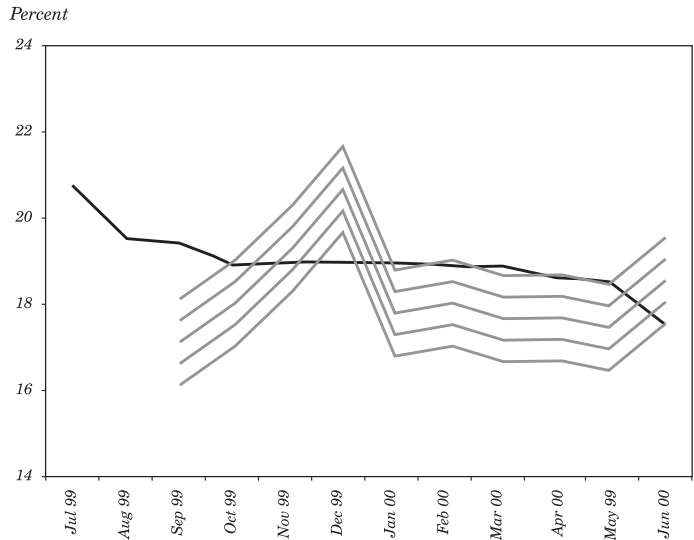
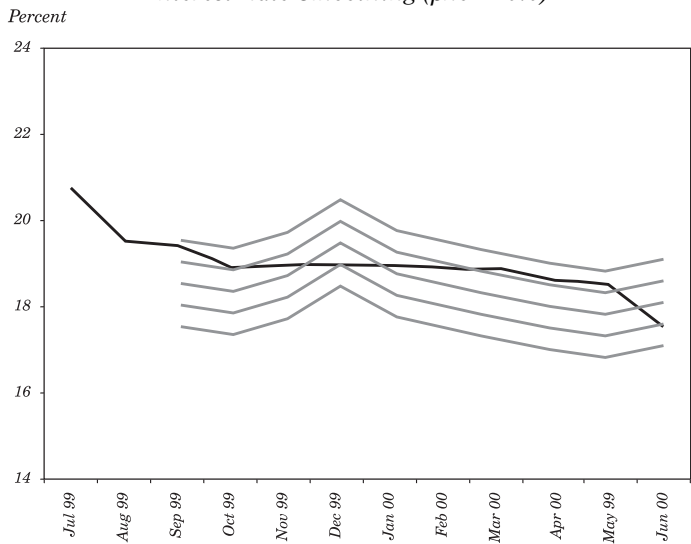### The SELIC and a Simple Taylor Rule ($\alpha = 0$, $\beta = 2$)
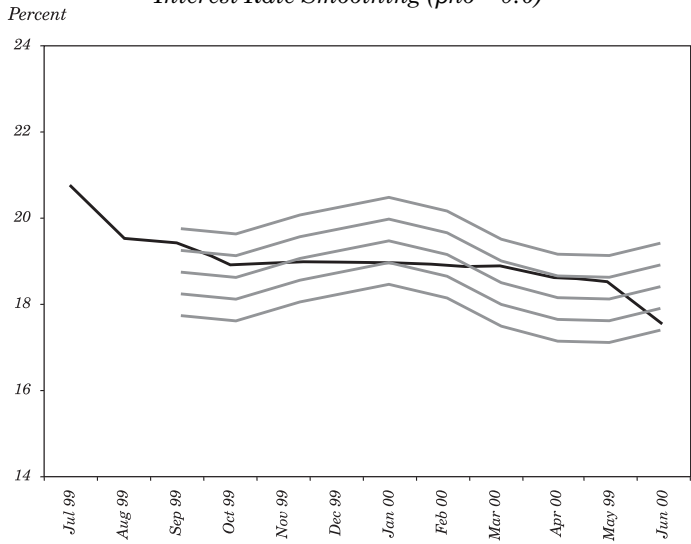### No Interest Rate Smoothing
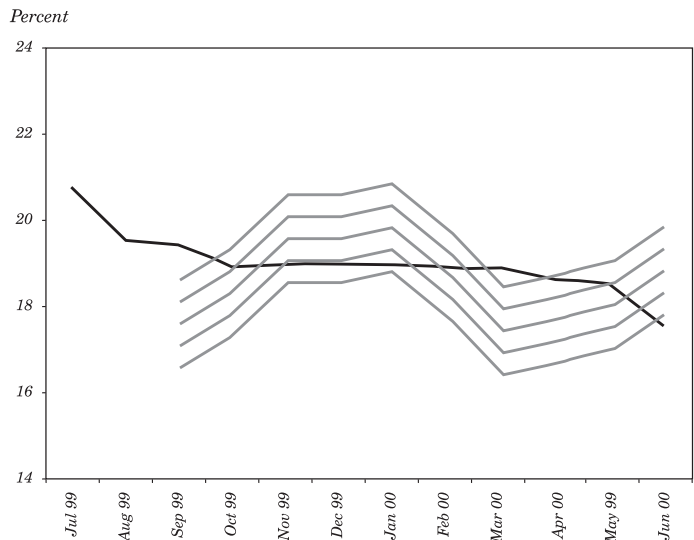
Source: Banco Central do Brasil; authors' estimates.

Figure 5. Brazil: Taylor Rules with Market Expectations of Inflation

The SELIC and a Simple Taylor Rule (α = 0.5, β = 1.5)
Interest Rate Smoothing (ρho = 0.6)

Percent

The SELIC and a Simple Taylor Rule (α = 0, β = 2)
Interest Rate Smoothing (ρho = 0.6)

Percent

Source: Banco Central do Brasil; authors' estimates.

6. Concluding Remarks

In Fund programs, conditionality links the achievement of a set of policy objectives to continued access to IMF resources. It provides a yardstick for evaluating whether the policies that are being carried out are moving the country toward the achievement of stated policy objectives, in particular a sustainable external balance. Conditionality thereby safeguards the temporary use of the IMF's resources.

In the monetary area, conditionality has traditionally relied on two performance criteria: a ceiling on the central bank's NDA and a floor on its NIR. The primary focus of this approach has always been a program's external sustainability, rather than inflation. The main role of the NIR floor is to indicate whether a Fund program is likely to achieve its external objective, while the ceiling on NDA seeks to ensure that this objective is not jeopardized by excessive credit expansion or by sterilized intervention, that is, by compensating unprogrammed NIR losses through additional credit creation. The framework assumes that the demand for base money matters from a macroeconomic perspective and that it is stable and predictable.

When Fund program countries base their monetary policies on explicit inflation targets, traditional monetary conditionality should be adapted to the specific features of inflation targeting. This would help to improve the correspondence between the monetary objectives of the central bank and the targets of the IMF-supported adjustment program, and it would strengthen the instruments that are used to achieve these targets and objectives. It would also facilitate the communication of central bank policies to the markets.

As a first step, a Fund program could include the government's inflation target itself, as was the case in Brazil. This may require specifying the target in more detail than the official target. For example, most countries operate with annual inflation targets; Fund programs are frequently monitored on a quarterly basis, however, such that additional quarterly inflation objectives may have to be added. Furthermore, a consultation mechanism needs to be established to allow program reviews to take place if inflation goes off-track. This, in turn, requires specifying parameters around the targeted inflation rate that would trigger such reviews. In the case of Brazil, the program established consultation bands around the central target, which would trigger consultations with either Fund staff or the Fund's Executive Board, depending on the size of the deviation from the target.

A potential drawback of monitoring a Fund program on the basis of inflation outcomes—for example, on the basis of the actual twelve-month inflation rate vis-à-vis the target twelve-month inflation rate—is that this process is largely backward looking, that is, the inflation outcome itself offers no guidance as to the appropriateness of the stance of monetary policies. Hence, inflation targets in the context of a Fund program work much the same way in which they are used by the government: they serve as a parameter for carrying out an ex post analysis of central bank policies. It is not enough to look at actual inflation, however, to analyze the appropriateness of the current monetary policy stance. This raises the question of whether additional options are available for further strengthening monetary conditionality under inflation targeting in the context of a Fund program.[16] This could be achieved either through regular, frequent consultations or through a forward-looking trigger mechanism for consultations between the country authorities and the Fund.

One option that has been explored in this paper is the use of simple monetary policy rules, such as Taylor rules or McCallum rules, as a potential trigger mechanism for such consultations. While simple policy rules are not a useful device for policymaking, they do provide a rough first evaluation of a policy stance. To illustrate the point, we tested various simple Taylor rules, using the successful experience of Brazil in its first year under inflation targeting as an example. The results of the simulations suggest that simple mechanical rules may indeed provide some rough initial guidance on the appropriate level of interest rates, particularly in an environment characterized by relatively low inflation and a fairly stable overall macroeconomic environment (featuring, for example, continued tight fiscal polices and a stable exchange rate).

Taylor rules or other rules that provide a rough evaluation of central bank policies merit further exploration as possible mechanisms for strengthening Fund conditionality and, in particular, helping monitor the stance of monetary policies vis-à-vis a government's inflation target. To be useful in the context of a Fund program, the rules should be kept simple and forward looking, in the sense that they should include inflation expectations.

16. Knight (1999) also provides suggestions on IMF conditionality in the context of inflation targeting.

APPENDIX

Simulation of Taylor Rules

We simulate a simple Taylor rule for Brazil during 1999–2000 to compare actual policy outcomes with rule-based policy prescriptions. Using monthly data, the simulated rule takes the standard form, with

$$r_t = \rho r_{t-1} + (1-\rho)[r^* + \alpha y_t + \beta(\pi_t - \pi_t^*)] \text{ and}$$

$$r^* = \bar{r} + \pi_t^*,$$

where r_t is the annualized overnight interest rate (the SELIC rate) in period t; ρ is the interest-smoothing parameter with $0 \le \rho \le 1$; y_t is the output gap in period t; π_t is the twelve-month inflation rate in period t; π_t^* is the inflation target applicable to period t; r^* is the equilibrium nominal interest rate; and $\bar{r}$ is the equilibrium real interest rate. Parameters α and β are the parameters of the Taylor rule; for simplicity, we choose those suggested in Taylor's original formulation, with α equal to either 0 or 0.5, depending on whether output considerations can be assumed to be part of the central bank's objective function, and β is either 2.0 or 1.5, accordingly.

We generally use monthly end-of-period data for the SELIC rate and the other variables in the model. The output gap was first estimated by fitting a linear trend on the natural logarithm of monthly GDP, as estimated by the Central Bank. This yielded a relatively low potential real output growth, and we subsequently used values in the more realistic range of 3–4 percent. The value of the equilibrium real interest rate was initially assumed to be 12.0 percent, but we then used values in the 10.5 percent to 12.5 percent range to generate the Taylor rule bands.

The inflation target for each month is a linear extrapolation of the quarterly targets for December 1999 to December 2000 that were used under the IMF program. For the period before December 1999, when inflation was still low, we used the lower band of the target range to simulate the Taylor rule and then linearly increased it to reach 8 percent (the central target) in December 1999. Hence, for July 1999, we assume that the Central Bank did set its inflation target in the lower limit of its annual band for 1999 (6 percent), and that it increased this linearly to reach the inflation target of 8 percent in December 1999. However, using the December 1999 target for the period leading up to December 1999 did not change the outcomes qualitatively.

We simulate four policy rules: the original Taylor rule (setting $\alpha = 0.5$ and $\beta = 1.5$) with no interest rate smoothing ($\rho = 0$); the original rule with interest rate smoothing ($\rho = 0.6$); a more aggressive rule that only targets inflation ($\alpha = 0$, $\beta = 2.0$), with no interest rate smoothing ($\rho = 0$); and the more aggressive rule with interest rate smoothing ($\rho = 0.6$). Choosing $\rho = 0.6$ strikes a balance between having a fairly high degree of interest rate smoothing and letting the effect die out after only a few periods.

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