CHAPTER IV

DOES INFLATION TARGETING WORK IN EMERGING MARKETS?

Inflation targeting has become an increasingly popular monetary policy strategy, with some 21 countries (8 industrial and 13 emerging market) now inflation targeters. Other countries are considering following in their footsteps. Yet, while there have been numerous studies of inflation targeting in industrial countries, there has been little analysis of the effects of inflation targeting in emerging market countries.

This chapter makes a first attempt to fill this void. It looks at the experience of the emerging market countries that have adopted inflation targeting since the late 1990s, focusing both on macroeconomic performance and the potential benefits and costs of adopting inflation targeting. A new and detailed survey of 31 central banks was conducted to support the analysis in the chapter. Particular attention is paid to the implications for institutional change and to the feasibility and success of inflation targeting when specific initial conditions, such as central bank independence, are initially absent.

What Is Inflation Targeting and Why Does Inflation Targeting Matter?

It is now widely accepted that the primary role of monetary policy is to maintain price stability.[1] An operating definition of price stability that is now broadly accepted has been offered by Alan Greenspan, Chairman of the Federal Reserve's Open Market Committee: "[P]rice stability obtains when economic agents no longer take account of the prospective change in the general price level in their economic decision making" (Greenspan, Testimony to U.S. Congress, 1996). This is often thought to correspond to an annual rate of inflation in the low single digits.[2]

Inflation targeting is one of the operational frameworks for monetary policy aimed at attaining price stability. In contrast to alternative strategies, notably money or exchange rate targeting, which seek to achieve low and stable inflation through targeting intermediate variables—for example, the growth rate of money aggregates or the level of the exchange rate of an "anchor" currency—inflation targeting involves targeting inflation directly. The literature offers several different definitions of inflation targeting.[3] In practice, however, inflation targeting has two main characteristics that distinguish it from other monetary policy strategies.

- The central bank is mandated, and commits to, a unique numerical target in the form of a level or a range for annual inflation. A single target for inflation emphasizes the fact that price stabilization is the primary focus of the strategy, and the numeric specification provides a guide to what the authorities intend as price stability.
- The inflation forecast over some horizon is the de facto intermediate target of policy. For this reason inflation targeting is sometimes referred to as "inflation forecast targeting" (Svensson, 1998). Since inflation is partially predetermined in the short term because of existing price and wage contracts and/or indexation to past inflation, monetary policy

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[1]See Batini and Yates (2003) and Pianalto (2005).

[2]See Bernanke and others (1999); Mishkin and Schmidt-Hebbel (2001); Brook, Karagedikli, and Scrimgeour (2002); Batini (2004); and Burdekin and Siklos (2004).

[3]See, among others, Leiderman and Svensson (1995); Mishkin (1999); and Bernanke and others (1999).

Table 4.1. Inflation Targeters

	Inflation Targeting Adoption Date[1]	Unique Numeric Target = Inflation	Current Inflation Target (percent)	Forecast Process	Publish Forecast
Emerging market countries					
Israel	1997:Q2	Y	1–3	Y	Y
Czech Republic	1998:Q1	Y	3 (+/–1)	Y	Y
Korea	1998:Q2	Y	2.5–3.5	Y	Y
Poland	1999:Q1	Y	2.5 (+/–1)	Y	Y
Brazil	1999:Q2	Y	4.5 (+/–2.5)	Y	Y
Chile	1999:Q3	Y	2–4	Y	Y
Colombia	1999:Q3	Y	5 (+/–0.5)	Y	Y
South Africa	2000:Q1	Y	3–6	Y	Y
Thailand	2000:Q2	Y	0–3.5	Y	Y
Mexico	2001:Q1	Y	3 (+/–1)	Y	N
Hungary	2001:Q3	Y	3.5 (+/–1)	Y	Y
Peru	2002:Q1	Y	2.5 (+/–1)	Y	Y
Philippines	2002:Q1	Y	5–6	Y	Y
Industrial countries					
New Zealand	1990:Q1	Y	1–3	Y	Y
Canada	1991:Q1	Y	1–3	Y	Y
United Kingdom	1992:Q4	Y	2	Y	Y
Australia	1993:Q1	Y	2–3	Y	Y
Sweden	1993:Q1	Y	2 (+/–1)	Y	Y
Switzerland	2000:Q1	Y	<2	Y	Y
Iceland	2001:Q1	Y	2.5	Y	Y
Norway	2001:Q1	Y	2.5	Y	Y

Source: National authorities.
[1]This date indicates when countries de facto adopted inflation targeting as defined at the beginning of this chapter. Official adoption dates may vary.

can only influence expected future inflation. By altering monetary conditions in response to new information, central banks influence expected inflation and bring it in line over time with the inflation target, which eventually leads actual inflation to the target.

To date, the monetary policy strategy followed by 21 countries has these characteristics, and for the purpose of this chapter these are treated as inflation targeters (Table 4.1).[4] Defining inflation targeting according to these two characteristics makes it clear why, for example, neither the Federal Reserve nor the European Central Bank (ECB) are considered inflation targeters: the former lacks a numerical specification for its price stability objective,[5] while the latter has traditionally given a special status to a "reference value" for the growth of the euro area M3 broad money aggregate.[6]

Proponents of inflation targeting argue that it yields a number of benefits relative to other operating strategies (see, for example, Truman, 2003). The main benefits are seen as the following.

- *Inflation targeting can help build credibility and anchor inflation expectations more rapidly and durably.* Inflation targeting makes it clear that low inflation is the primary goal of monetary policy and involves greater transparency to compensate for the greater operational freedom that inflation targeting offers. Inflation targets are also intrinsically clearer and more easily observable and understandable than other targets since they typically do not change

[4]According to these criteria, Chile and Israel are not classified as having adopted inflation targeting until the de-emphasis of their exchange rate targets, in 1999 and 1997, respectively.
[5]See Kohn (2003); Gramlich (2003); and Bernanke (2003).
[6]See European Central Bank (1999); Solans (2000); and Issing (2000). However, the ECB has recently de-emphasized the weight attached to this reference value, moving more toward a "pure" inflation-targeting regime. See European Central Bank (2003).

over time and are controllable by monetary means.[7] In this way, inflation targeting can help economic agents better understand and evaluate the performance of the central bank, anchoring inflation expectations faster and more permanently than other strategies, in which the task of the central bank is less clear or less monitorable (see Box 4.1, "A Closer Look at Inflation Targeting Alternatives: Money and Exchange Rate Targets").

- *Inflation targeting grants more flexibility.* Since inflation cannot be controlled instantaneously, the target on inflation is typically interpreted as a medium-term goal. This implies that inflation-targeting central banks pursue the inflation target over a certain horizon, by focusing on keeping inflation expectations at target.[8] Short-term deviations of inflation from target are acceptable and do not necessarily translate into losses in credibility.[9] The scope for greater flexibility could reduce output gap variability (Box 4.1 looks at why some inflation-targeting alternatives may imply higher output costs).
- *Inflation targeting involves a lower economic cost in the face of monetary policy failures.* The output costs of policy failure under some alternative monetary commitments, like exchange rate pegs, can be very large, usually involving massive reserve losses, high inflation, financial and banking crises, and possibly debt defaults.[10] In contrast, the output costs of a failure to meet the inflation target are limited to temporarily higher-than-target inflation and temporarily slower growth, as interest rates are raised to bring inflation back to target.[11]

Critics, however, have argued that inflation targeting has important disadvantages.

- *Inflation targeting offers too little discretion and so it unnecessarily restrains growth.* Since the success of inflation targeting relies on the establishment of a reputational equilibrium between the central bank and agents in the domestic economy, inflation targeting can work effectively only if the central bank acts consistently and convincingly to attain the inflation target—in other words, for inflation targeting to work well, the central bank must demonstrate its commitment to low and stable inflation through tangible actions. In the initial phases of inflation targeting, demonstrating commitment may require an aggressive response to inflationary pressures, which could temporarily reduce output. More generally, inflation targeting constrains discretion inappropriately: it is too confining in terms of an ex ante commitment to a particular inflation number and a particular horizon over which to return inflation to target.[12] By obliging a country to hit the target so restrictively, inflation targeting can unnecessarily restrain growth.[13]
- *Inflation targeting cannot anchor expectations because it offers too much discretion.* Contrary

[7]Money targets, for example, have to be reset yearly and are hard to control because shifts in money demand or in the money multiplier impair the control of money supply and alter the long-run relationship between money and inflation. Likewise, the control of exchange rate targets by the central bank is limited because the level of the exchange rate is ultimately determined by the international demand and supply of the domestic currency vis-à-vis that of the "anchor" currency, and hence shifts in sentiment about the domestic currency can trigger abrupt changes in its relative value that cannot be offset easily by central bank actions. Many central banks have abandoned money and exchange rate targets on these grounds. See Box 4.1.

[8]The horizon over which inflation-targeting central banks attempt to stabilize inflation at target usually varies with the types of shocks that have taken inflation away from target and with the speed of monetary transmission. See Batini and Nelson (2001) for a discussion of optimal horizons under inflation targeting.

[9]Under "full credibility," economic agents under inflation targeting preemptively adjust their plans in the face of incipient inflationary pressures, so that the central bank has to move interest rates even less, and price stabilization comes at even lower output gap variability costs (see, for example, King, 2005).

[10]The experience of Argentina in 2001 is an example of this.

[11]The experience of South Africa in late 2002 is one such case.

[12]The horizon over which inflation-targeting central banks attempt to stabilize inflation at target is not always specified and varies from country to country. See Batini and Nelson (2001) for a discussion of optimal horizons under inflation targeting.

[13]See, among others, Rivlin (2002) and Blanchard (2003).

Box 4.1. A Closer Look at Inflation-Targeting Alternatives: Money and Exchange Rate Targets

Money and exchange rate targets are the main alternative monetary policy strategies to inflation targeting. Both strategies target inflation indirectly, by targeting "intermediate" variables on the assumption that these are both controllable and reliably related to the ultimate objective of policy—inflation. This box discusses strengths and weaknesses of these alternatives, and offers a brief review of the historical experience of countries that have used them.[1]

Money Targets

In the late 1970s and 1980s many central banks built their fight against inflation around money targeting (Goodhart, 1989). Money targeting involves announcing a target every year for the growth of a monetary aggregate[2] on the assumption that controlling the growth of money gives control of inflation.[3] The main benefits of money targets are that data on money are usually available more rapidly than other data—providing early information on the short-term inflation outlook—and that the nominal money supply may be more directly controllable than inflation itself. A tight control of the money stock is also largely incompatible with debt monetization, and is therefore believed to provide some discipline over fiscal policy. In addition, money targets typically involve little analytical effort, requiring only yearly assumptions on trend real growth, trend money velocity, and the money base multiplier.

On the other hand, money targets have both conceptual and practical shortcomings. Conceptually, under money targets it is more difficult to anchor inflation expectations because money targets introduce a second numerical target to the ultimate target of policy, obscuring the task of the central bank and making it harder to monitor its performance. Money targets are therefore particularly unsuited for countries where the inflation record and central bank credibility are fragile. Money targets are based on the assumptions that the central bank has full control of the nominal money stock—that is, the money multiplier is predictable—and that money velocity is predictable—that is, the long-run relationship between money growth and nominal income growth (and therefore inflation, for given trend real growth) is stable. In practice, money targets were often missed, leading people to question their usefulness as intermediate targets. The only countries that still target money today are developing countries,[4] although even there, neither the money multiplier[5] nor the velocity of money appears stable over time (the two figures show this for a selected group of countries not on IMF programs).

Exchange Rate Targets

There are two main types of exchange rate targets: fixed exchange rates (currency boards, monetary unions, and unilateral dollarization)

Note: The main authors of this box are Nicoletta Batini and Manuela Goretti.

[1]Many of the strengths and weaknesses of intermediate targets relative to inflation targeting are reflected in the experience of the United Kingdom since World War II. See Batini and Nelson (2005).

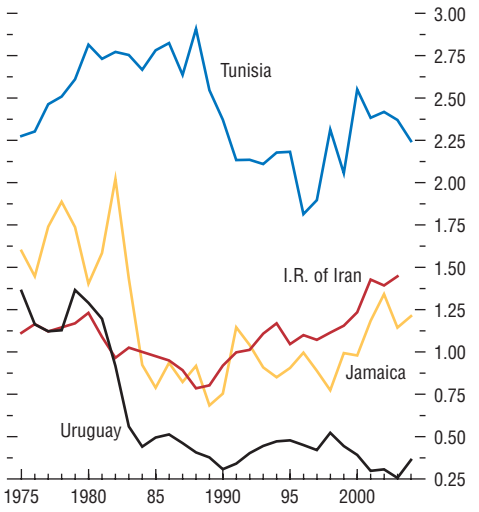
[2]Most definitions are country specific but money targets usually refer to slightly broader aggregates than base money, that is, aggregates including currency in circulation, sight deposits, and time deposits with unrestricted access.

[3]This assumption finds its origins in a popular identity by Irving Fisher called the "quantity equation" or the "equation of exchanges." The identity states that the value of all economic transactions (or more generally all nominal income generated in an economy) has to be paid with money. It follows that money in circulation times money velocity—that is, the time on average in which a unit of money is spent during a certain period—must equal nominal income. Because of money neutrality, changes in the nominal money stock have no effect on changes in real output in the long run but can thus affect inflation, as long as money velocity is constant.

[4]Of the 22 developing countries that declare themselves money targeters, only 9 periodically disclose their numeric money targets. Five of these nine are on IMF programs. However, numerous countries still monitor money and credit aggregates as part of their overall assessment of economic and financial market conditions.

[5]The instability and unpredictability of the multiplier in developing countries are often a consequence of capital flows (including aid flows), which severely distort growth in the money base.

Money Multipliers[1]

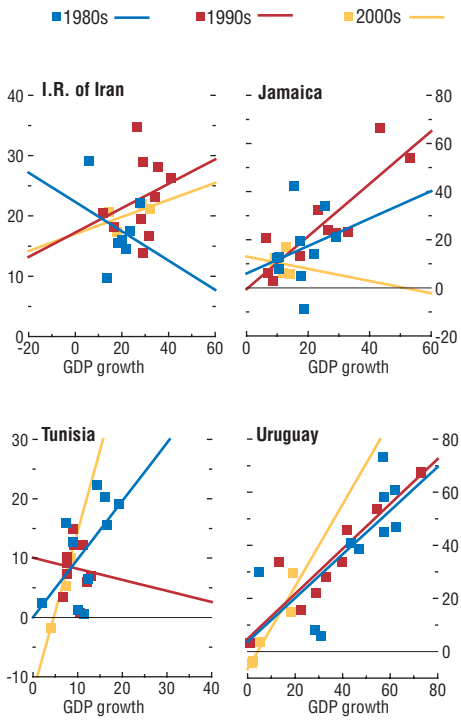


Sources: IMF, *International Financial Statistics;* and IMF staff calculations.

[1]Ratio of narrow money (M1) to base money (M0). Actual money targets in I.R. of Iran and Tunisia are broader money aggregates than M1, i.e., M2 and M3 respectively. However, volatility in M1 transmits to these broader aggregates.

Money Growth Versus Nominal Income Growth

(Percent; M1 growth on y-axis)



Sources: IMF, *International Financial Statistics;* and IMF staff calculations.

and fixed-but-adjustable exchange rates ("pegs," including bilateral or currency basket pegs as well as constant or crawling pegs; pegs can be on a point or a band target).

To various degrees, both types of exchange rate targets involve "adopting" the monetary policy of another country to acquire credibility from a foreign source when this is not available domestically.[6] Fixed-but-adjustable exchange rates are thought to offer most of the credibility gains associated with a fixed exchange rate, but without the inflexibility of more rigid arrangements (see Chapter II of the September 2004 *World Economic Outlook*). Under exchange rate targets, the central bank's sole task is to maintain the value of the domestic money in terms of another country or group of countries. In the absence of effective capital controls, capital flows have to be sterilized and domestic money expansion can only result from money expansion in the "anchor" country, eventually bringing domestic inflation in line with inflation in the "anchor" country. Exchange rate targets also promise to reduce exchange rate volatility.

[6]Monetary unions, like the European Economic and Monetary Union, are a special category of fixed exchange rates where groups of countries abandon their national currencies to embrace a unique and collective new currency. The main benefits of such unions are lower currency transaction costs and the elimination of intra-union exchange rate volatility. Monetary unions, however, imply a partial loss of monetary autonomy—as monetary policy decisions have to be "coordinated" with other members—and a substantial loss in seigniorage for some member countries.

Box 4.1 *(concluded)*

The main drawbacks of exchange rate targets are three. First, because they imply delegating central bank power to another country, exchange rate targets result in losing much, if not all, monetary autonomy—for example, monetary instruments cannot be used for domestic purposes. Second, exchange rate targets can subject the central bank to speculative attacks and in extreme cases force a parity change that might not have been necessary on fundamental grounds. In addition, because exchange rate targets create a sense of security from currency risk, they can encourage unhedged currency mismatches, implying that successful speculative attacks are often followed by financial and banking crises and debt defaults (Flood and Marion, 1999; Sachs, Tornell, and Velasco, 1996). Third, the burden of achieving the proper real exchange rate falls entirely on the level of domestic prices, and this is particularly costly in terms of output when prices are sticky because then it is output that must adjust first.

Although fixed-but-adjustable pegs have been popular in the past, a consensus appears to have emerged that adjustable pegs can be dangerous arrangements for open economies subject to international capital flows (see, for instance, Fischer, 2001). The fact that they are adjustable makes them more prone to speculative attacks because, many argue, it signals a less strong commitment than fixed exchange rates. About one-half of the countries with a long-lived—that is, five-year or longer—fixed-but-adjustable exchange rate since 1991 were forced to abandon it following a currency crisis.[7] Most countries that used to have fixed-but-adjustable exchange rates have either given up their national currencies completely by fixing their exchange rates (at present only seven countries—with populations above two million people—have a currency board)[8] or have moved to inflation targeting combined with a floating exchange rate. As discussed in the main text, overall, the recent inflation performance of countries with hard pegs is good, although not as good as that of countries that have moved to inflation targeting. In addition, the costs of policy failure are much higher, as the recent experience in Argentina has demonstrated.

[7]Of the remaining countries with fixed-but-adjustable pegs, about a half are small tourism-dependent economies and highly dependent principalities, all with populations of less than two million.

[8]We consider a "de facto" classification, based on the methodology of Obstfeld and Rogoff (1995). On that basis, the countries that still have a currency board or another currency as legal tender are Bosnia and Herzegovina, Bulgaria, Ecuador, El Salvador, Hong Kong SAR, Lithuania, and Panama.

to those who worry that inflation targeting may be too restraining, some argue that it cannot help build credibility in countries that lack it because it offers excessive discretion over how and when to bring inflation back to target and because targets can be changed as well.[14]

- *Inflation targeting implies high exchange rate volatility.* It is often believed that, because it elevates price stability to the status of the primary goal for the central bank, inflation targeting requires a benign neglect of the exchange rate. If true, this could have negative repercussions on exchange rate volatility and growth.
- *Inflation targeting cannot work in countries that do not meet a stringent set of "preconditions,"* making the framework unsuitable for the majority of emerging market economies. Preconditions often considered essential include, for example, the technical capability of the central bank in implementing inflation targeting, absence of fiscal dominance, financial market soundness, and an efficient institutional setup

[14]See, for example, Rich (2000, 2001); Genberg (2001); and Kumhof (2002).

to support and motivate the commitment to low inflation.

Inflation Targeting: An Assessment of the Impact

Empirical studies so far have focused primarily on the experience of industrial economies, because these countries, many of which adopted inflation targeting in the early 1990s, have a track record of sufficient length to assess the policy's economic impact.[15] These studies generally suggest that inflation targeting has been associated with performance improvements, although the evidence is typically insufficient to establish statistical significance of these improvements. No study, however, finds that performance has deteriorated under inflation targeting.

The lack of strong evidence from industrial countries may reflect several factors. First, there are only seven or eight inflation targeters to look at, and a limited set of nontargeters to compare them against. Second, the macroeconomic performance of inflation targeters and non-inflation-targeters alike improved during the 1990s for a variety of reasons including, but not limited to, better monetary policy—for example, some aspects of the performance of many non-inflation-targeters along some dimensions were improved by preparations for entry into the European Economic and Monetary Union (EMU). And finally, the fact that most industrial countries entered the 1990s with relatively low and stable inflation makes it more difficult to discern any incremental improvement due to inflation targeting.

In many ways, the experience of emerging markets offers a richer set of data for assessing the effects of inflation targeting than that of the industrial countries. The time span covered is short—ranging from three to seven years—but the sample of inflation targeters and suitable comparison countries is considerably larger. Moreover, because many emerging market inflation targeters experienced relatively high levels of inflation and macroeconomic volatility prior to the adoption of inflation targeting, it should be easier to discern the effects of inflation targeting. Perhaps more crucially, looking at the experience of emerging markets allows a check on how inflation targeting performs during periods of economic turbulence. While the global inflation and financial market environment has generally been benign in recent years, a number of emerging market inflation targeters have been under periods of substantial stress during the course of their inflation-targeting regimes (for example, Brazil and other Latin American inflation targeters in the early 2000s; South Africa in late 2002; and Hungary and Poland in the years since 2000).

For the analysis that follows, we look at 13 emerging market inflation targeters (see Table 4.1).[16] We compare them against the remaining 22 emerging market countries that are in the JPMorgan EMBI Index, plus seven additional countries that are largely classified similarly.[17]

It is useful to begin by reviewing the inflation performance of inflation targeters and non-inflation-targeters over the past 15 years (Figure 4.1). Inflation in both groups was quite high in the early to mid-1990s but, as of 1997, somewhat higher for the non-inflation-targeters, which, as a group, had already begun to disinflate by 1995.[18] Inflation fell in both inflation-targeting and non-

[15]See, for example, Ball and Sheridan (2003); Levin, Natalucci, and Piger (2004); Truman (2003); and Hyvonen (2004), among others.

[16]Apart from the Czech Republic and Israel, all these countries are included in the JPMorgan Emerging Markets Bond Index (EMBI).

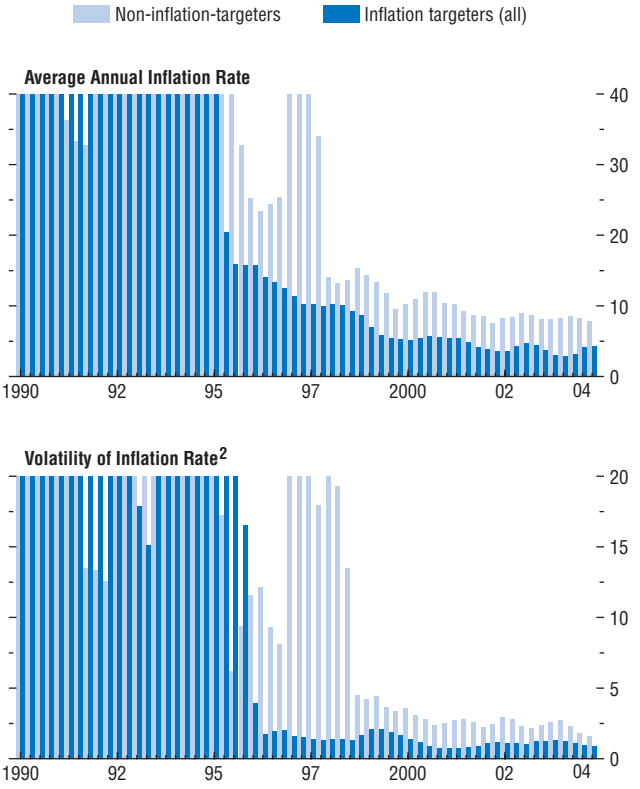
[17]These are Botswana, Costa Rica, Ghana, Guatemala, India, Jordan, and Tanzania. We also experiment with excluding these seven countries from the control group.

[18]The hypothesis put forth by Ball and Sheridan (2003) that the countries that chose to adopt inflation targeting were those experiencing a transitory increase in inflation is broadly inconsistent with the data when the country sample is extended to include emerging markets.

Figure 4.1. Inflation, 1990–2004[1]

(Percent)

Average inflation has fallen for both inflation targeters and non-inflation-targeters over the past 15 years, but more so for inflation-targeting countries today.



Sources: IMF, *International Financial Statistics;* and IMF staff calculations.
[1]Regional average for emerging market and selected developing countries; average inflation rates above 40 percent and volatilities above 20 percent are not shown, to enable clearer illustration of smaller average inflation differences in the recent past.
[2]Rolling 1-year standard deviation of inflation.

Table 4.2. Inflation Outcomes Relative to Target

	Standard Deviation from Target (RMSE) (percentage points)[1]	Frequency of Deviations[2] (percent)		
		Total	Below	Above
All countries	1.8	43.5	24.2	19.3
Stable inflation targets	1.3	32.2	21.7	10.6
Disinflation targets	2.2	59.7	27.7	32.0
Industrial countries	1.3	34.8	22.5	12.3
Emerging market countries	2.3	52.2	25.9	26.2

Source: Roger and Stone (2005).
[1]Inflation outcome relative to target or center of target zone ranges. Equally weighted averages of corresponding statistics for individual countries in relevant groups. Individual country statistics are based on monthly (quarterly for Australia and New Zealand) differences between 12-month inflation rates and centers of target ranges.
[2]Inflation outcomes relative to edges of target ranges.

inflation-targeting countries—but even into 2004, a sizable "wedge" of roughly 3½ percentage points remained. Such a wedge reflects the success of most inflation targeters in keeping actual inflation, on average, close to target, although target misses have occurred, especially for disinflating countries, where target misses have tended to be larger and more frequent than in countries with stable inflation targets (Table 4.2; and Roger and Stone, 2005).

To look at the experience in more detail, we now turn to the economic performance of inflation-targeting countries before and after adopting inflation targeting relative to the performance of non-inflation-targeters. This approach raises the issue of what to use as the "break date" for non-inflation-targeters: while no partitioning of the sample is perfect, we follow Ball and Sheridan (2003) in using the average adoption date for the inflation targeters (1999:Q4) for this purpose (in practice, dates range from 1997:Q2 to 2002:Q1). Other partitions of the sample are also considered and, as reported below, yield very similar results.

As shown in the first panel of Figure 4.2, the level and volatility of inflation prior to the adoption of inflation targeting are, for many countries in the sample, quite high and variable (Figure 4.2). The convergence to low and stable inflation after adoption is striking: in 2004 all countries were clustered in the 1–7 percent range, with a maximum standard deviation of

Table 4.3. Baseline Results

Variables	*IT Dummy Variable*
CPI inflation	−4.820**
Volatility of CPI inflation	−3.638**
Volatility of real output growth	−0.633
Volatility of output gap	−0.010**

Sources: IMF, *International Financial Statistics;* and IMF staff calculations.

Note: One, two, and three asterisks denote statistical significance at the 10, 5, and 1 percent level, respectively.

2 percent. The non-inflation-targeters also show improvement along both dimensions, and many succeeded in stabilizing inflation at low levels; but as a group, they do display less strong convergence than the inflation targeters, with many continuing to experience relatively high and volatile inflation. For real output growth and volatility, the pattern is less clear: abstracting from one or two outliers, output volatility is generally lower in the "post" period for both groups, with little change in average growth rates.

A more formal statistical analysis, along the lines proposed by Ball and Sheridan (2003), gives very similar results (see Appendix 4.1 for details of this analysis). Underlying the analysis is the assumption that some gauge of macroeconomic performance—call it *X*—depends partly on its own past history, and partly on some underlying mean value of the variable in question. In the case of the inflation rate for inflation targeters, this mean should, of course, correspond to the inflation target; for other countries, this would simply be the "normal" level of inflation to which observed inflation reverts.

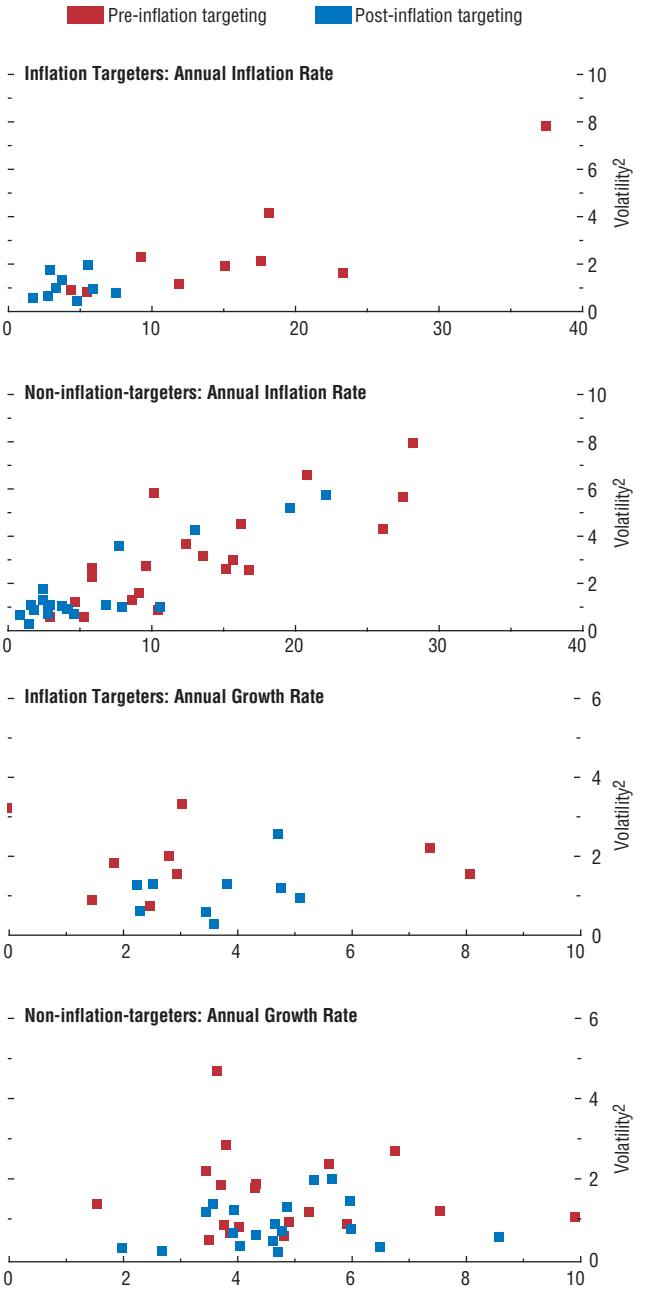
The results reaffirm the descriptive statistics and the visual impression from the plots: inflation targeting is associated with a significant 4.8 percentage point reduction in average inflation, and a reduction in its standard deviation of 3.6 percentage points *relative* to other strategies (Table 4.3).[19] The standard deviation of output

[19]This finding is at odds with arguments raised by Kumhof (2002); Genberg (2001); and Rich (2000), among others, that inflation targeting is too soft or too discretionary to actually enable central banks to reduce inflation on a durable basis.

Figure 4.2. Inflation and Growth Performance[1]

(1985–2004; percent; average on x-axis)

Over the past 15 years, there is a stronger convergence to low and stable inflation for inflation targeters than non-inflation-targeters. Growth performance is also more homogeneously better for inflation targeters.



Sources: IMF, *International Financial Statistics;* OECD Analytical Database; and IMF staff calculations.

[1]Period average for emerging market and selected developing countries, with pre-inflation targeting average inflation less than 40 percent.

[2]Rolling one-year standard deviation of inflation.

Table 4.4. Baseline Model Robustness Checks Using Different Classifications

Variables	World Bank Classification by Income		World Bank Classification by Foreign Indebtedness		
	No low-income country	No lower-middle-income country	No severely indebted country	Emerging Markets	EMBI Classification
	IT Dummy Variable				
CPI inflation	–5.025**	–9.406*	–3.820**	–4.972**	–4.653**
Volatility of CPI inflation	–4.138**	–4.209	–1.842	–4.828**	–3.959**
Volatility of real output growth	–0.898	–3.128*	–0.435	–1.235	–0.937
Volatility of output gap	–0.012**	–0.024**	–0.009	–0.014**	–0.012**

Sources: IMF, *International Financial Statistics;* JPMorgan Chase & Co.; national sources; World Bank; and IMF staff calculations.
Note: One, two, and three asterisks denote statistical significance at the 10, 5, and 1 percent level, respectively.

is also slightly lower for the inflation targeters, and the difference from the comparison group of non-inflation-targeters is statistically significant at the 5 percent level. Thus, there is no evidence that inflation targeters meet their inflation objectives at the expense of real output stabilization.[20]

Next, we examined how sensitive the results are to (1) the way the sample was partitioned into "pre" and "post" periods; (2) the exclusion of countries whose inflation was high in the "pre" period; (3) the exclusion of "low-income" countries or of both these and countries that are not "upper-middle-income" according to the World Bank classification by income; (4) the exclusion of the seven non-inflation-targeting countries not included in the JPMorgan EMBI; (5) the exclusion of countries that are severely indebted according to the World Bank classification of country external indebtedness; (6) the exclusion of countries with an exchange rate peg in the "post" period; and finally, (7) different degrees of fiscal discipline among countries. (Appendix 4.1 describes the controls and the alternative sample partitioning schemes that were used, reporting all the associated results.)

None of these modifications significantly alters the baseline results reported above. As shown in Tables 4.4 and 4.5, inflation targeting continues to be associated with a statistically significant larger reduction in the level and standard deviation of inflation relative to other regimes; and with little or no effect on the volatility of output.[21] The main results of the analysis, therefore, appear to be quite robust, even when the improvement in fiscal performance in the post-inflation-targeting period is accounted for. Interestingly, inflation targeting seems to outperform exchange rate pegs—even when only successful pegs are chosen in comparison.

The result that inflation targeting improves inflation performance more than other regimes is in a sense unsurprising, as the control of inflation is, after all, the central bank's overriding medium-term objective. An interesting question is how performance compares in other dimen-

[20]This result suggests that concerns raised by, among others, Friedman (2002); Baltensperger, Fischer, and Jordan (2002); Meyer (2002); Rivlin (2002); and Blanchard (2003), that inflation targeting is too rigid and constrains discretion inappropriately at the expense of the rate or variability of economic growth may be unwarranted, at least for emerging markets.

[21]Inflation targeting advantages relative to other non-inflation-targeting strategies are robust independent of the controls used. However, countries with an initial level of inflation above 40 percent show a relatively smaller reduction in inflation and inflation volatility between the pre- and the post-inflation-targeting-adoption periods. We also find that when severely indebted countries are excluded, inflation targeting still implies statistically significant macroeconomic improvements relative to not having inflation targeting, although the reduction in inflation volatility and output gap volatility is no longer statistically significant.

Table 4.5. Baseline Model Robustness Checks by Date and Control Variables

Variables	Different Dates			Control Variables				
				Fiscal discipline		Inflation		
	Starting date: 1990	Actual dates for non-inflation-targeters; starting date = 1985	Time periods 1994–96 vs. 2002–04	Debt/GDP (pre)[1]	Debt/GDP (change)[2,3]	Pre-inflation >40 percent[4]	Pre-inflation >100 percent[5]	Exchange rate regime pegs
	IT Dummy Variable			*IT Dummy/Control Variables*				
CPI inflation	–4.818**	–6.519***	–4.520***	–5.254***	–5.910**	–4.411**/10.036**	–4.758**	–5.829**
Volatility of CPI inflation	–3.636**	–4.159***	–2.358**	–3.461**	–4.084**	–3.498**/7.695**	–3.631**	–3.835**
Volatility of real output growth	–0.653	–1.221	–1.030	–0.595	–0.868	–0.649/2.650**	–0.633	–0.751
Volatility of output gap	–0.009**	–0.013**	–0.010*	–0.010**	–0.011**	–0.011**/0.015**	–0.010**	–0.013**

Sources: IMF, *International Financial Statistics*; national sources; and IMF staff calculations.

Note: One, two, and three asterisks denote statistical significance at the 10, 5, and 1 percent level, respectively. Control variables missing when not significant.

[1]Debt in percent of GDP prior to adoption of inflation targeting.

[2]Difference between current and pre-adoption debt in percent of GDP.

[3]The sample does not include Argentina and China because fiscal changes in these countries were many times larger than the average in non-inflation-targeting countries, and were, therefore, biasing the results (showing when included that an improvement in the fiscal stance worsens inflation expectations).

[4]Period average inflation prior to adoption of inflation targeting above 40 percent.

[5]Period average inflation prior to adoption of inflation targeting above 100 percent.

sions that are not directly related to inflation per se, including survey-based inflation expectations, their volatility, nominal exchange rate volatility, foreign reserves volatility, and real interest rate volatility. Finally, inflation-targeting performance was checked with respect to a proxy for the probability of exchange rate crises, using the "exchange market pressure" index based on the seminal work by Girton and Roper (1977) and developed by Eichengreen, Rose, and Wyplosz (1994, 1995).

Using the same statistical framework as before, inflation targeting leads to a reduction in the level and volatility of inflation expectations, along with inflation itself (Table 4.6). This confirms the notion that inflation targeting has an advantage over other regimes at anchoring expectations and building credibility on a more durable basis, even if in emerging markets inflation targets are missed more—and more often—than in industrial countries. In the sample used here, the fiscal position before inflation targeting adoption or the absence of fiscal improvement after adoption does not seem to affect the ability of inflation targeting to deliver lower or more stable inflation (or inflation expectations) relative to other strategies.[22] Nominal exchange rate volatility is lower, relative to non-inflation-targeters, as is the standard deviation of the real interest rate and the volatility of international reserves.[23] Interestingly, there is evidence at the 5 percent level that inflation targeting is associated with a lower probability of crises, perhaps in part reflecting the greater de jure—if not de facto—flexibility of the exchange rate regime.

The conclusions of this analysis are subject to two important caveats. First, although the success of inflation targeting in emerging markets to date is encouraging, the time elapsed since they adopted inflation targeting is short. This makes it hard to draw definite conclusions about the effects of inflation targeting. Nevertheless, the observed similarities in the behavior of inflation expectations in emerging market and industrial country inflation targeters over a comparable post-inflation-targeting time span bodes

[22]An event study by Celasun, Gelos, and Prati (2004) over time samples predating the adoption of inflation targeting has found that fiscal improvements may have helped lower inflation expectations in some emerging market countries.

[23]Exchange rate volatility in inflation-targeting countries is still lower than in non-inflation-targeting countries even when countries with exchange rate targets are dropped from the non-inflation-targeting control group.

Table 4.6. Baseline Model Robustness Checks: Additional Performance Indicators

Variables	Starting Date		Actual Dates for Non-Inflation-Targeters Starting Date:	Time Periods	Fiscal Discipline		Inflation		Exchange Rate
	1985	1990	1985	1994–96 vs. 2002–04	Debt/GDP (pre)[1]	Debt/GDP (change)[2,3]	Pre-Inflation >40 percent[4]	Pre-Inflation >100 percent[5]	Regime Pegs
	IT Dummy Variable				*IT Dummy/Control Variables*				
5-year π forecast[5]	–2.672**	–2.672**	–3.016**	–2.197	–2.906**	–2.901**	–2.578**	–2.726**	–1.721
Volatility of 5-year π forecast	–2.076**	–2.076**	–1.330**	–1.717**	–1.840*	–1.755**	–1.765**	–2.103**	–1.491**
6–10-year π forecast	–2.185**	–2.185**	–2.558**	–2.184	–2.203*	–2.404*	–2.085**	–2.146*	–1.592*
Volatility of 6–10-year π forecast	–1.737***	–1.737***	–1.232**	–1.596**	–1.350**/ 0.018***	–1.548***	–1.645***	–1.704**	–1.675*
Exchange market pressure index	–0.340**	–0.327*	–0.330	–0.494*	–0.328**	–0.384**	–0.339**	–0.340*	–0.519***/ –0.433*
Exchange rate volatility	–11.090*	–11.107**	–9.303	–3.654	–9.510**	–7.958*	–9.721*	–11.927*	–13.240**
Reserves volatility	–16.333***	–16.384***	–21.945***	–14.770**	–15.458**	–20.886***/ 0.186**	–16.072***	–16.328***	–20.109***
Volatility of real interest rate	–5.025***	–5.025**	–4.695***	–3.020**	–4.985**	–6.186**	–5.129**/ 8.790**	–5.019**	–5.817**

Sources: IMF, *International Financial Statistics;* national sources; and IMF staff calculations.
Note: One, two, and three asterisks denote statistical significance at the 10, 5, and 1 percent level, respectively. Control variables missing when not significant.
[1]Debt in percent of GDP prior to adoption of inflation targeting.
[2]Difference between current and pre-adoption debt in percent of GDP.
[3]The sample does not include Argentina and China because fiscal changes in these countries were many times larger than the average in non-inflation-targeting countries, and were, therefore, biasing the results (showing when included that an improvement in the fiscal stance worsens inflation expectations).
[4]Period average inflation prior to adoption of inflation targeting above 40 percent.
[5]Period average inflation prior to adoption of inflation targeting above 100 percent.
[6]π refers to CPI inflation.

well for what may lie ahead for emerging market inflation targeters (see Box 4.2).

Second, in the absence of a counterfactual, it is difficult to resolve definitively whether inflation targeting is "causal" in generating the observed benefits. In many cases the adoption of inflation targeting coincided with the passage of significant reforms of countries' central banking laws in the early 1990s, which might be interpreted as the manifestation of a shift in preferences toward lower inflation. The fact that these banks *still* felt the need to install a new monetary framework, however, suggests that change of heart is not enough without a framework that allows the central bank to follow through on that intention.

Do "Preconditions" Need to Be Met Before the Adoption of Inflation Targeting?

As noted above, an oft-heard objection to inflation targeting is that it is costly in terms of institutional and technical requirements, making the framework unsuitable for some emerging market economies. The most detailed exposition of this point was made in Eichengreen and others (1999), who argued that technical capabilities and central bank autonomy were severely lacking in most emerging market economies (including several that subsequently adopted inflation targeting).[24] Such countries, the argument goes, would be better off sticking with a "conventional" policy framework, such as an exchange rate peg or money growth

[24]Others who stressed the conceptual relevance of "preconditions" include Agénor (2002); Stone and Zelmer (2000); Carare, Schaechter, and Stone (2002); Khan (2003); and the May 2001 *World Economic Outlook*. More neutral or benign views on the conceptual relevance of "preconditions" can instead be found in Truman (2003); Jonas and Mishkin (2005); Debelle (2001); and Amato and Gerlach (2002).

Box 4.2. Long-Term Inflation Expectations and Credibility

All of the countries that have adopted inflation targeting have had some experience with high inflation, and the move to an inflation targeting regime was seen as an important step to anchor inflation expectations durably once a track record had been established. Indeed, when an inflation targeting regime becomes credible, measures of long-term inflation expectations should become better anchored to the target, and the inflation premium embodied in long-term bond yields should become less sensitive to economic news about near-term inflation developments. So what have been the experiences thus far in inflation-targeting countries, and how do they compare with non-inflation-targeting countries? This box reviews some existing empirical evidence that is based on advanced economies and then extends some of this analysis to a group of emerging market economies.

Recent evidence reported by Levin, Natalucci, and Piger (2004) shows that long-term inflation expectations have become better anchored in inflation-targeting countries that have a well-defined point target for inflation and have established a track record achieving results. Using data on consensus inflation forecasts from Consensus Economics, Levin, Natalucci, and Piger show that long-term inflation expectations (6–10 years in the future) for a group of five inflation-targeting countries (Australia, Canada, New Zealand, Sweden, and the United Kingdom) have become delinked from actual inflation outcomes, while there is evidence that they still respond to actual outcomes in the United States and the euro area.

Similar findings were obtained by Gürkaynak, Sack, and Swanson (2005), who argue there is "excessive" volatility in the forward-yield curve in the United States because the Federal Reserve does not have a numerical objective for inflation to help tie down long-term inflation expectations. In particular, Gürkaynak, Sack, and Swanson show that long-term forward yields in the United States respond "excessively" to economic news, including surprises in the Federal Reserve's funds rate, which market participants interpret as signals about the Federal Reserve's long-term inflation objectives. To contrast their results with an inflation-targeting country, Gürkaynak, Sack, and Swanson show that such "excess" sensitivity in long-term inflation expectations does not exist in the United Kingdom after the change in their regime in May 1997, which specified a 2.5 percentage point target for inflation and assigned instrument independence to the Bank of England.[1] Indeed, following the changes in the United Kingdom's monetary framework in May 1997, there was a dramatic reduction in long-term inflation expectations (see the figure). The inflation premium on long-term bonds fell in line with the target within a few months and has remained within 1 percentage point of the target ever since. This is in sharp contrast to the period preceding May 1997, when long-term inflation expectations were systematically above both the target range for inflation and actual inflation outcomes.

The experience in the United Kingdom shows how a significant change in fundamentals (central bank instrument independence and a well-defined point target) can have a large and durable effect on anchoring inflation expectations. The experience of other advanced inflation-targeting countries, which had well-defined point targets and central bank independence at the time of announcing their inflation-targeting regimes, shows that long-term inflation expectations were anchored more slowly for the early adopters (Canada, New Zealand, and Sweden) than for the later adopters (Australia, Switzerland, and Norway).

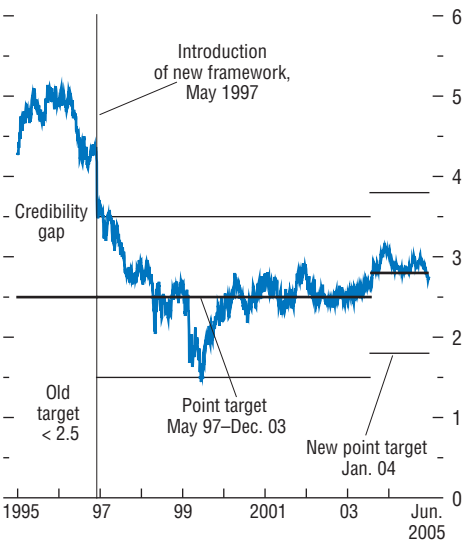
Note: The main authors of this box are Manuela Goretti and Douglas Laxton.

[1]The point target was revised in January 2004 and is now expressed in terms of the Harmonized Index of Consumer Prices (HICP), which has been set at 2.0 percent. The Bank of England reported at the time that this would be consistent with a target of 2.8 percent expressed in terms of the Retail Price Index (RPI), which is the index that is used for indexed bonds.

Box 4.2 *(concluded)*

United Kingdom: Retail Price Index Inflation Expectations 10 Years Ahead[1]

(Percent)



Source: Bank of England.

[1]The definition and magnitude of the target changed in January 2004. It is now set at 2.0 percent and is expressed in terms of the year-on-year percent change in the HICP (Harmonized Index of Consumer Price). This is consistent with an estimate of 2.8 percent for the RPI (Retail Price Index), which is the definition used for the indexed bonds.

There are two potential explanations for this. First, as experience with the regime grows and becomes better understood by the public and bond-market participants, it may take less time to establish a track record and for the inflation target to become a focal point for long-term inflation expectations. Second, it may take less time in cases where a country has already established a reasonable track record in delivering low inflation before it announces an inflation-targeting regime (for example, Switzerland).

What does the evidence say for less advanced countries and how do inflation-targeting countries compare with non-inflation-targeting countries? Since measures of long-term inflation expectations derived from bond markets typically do not exist, we follow Levin, Natalucci, and Piger and turn to data on long-term inflation forecasts (6–10 years ahead) provided by Consensus Economics, which covers 10 inflation-targeting and 9 non-inflation-targeting countries.[2] First, revisions in long-term inflation forecasts (6–10 years) are much smaller in inflation-targeting countries than in non-inflation-targeting countries and this is true if one looks at the sample of countries as a whole or breaks the sample on a regional basis (see the first table). Second, with the exception of Colombia, long-term inflation expectations have fallen within the announced bands for each country since the second quarter of 2002, and they have become more tightly anchored to the midpoints of the target bands or ranges since then.[3] Third, there is no evidence over the past two years that revisions in long-term inflation expectations in the group as a whole have responded to changes in either actual inflation or Levin, Natalucci, and Piger's three-year mov-

Standard Deviation of Revisions in Long-Term Inflation Forecasts

(Sample 2003:Q3–2005:Q2)

	Inflation-Targeting	Non-inflation-targeting
All emerging market	0.33	2.19
Eastern Europe	0.38	1.09
Asia	0.27	0.59
Latin America	0.34	4.88

Source: Consensus Economics.

[2]The inflation-targeting countries covered in the surveys by Consensus Economics are Brazil, Chile, Colombia, Czech Republic, Hungary, Korea, Mexico, Peru, Poland, and Thailand, while the non-inflation-targeting countries are Argentina, China, India, Indonesia, Malaysia, Russia, Turkey, Ukraine, and Venezuela.

[3]Inflation expectations data derived from indexed and conventional bonds suggest that long-term inflation expectations have become more firmly anchored to the target in Colombia than what is suggested by the survey data.

Pooled Regression Estimates of the Effects of Inflation on Revisions in Long-Term Inflation Forecasts
(Sample 2003:Q2–2005:Q2)

	Inflation-Targeting	Non-inflation-targeting
Year-on-year inflation	0.03 (t = 0.89)	0.25 (t = 3.48)
Trend inflation	0.04 (t = 0.55)	0.01 (t = 0.13)

Sources: Consensus Economics, and IMF, *International Financial Statistics*.
Note: Estimation methodology based on Levin, Natalucci, and Piger (2004). Estimates obtained from STATA with robust standard errors.

ing average measure of trend inflation (see the second table). By contrast, for the sample of nine non-inflation-targeting emerging market countries covered by Consensus Economics, the revisions in long-term inflation expectations are significantly and highly correlated with information about recent inflation developments. Indeed, unlike Levin, Natalucci, and Piger's findings for advanced non-inflation-targeting countries, which showed that revisions in long-term inflation expectations depend significantly on a trend measure of inflation, these results suggest that long-term inflation expectations in less-advanced non-inflation-targeting countries are far from being firmly anchored and depend strongly on revisions in actual headline inflation.[4] While the sample is too short to make claims about individual experiences of these 10 inflation-targeting countries, or to distinguish between point targeters and range targeters, it is interesting that these data for emerging market economies are not inconsistent with the evidence for advanced economies, which suggests that, over time, long-term inflation expectations may become better anchored in inflation-targeting countries than in non-inflation-targeting countries.

[4]The key results are robust when Argentina and Venezuela are removed from the sample of non-inflation-targeting countries. However, in this case revisions in long-term inflation expectations depend significantly on both measures of inflation. In addition, when trend inflation is dropped from the regression for inflation-targeting countries, it remains the case that the parameter estimate is insignificant on actual inflation. As indicated earlier, measures of inflation expectations for Colombia derived from yields on conventional and indexed bonds suggest that long-term inflation expectations have become anchored to the target, while significant differences exist from the estimates derived from the survey data. Eliminating Colombia from the sample of inflation-targeting countries reduces both the magnitude and the significance of the parameters on the inflation variables.

targeting. Such "preconditions" fall into four broad categories.

- *Institutional independence.* The central bank must have full legal autonomy and be free from fiscal and/or political pressure that would create conflicts with the inflation objective.
- *A well-developed technical infrastructure.* Inflation forecasting and modeling capabilities, and the data needed to implement them, must be available at the central bank.
- *Economic structure.* For effective inflation control, prices must be fully deregulated, the economy should not be overly sensitive to commodity prices and exchange rates, and dollarization should be minimal.
- *A healthy financial system.* To minimize potential conflicts with financial stabilization objectives and guarantee effective monetary policy transmission, the banking system should be sound, and capital markets well developed.

To assess the role of "preconditions" for the adoption of inflation targeting, a special survey was conducted through a questionnaire completed by 21 inflation-targeting central banks, and 10 non-inflation-targeting emerging market central banks.[25] The version of the survey given

[25]These included Botswana, Guatemala, India, Indonesia, Malaysia, Pakistan, Russia, Tanzania, Turkey, and Uruguay.

Table 4.7. Baseline Model Robustness Checks: Preconditions and Current Conditions

(1 = best current practice)

	Inflation Targeters				Non-inflation-targeters	
	Emerging markets		Industrial countries		Emerging markets	
	Pre-adoption	Current	Pre-adoption	Current	Pre-adoption of current regime	Current
Technical infrastructure	**0.29**	**0.97**	**0.74**	**0.98**	**0.51**	**0.62**
Data availability	0.63	0.92	0.84	0.94	0.65	0.70
Systematic forecast process	0.10	1.00	1.00	1.00	0.60	0.80
Models capable of conditional forecasts	0.13	1.00	0.38	1.00	0.28	0.35
Financial system health	**0.41**	**0.48**	**0.53**	**0.60**	**0.40**	**0.49**
Bank regulatory capital to risk-weighted assets	0.75	1.00	0.75	1.00	0.71	0.86
Stock market capitalization to GDP	0.16	0.21	0.28	0.44	0.16	0.19
Private bond market capitalization to GDP	0.10	0.07	0.40	0.31	0.29	0.20
Stock market turnover ratio	0.29	0.22	0.28	0.35	0.37	0.45
Currency mismatch	0.92	0.96	1.00	1.00	0.67	0.97
Maturity of bonds	0.23	0.43	0.46	0.52	0.18	0.29
Institutional independence	**0.59**	**0.72**	**0.56**	**0.78**	**0.49**	**0.64**
Fiscal obligation	0.77	1.00	0.75	1.00	0.50	0.70
Operational independence	0.81	0.96	0.63	1.00	0.70	1.00
Central bank legal mandate	0.50	0.62	0.16	0.44	0.40	0.55
Governor's job security	0.85	0.85	1.00	1.00	0.80	0.80
Fiscal balance in percent of GDP	0.48	0.47	0.45	0.78	0.38	0.42
Public debt in percent of GDP	0.47	0.47	0.53	0.54	0.35	0.46
Central bank independence	0.26	0.64	0.44	0.72	0.32	0.55
Economic structure	**0.36**	**0.46**	**0.47**	**0.55**	**0.55**	**0.44**
Exchange rate pass-through	0.23	0.44	0.31	0.50	0.33	0.42
Sensitivity to commodity prices	0.35	0.42	0.44	0.56	0.67	0.55
Extent of dollarization	0.69	0.75	1.00	1.00	0.63	0.60
Trade openness	0.18	0.21	0.13	0.16	0.56	0.19

Sources: Arnone and others (2005); IMF, *Global Financial Stability Report;* IMF, *International Financial Statistics;* national sources; OECD; Ramón-Ballester and Wezel (2004); World Bank, Financial Structure and Economic Development Database; and IMF staff calculations.

to inflation-targeting central banks focused particularly on how policy was formulated, implemented, and communicated—and how various aspects of central banking practice had changed both during and prior to the adoption of inflation targeting.[26] Survey responses were cross-checked with independent primary and secondary sources, and in many cases augmented with "hard" economic data (see Appendix 4.1).

Overall, the evidence indicates that no inflation targeter had all these "preconditions" in place prior to the adoption of inflation targeting, although—unsurprisingly—industrial economy inflation targeters were generally in better shape than emerging market inflation targeters at least in some dimension (Table 4.7).

- *Institutional independence.* Most of the central banks enjoyed at least de jure instrument independence at the time of inflation-targeting adoption.[27] However, survey responses—corroborated by consulting the relevant central bank laws—indicate that only one-fifth[28] of the

[26]The version for non-inflation-targeters was similar in all respects, but focused on change before and after the current monetary regime.

[27]Instrument independence, which allows the central bank full control over the setting of the policy instrument, is by far the more important criterion of central bank independence. Goal independence, or the ability of the central bank to set macroeconomic objectives unilaterally, is rare, even among industrial country central banks, where these goals are typically determined by the elected government or through consultation between the central bank and the government. See Debelle and Fischer (1994).

[28]This overall picture is borne out by broader measures of central bank independence, notably by indices prepared by Arnone and others (2005), based in turn on the methods of Grilli, Masciandaro, and Tabellini (1991).

emerging market inflation targeters contemporaneously satisfied other key indicators[29] of independence at adoption, and thus can be characterized as having adopted inflation targeting under a very high degree of legal autonomy.[30] Of course, it is possible that even legal provisions designed to shield the central bank from pressures to monetize might be overwhelmed by a dire fiscal imbalance. Data suggest that inflation targeters faced a wide variety of fiscal conditions at the time of inflation targeting adoption. Israel and the Philippines, for example, had high ratios of public debt to GDP and large fiscal deficits, while Chile was in good fiscal shape. The emerging market inflation targeters did, however, tend to have somewhat higher public debt levels than the industrial country inflation targeters.

- *Technical infrastructure.* Central bank survey responses indicate that the majority of industrial country and emerging market inflation targeters started with little or no forecasting capability and no forecasting model at all; and when a small model was available, most central banks report that it was not suitable to make forecasts conditional on different assumptions for the monetary policy instrument.[31] In addition, although industrial country inflation targeters often had some sort of systematic forecast process in place, most emerging market inflation targeters did not. Likewise, data availability at the time of adoption of inflation targeting was not ideal, with emerging market inflation targeters again at a disadvantage on data availability relative to industrial country inflation targeters.
- *Economic structure.* Results from the survey indicate that none of the inflation targeters enjoyed ideal economic conditions at the time of adoption. Countries were all sensitive to changes in exchange rates and commodity prices when they adopted inflation targeting, and although dollarization was not an issue for industrial inflation targeters, the evidence on dollarization from the survey and data collected in Ramón-Ballester and Wezel (2004) indicates different degrees of dollarization across emerging market inflation targeters—Peru ranking as the most dollarized inflation targeter.[32] Last but not least, the survey indicates that the consumer price index in a number of inflation-targeting countries included at the time of adoption (and in most case still includes) a significant share of administered prices.
- *Healthy financial and banking system.* At adoption, most inflation targeters scored relatively poorly in this area, looking at indicators such as the risk-weighted capital adequacy ratio, measures of financial market depth (ratio of stock market capitalization to GDP, ratio of private bond issuance to GDP, stock market turnover, and the maximum maturity of actively traded nominal bonds, either government or corporate), and the extent of banks' foreign currency open positions.

The fact that none of today's inflation targeters—either individually or on average—had strong "preconditions" suggests that the

[29]These include (1) freedom from any obligation of the central bank to purchase government debt, thus preventing monetization; (2) a high degree of job security for the central bank governor (specifically, a fixed term and provisions that allow him or her to be fired only with cause); (3) whether the central bank operates under an "inflation-focused" mandate in which inflation (price stability) is the sole stated objective; or, if other objectives are specified, the inflation goal takes precedence.

[30]It is also worth noting that legal autonomy was sometimes granted concurrently—or, in one case, after—the adoption of inflation targeting. Many of the central banks in our sample achieved greater independence in the early 1990s (see Jácome, 2001, for a survey of developments in Latin America). Korea and Hungary, on the other hand, became fully independent just as inflation targeting was being adopted, suggesting a recognition of the close connection between the two. The Central Bank of Thailand, which adopted inflation targeting in 2000, continues to operate under a charter from 1942 that says almost nothing on issues of monetary autonomy—although a new central bank law is reportedly under consideration by the Thai parliament.

[31]The exceptions are Canada, Sweden, and the United Kingdom among industrial countries, and Poland and South Africa among emerging markets.

[32]These data are broadly in line with those by Reinhart, Rogoff, and Savastano (2003).

absence of these "preconditions" is not by itself an impediment to the adoption and success of inflation targeting (Figure 4.3). This is confirmed by more formal econometric tests. Using the "preconditions" listed in Table 4.7 as additional control variables in the regressions of the previous section, we find that no "precondition" enters significantly in the equations explaining the improvement in macroeconomic performance after inflation targeting adoption.

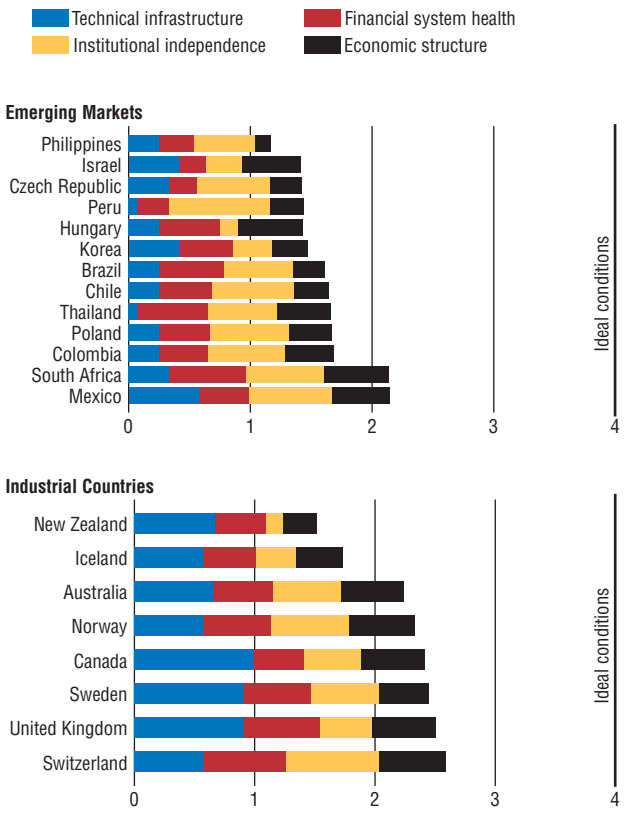
Two other messages emerge from Table 4.7.

- First, in terms of institutional, technical, and economic characteristics, the gap between inflation targeters (at the time of adoption) and potential emerging market inflation-targeting adopters (today) is relatively small, suggesting that these factors should not stand in the way of the successful adoption of inflation targeting in these countries. It is, however, not possible to infer from this analysis whether this is equally true for other countries that may have worse initial conditions than those documented here.
- Second, available evidence and survey responses indicate that the adoption of inflation targeting has been associated with rapid improvements in institutional and technical structures including, for example, developments in data availability and forecasting. Thus, even if meeting institutional and technical standards may not be critical before the adoption of inflation targeting, a proactive approach to making improvements by the central bank and other parts of government after the adoption of inflation targeting may be essential to ensure the conditions needed for the success of inflation targeting after adoption.

Figure 4.3. Initial Conditions Prior to Adopting Inflation Targeting

(0 = poor; 1 = ideal; for each of the four categories of initial conditions)

Most of the inflation targeters had poor initial conditions prior to the adoption of inflation targeting.



Source: IMF staff calculations.

Conclusions

Inflation targeting is a relatively new monetary policy framework for emerging market countries. This chapter has made a first effort at assessing the impact of inflation targeting in emerging markets, and while the short time that has elapsed since the adoption of these frameworks certainly means that any assessment must

be preliminary, the evidence from the initial years of operation is encouraging. Inflation targeting appears to have been associated with lower inflation, lower inflation expectations, and lower inflation volatility relative to countries that have not adopted it. There have been no visible adverse effects on output, and performance along other dimensions—such as the volatility of interest rates, exchange rates, and international reserves—has also been favorable. All this may explain the appeal of this strategy for emerging markets, where poor past inflation records make it more difficult to build credibility and where keeping to a minimum the output costs of reducing inflation is imperative for social and political reasons. It also may explain why no country has yet abandoned inflation targeting.

Further, while there needs to be a clear agreement between the central bank and the government on the importance of price stability as the overriding objective of monetary policy, it does not appear to be necessary for emerging market countries to meet a stringent set of institutional, technical, and economic "preconditions" for the successful adoption of inflation targeting. Instead, the feasibility and success of inflation targeting appear to depend more on the authorities' commitment and ability to plan and drive institutional change after the introduction of inflation targeting. Consequently, policy advice to countries that are interested in adopting inflation targeting could usefully focus on the institutional and technical goals that central banks should strive for during and after the adoption of inflation targeting to maximize its potential benefits.

Appendix 4.1. Details on Econometric Specifications and on Data from the Survey on Preconditions and Current Conditions

The main authors of this appendix are Nicoletta Batini and Kenneth Kuttner, with support from Manuela Goretti.

This appendix provides details on the baseline and alternative econometric specifications discussed in the main text measuring the relative macroeconomic performance of inflation targeters versus non-inflation-targeters. The appendix also gives details on data used in the empirical analysis of the main text, including data from the survey.

Econometric Specifications

In line with Ball and Sheridan (2003), macroeconomic performance is considered to depend partly on its own past history, and partly on some underlying mean value of the variable in question. In the case of the inflation rate for inflation targeters, this mean should, of course, correspond to the inflation target; for other countries, this would simply be the "normal" level of inflation to which observed inflation reverts. Mathematically, this process can be expressed as follows:

$$X_{i,t} = \phi[\alpha^T d_{i,t} + \alpha^N(1 - d_{i,t})] + (1 - \phi) X_{i,t-1}, \quad (1)$$

where $X_{i,t}$ is the value of a macroeconomic performance indicator X for country i at time t, α^T is the mean to which X reverts for inflation targeters, α^N is the mean to which X reverts for *non*-inflation-targeters, and $d_{i,t}$ is a variable equal to 1 for inflation targeters and 0 for non-inflation-targeters. The parameter ϕ represents the speed with which X reverts to its group-specific α: a value of ϕ equal to 1 means X reverts completely after one period, while a value of ϕ equal to 0 would imply that X depends only on its past history, with no tendency to revert to any particular value.

The regression used by Ball and Sheridan (2003), and in the results reported in Tables 4.3–4.6, is simply a version of equation (1), rewritten in terms of the change in X, appending an error term e, and assuming there are two periods: "pre" and "post":

$$X_{i,\text{post}} - X_{i,\text{pre}} = \phi\alpha^T d_i + \phi\alpha^N(1 - d_i) - \phi X_{i,\text{pre}} + e_i, \quad (2)$$

or, letting

$$a_0 = \phi\alpha^N,\ a_1 = \phi(\alpha^T - \alpha^N), \text{ and } b = -\phi,$$
$$X_{i,\text{post}} - X_{i,\text{pre}} = a_0 + a_1 d_i + b X_{i,\text{pre}} + e_i. \quad (3)$$

As discussed in the main text, the "pre" period for inflation targeters is defined as 1985 until the quarter prior to the adoption of inflation targeting, while the "post" period runs from inflation targeting adoption through 2004. The break date for non-inflation-targeters is taken to be 1999:Q4, which corresponds to the mean adoption date for emerging market inflation targeters.

In this framework, the relevant parameter for gauging inflation targeting's economic impact is a_1, the coefficient on the inflation targeting dummy variable, and this is what is reported in Tables 4.3–4.6 (a_0 instead captures whether there has been a generalized improvement in macroeconomic performance across countries independently of differences in monetary regimes). Take, for example, the row on CPI inflation in Table 4.3, showing estimates of Equation (3) when X = CPI inflation. There, $a_1 = -4.8$, implying that in countries that have adopted inflation targeting, the reduction in CPI inflation has been on average 4.8 percentage points greater than in countries that have not adopted inflation targeting. Note that if ϕ were known to be zero (i.e., complete mean reversion), the estimated a_1 would be nothing more than the difference in average $X_{post} - X_{pre}$ for inflation targeters versus non-inflation-targeters; the only advantage of the regression method is to be able to control for the initial level of X_{pre}. Furthermore, by focusing on relatively long periods of time, the analysis is largely a comparison of steady states, saying nothing about what happens during the transition to inflation targeting (or any other) policy framework; to do so would obviously require a very careful control of cyclical conditions to distinguish transition effects from the normal trajectory of the business cycle.

The baseline results obtained from estimating Equation (3) on the full sample of 35 emerging market economies of the JPMorgan EMBI Index plus the Czech Republic and Israel (which are inflation targeters, but not part of the index) plus seven countries that are most often classified as emerging markets appear in Table 4.3. Included in the set of X variables are the same gauges of core macroeconomic performance that appeared in the descriptive tables: CPI inflation, inflation volatility, and the volatility of real GDP growth, and the output gap.

Robustness Checks

One issue that arises in the context of the baseline analysis described above is that the partitioning of the sample into "pre" and "post" periods is somewhat arbitrary—both in determining the starting date for the calculation of the "pre" period averages, and in the assigning of 1999:Q4 as the hypothetical break date for the non-inflation-targeters. In an effort to assess any distortion created by the arbitrariness of the partitioning, the regression Equation (3) was reestimated using two alternative sample partitioning schemes. The first is to start the "pre" period in 1990 rather than 1985, thus largely removing any effects of the Latin American debt crisis from the sample. The second is to change the break date for non-inflation-targeters from 1999:Q4 to the date of the most recent de facto change in monetary policy framework (based on IMF staff calculations and the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*). Under these schemes and the baseline partitioning, however, the "pre" and "post" samples vary across countries; therefore, to eliminate any possibility that simple time effects could account for the results, a third alternative partitioning was tried, using a standardized 1994–96 "pre" period, and a standardized 2002–04 "post" period.

A number of additional checks were also performed to ensure that the results are robust to sample selection and to the inclusion of other potentially important factors affecting macroeconomic outcomes. First, to guard against the possibility that a handful of extreme inflation observations might be exerting undue influence on the regression, a control was included for countries whose inflation rate exceeded 40 percent in the "pre" period; a threshold of 100 percent was also tried. Second, Equation (3) was reestimated over a smaller sample, excluding countries defined as "low-income" by the World Bank and also over a sample that excluded the

seven countries in our control group not listed in the JPMorgan EMBI. Third, on the full sample a control was included for countries that are severely indebted externally, in line with the World Bank classification of countries' external indebtedness. Fourth, on the full sample a control for countries with an exchange rate peg during the "post" period was used. And finally, again on the full sample, controls were included for the ratio of public debt to GDP in the "pre" period, and the change between "post" and "pre" periods to rule out the possibility that the observed gains in macroeconomic performance are ascribable not to the introduction of inflation targeting but, rather, to improvements in fiscal discipline. Results for these two sets of robustness checks are reported in Tables 4.5 and 4.6.

The significance, sign, and magnitude of additional controls are reported after the slash next to each estimate of the a_1 coefficient (when nothing is reported it means that the control was not significant). Take, for example, the fifth column of Table 4.6, where the significance of a precondition on the debt-to-GDP ratio is examined. Results indicate that the control is only significant for the volatility of 6–10-year inflation expectations, suggesting that having a "bad" debt-to-GDP ratio before the adoption of inflation targeting would entail a 0.018 percentage point smaller reduction in the volatility of inflation expectations usually associated with inflation targeting relative to non-inflation-targeting.

Variable Descriptions and Data Sources

Unless otherwise noted, all data run from 1985:Q1 through 2004:Q4.

- *Inflation rate:* calculated as the annual growth rate of the consumer price index. Quarterly data were obtained from the IMF, *International Financial Statistics,* and from the OECD.
- *Output growth rate:* annual growth rate of real GDP in local currency. Quarterly data were obtained from the IMF, *International Financial Statistics* and *World Economic Outlook*; and from the OECD.
- *Output gap:* calculated as the residual from a regression of the logarithm of real GDP on a constant term, a linear trend, and a quadratic trend.
- *Nominal short-term interest rate:* Three-month money market interest rate or deposit rate. Quarterly data were obtained from the IMF, *International Financial Statistics* and *World Economic Outlook*; and from the OECD.
- *Foreign exchange rate:* local currency per U.S. dollar. Quarterly data were obtained from the IMF, *International Financial Statistics.*
- *International reserves minus gold:* in U.S. dollars. Quarterly data were obtained from the IMF, *International Financial Statistics.*
- *Broad money:* in local currency, broadest definition available. Quarterly data were obtained from the IMF, *International Financial Statistics* and *World Economic Outlook.*
- *Inflation expectations:* survey data obtained from Consensus Economics, Inc. Availability varies by country.

Indicators of Preconditions and Current Conditions

Central Bank Infrastructure

These three survey-based indicators are intended to measure central banks' data resources, modeling and forecasting capabilities. For the regression analysis, an index of central bank infrastructure was created as the simple average of these three measures.

- *Data availability.* Survey questions No. 78 and No. 84 asked whether all essential macroeconomic data were available at the time of inflation targeting adoption. Answers were coded as 1 if all data were available, reliable, and of good quality, and as 0 if any data were missing. A value of 0.25 was assigned if all data were available but most were either highly unreliable because, for example, they were typically subject to large revisions or only available at low frequencies; similarly, if data were all available, but one or few were not reliable or of good quality, a value of 0.75 was assigned.

- *Systematic forecast process.* Survey questions No. 47 through No. 52 asked about the forecasting capabilities in place at the time of adoption. From the responses to these questions, a variable was created and set to 1 if a periodic, systematic forecast process was already in place; the variable was set to 0 if no such process was in place.
- *Models capable of conditional forecasts.* From the same set of questions as for the previous indicator (No. 47 through No. 52), a variable was created and set to 1 if forecasting models capable of generating conditional forecasts were available; the variable was set to 0 if no such models were available.

Health of the Financial System

The following six indicators measure the degree of development and degree of soundness of the banking and financial system. Two are taken from the survey responses, and four are based on nonsurvey data sources. For the regression analysis, an index of banking and financial conditions was created as the simple average of these six measures. In most cases, the health of the United Kingdom's financial system was taken as the benchmark in the construction of components of the index itself, on the grounds that the United Kingdom is widely considered to be financially developed and sound from a financial regulatory point of view.

- *Percentage of banks' risk-weighted assets.* Using data compiled and reported in a previous IMF study,[33] a variable was created and set to 1 for countries in which the banking system, in aggregate, had regulatory capital in excess of 10 percent of risk-weighted assets; the variable was set to 0 for countries not meeting this standard.
- *Stock market capitalization.* Using data from the World Bank, the ratio of stock market capitalization to GDP was calculated for each country in the sample, and scaled to the ratio for the United Kingdom so that a value of 1 indicates a degree of stock market capitalization comparable to that of the United Kingdom.[34]
- *Depth of private bond market.* Using the same World Bank data, the ratio of privately issued bonds outstanding to GDP was calculated for each country in the sample, and scaled to the ratio for the United Kingdom, so that a value of 1 indicates a degree of private bond market depth comparable to that of the United Kingdom.
- *Stock market turnover.* Using the same World Bank data, the ratio of stock market turnover to GDP was calculated for each country in the sample, and scaled to the ratio for the United Kingdom, so that a value of 1 indicates a transaction volume comparable to that of the United Kingdom.
- *Lack of currency mismatch.* Survey question No. 106 asked central banks to characterize the degree of currency mismatch faced by domestically owned banks. From the responses to this question, a variable equal to 1 was created if the degree of mismatch was described as "none" or "low." The variable was set equal to 0.5 if "some" or "moderate" mismatch was reported, and set to 0 of the degree of reported mismatch was "high."
- *Maturity of bonds.* Survey question No. 114 asked central banks to report the maximum maturity of actively traded bonds. The response to this question was converted to years and divided by 30, so that countries with actively traded 30-year bonds were assigned a value of 1 for this variable.

Institutional Independence

The following six indicators are intended to gauge the degree to which the central bank is able to pursue its monetary policy objectives free from conflict with other, competing objectives. Three are based on the responses to the survey administered to the central banks in our sample

[33]IMF (2005).

[34]The underlying data were obtained from the World Bank Financial Structure and Economic Database; available via the Internet: http://www.worldbank.org/research/projects/finstructure/database.htm.

(checked for consistency against other central bank sources), and three are derived from independent data sources. For the regression analysis, an index of institutional autonomy was created as the simple average of these six measures.

- *Absence of fiscal obligation.* Survey questions No. 3 and No. 7 asked central banks whether there was an obligation, either implicit or explicit, to finance government budget deficits. From the responses, a variable was created and set equal to 1 if no such obligation existed, and 0 otherwise.
- *Operational independence.* Survey questions No. 4 and No. 7 asked whether the central bank had full "instrument independence," giving it sole responsibility for setting the monetary policy instrument. A variable was created and set to 1 for those countries reporting full instrument independence, and 0 otherwise.
- *Inflation-focused mandate.* Survey questions No. 14 and No. 18 asked central banks to describe their legal mandate. From these responses, a variable was created and set to 1 if inflation is the only formal objective; to 0.5 if other objectives are specified, but inflation takes precedence; and to 0 if other objectives are specified on an equal footing with inflation.
- *Favorable fiscal balance.* Using primary fiscal balance data from the IMF and the OECD, a variable was created indicating a lack of pressure to finance fiscal deficits. For each country in the sample, the ratio of the primary fiscal balance to GDP was calculated, and averaged over the two years prior to the adoption of inflation targeting. (For non-inflation-targeters, the most recent two years were used.) This ratio was converted to a score ranging from 0 to 1 using a logistic transformation, scaled in such a way that a budget that was in balance or in surplus was assigned a value of 1, and a budget deficit in excess of 3 percent of GDP was assigned a value of 0.[35]
- *Low public debt.* Using data from the OECD and the IMF's Fiscal Affairs Department/World Economic Outlook public debt database, the ratio of public debt to GDP was calculated for the year prior to the adoption of inflation targeting. (For non-inflation-targeters, the most recent available observation was used.) From this, a variable was created equal to the greater of the following two measures: 1 or 1 minus the ratio of debt to GDP. Thus, a country with no public debt would receive a value of 1, and one with a ratio of debt to GDP equal to or greater than 100 would receive a value of 0.
- *Central bank independence.* This variable is the "overall" measure (the average of political and economic) of central bank independence reported by Arnone and others (2005). These data are available for two periods, 1991–92 and 2003, and are scaled so that a value of 1 indicates complete independence while values closer to 0 indicate a diminishing degree of independence.

Economic Structure

The final set of four indicators, which draw on the survey results and independent data sources, are intended to capture a variety of economic conditions that are often thought to affect the likelihood of success of inflation targeting. For the regression analysis, an index of economic conditions was created as the simple average of these four measures.

- *Low exchange rate pass-through.* Survey question No. 96 asked central banks to characterize the degree of exchange rate pass-through. In constructing this variable, the responses were coded as follows: 1 for "low or no pass-through," 0.5 for "moderate pass-through," and 0 for "high pass-through."
- *Low sensitivity to commodity prices.* Survey question No. 97 asked central banks to characterize the degree of sensitivity of inflation to

[35]The transformation used is $\exp[2 \times (\text{balance} + 1.5)]/\{1 + \exp[2 \times (\text{balance} + 1.5)]\}$, where "balance" is the fiscal balance, expressed as a percentage of GDP.

commodity price fluctuations. In constructing this variable, the responses were coded as follows: 1 for "not sensitive," 0.5 for "sensitive," and 0 for "very sensitive."

Extent of dollarization. Survey question No. 98 asked central banks to characterize the degree of dollarization in their economies. Using these responses, and data from Ramón-Ballester and Wezel (2004), a variable was constructed whose value was set to 1 for countries with little or no dollarization, to 0.5 for countries with some dollarization, and to 0 for those with a high degree of dollarization.

Extent of trade openness. Using data from the IMF (*International Financial Statistics* and *World Economic Outlook)* and the OECD, the ratio of exports plus imports to GDP was calculated. This ratio was then scaled to that of Singapore (the economy with the largest trade share relative to GDP) and subtracted from 1, resulting in an index that would equal 1 in the hypothetical case of a completely autarkic economy, and equal 0 for an economy with a degree of trade openness comparable to that of Singapore. Inflation targeters' preconditions are calculated using an average of the trade-to-GDP ratio over the two years prior to inflation targeting adoption; for non-inflation-targeters, the score is based on the most recent (2004) data.

References

Agénor, Pierre-Richard, 2002, "Monetary Policy Under Flexible Exchange Rates: An Introduction to Inflation Targeting," in *Inflation Targeting: Design, Performance, Challenges*, ed. by Norman Loayza and Raimundo Soto (Santiago: Central Bank of Chile).

Amato, Jeffrey D., and Stefan Gerlach, 2002, "Inflation Targeting in Emerging Market and Transition Economies: Lessons After a Decade," *European Economic Review*, Vol. 46 (May), pp. 781–90.

Arnone, Marco, and others, 2005, "New Measures of Central Bank Independence," IMF Working Paper (Washington: International Monetary Fund, forthcoming).

Ball, Laurence, and Niamh Sheridan, 2003, "Does Inflation Targeting Matter?" IMF Working Paper 03/129 (Washington: International Monetary Fund). Also forthcoming in *Inflation Targeting: Theory and Practice*, ed. by Ben S. Bernanke and Michael Woodford (Chicago: University of Chicago Press).

Baltensperger, Ernst, Andreas M. Fischer, and Thomas J. Jordan, 2002, "Abstaining from Inflation Targets: Understanding the Importance of Strong Goal Independence" (unpublished; Berne: Swiss National Bank, October).

Batini, Nicoletta, 2004, "Achieving and Maintaining Price Stability in Nigeria," IMF Working Paper 04/97 (Washington: International Monetary Fund).

———, and Edward Nelson, 2001, "Optimal Horizons for Inflation Targeting," *Journal of Economic Dynamics and Control*, Vol. 25 (June), pp. 891–910.

———, 2005, "The U.K.'s Rocky Road to Stability," Federal Reserve Bank of St. Louis Working Paper No. 2005–020A (St. Louis, Missouri: Federal Reserve Bank of St. Louis).

Batini, Nicoletta, and Anthony Yates, 2003, "Hybrid Inflation and Price-Level Targeting," *Journal of Money, Credit and Banking*, Vol. 35 (June), pp. 283–300.

Bernanke, Ben S., 2003, "A Perspective on Inflation Targeting," remarks at the Annual Washington Policy Conference of the National Association of Business Economists, March 25.

———, and others, 1999, *Inflation Targeting: Lessons From the International Experience* (Princeton, New Jersey: Princeton University Press).

Bernanke, Ben S., and Michael Woodford, 2004, eds., *The Inflation-Targeting Debate*, NBER Studies in Business Cycles, Vol. 32 (Chicago: University of Chicago Press).

Blanchard, Olivier, 2003, "Comment on *Inflation Targeting in Transition Economies: Experience and Prospects*, by Jiri Jonas and Frederic Mishkin," paper prepared for the NBER Conference on Inflation Targeting, Bal Harbour, Florida, January 23–25.

Brook, Anne-Marie, Özer Karagedikli, and Dean Scrimgeour, 2002, "An Optimal Inflation Target for New Zealand: Lessons from the Literature," *Reserve Bank of New Zealand Bulletin*, Vol. 65, No. 3.

Burdekin, Richard C.K., and Pierre L. Siklos, 2004, "Fears of Deflation and Policy Responses Then and Now," in *Deflation: Current and Historical Perspectives*, ed. by Richard C.K. Burdekin and Pierre L. Siklos (Cambridge: Cambridge University Press).

Carare, Alina, Andrea Schaechter, and Mark Stone, 2002, "Establishing Initial Conditions in Support of Inflation Targeting," IMF Working Paper 02/102 (Washington: International Monetary Fund).

Celasun, Oya, R. Gaston Gelos, and Alessandro Prati, 2004, "Obstacles to Disinflation: What Is the Role of Fiscal Expectations?" *Economic Policy: A European Forum* (October), pp. 441–81.

Debelle, Guy, 2001, "The Case for Inflation Targeting in East Asian Countries," in *Future Directions for Monetary Policies in East Asia*, ed. by David Gruen and John Simon (Sydney: Reserve Bank of Australia).

———, and Stanley Fischer, 1994, " How Independent Should a Central Bank Be?" in *Goals, Guidelines, and Constraints Facing Monetary Policymakers,* ed. by Jeffrey C. Fuhrer (Boston: Federal Reserve Bank of Boston).

Eichengreen, Barry, and others, 1999, *Transition Strategies and Nominal Anchors on the Road to Greater Exchange-Rate Flexibility*," Essays in International Finance, No. 213 (Princeton, New Jersey: International Finance Section, Department of Economics, Princeton University).

Eichengreen, Barry, Andrew K. Rose, and Charles Wyplosz, 1994, "Speculative Attacks on Pegged Exchange Rates: An Empirical Exploration with Special Reference to the European Monetary System," in *The New Transatlantic Economy*, ed. by Matthew Canzoneri, Paul Masson, and Vittorio Grilli (Cambridge: Cambridge University Press).

———, 1995, "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks," *Economic Policy*, Vol. 10 (October), pp. 249–312.

European Central Bank, 1999, *European Central Bank Monthly Bulletin* (January) (Frankfurt).

———, 2003, "Overview of the Background Studies for the Reflections on the ECB's Monetary Policy Strategy" (Frankfurt).

Fischer, Stanley, 2001, "Exchange Rate Regimes: Is the Bipolar View Correct?" in *Finance and Development,* Vol. 38 (June).

Flood, Robert, and Nancy Marion, 1999, "Perspectives on the Recent Currency Crisis Literature," *International Journal of Finance and Economics,* Vol. 4 (January), pp. 1–26.

Friedman, Benjamin, 2002, "The Use and Meaning of Words in Central Banking: Inflation Targeting, Credibility, and Transparency," NBER Working Paper No. 8972 (Cambridge, Massachusetts: National Bureau of Economic Research).

Genberg, Hans, 2001, "Asset Prices, Monetary Policy, and Macroeconomic Stability," *De Economist (Netherlands),* Vol. 149 (December), pp. 433–53.

Girton, Lance, and Don Roper, 1977, "A Monetary Model of Exchange Market Pressure Applied to Postwar Canadian Experience," *American Economic Review*, Vol. 67 (September), pp. 537–48.

Goodhart, Charles, 1989, "Conduct of Monetary Policy," *Economic Journal,* Vol. 99 (June), pp. 293–346.

Gramlich, Edward M., 2003, "Maintaining Price Stability," remarks by Governor Edward M. Gramlich at the Economic Club of Toronto, Toronto, October 1.

Grilli, Victorio, Donato Masciandaro, and Guido Tabellini, 1991, "Political and Monetary Institutions and Public Financial Policies in the Industrial Countries," *Economic Policy*, Vol. 6 (October), pp. 341–92.

Gürkaynak, Refet, Brian Sack, and Eric Swanson, 2005, "The Sensitivity of Long-Term Interest Rates to Economic News: Evidence and Implications for Macroeconomic Models," *American Economic Review*, Vol. 95 (March), pp. 425–36.

Heise, Michael, 2003, "The Seductive Charm of Inflation Targets," *Financial Times* (July 1).

Hume, David, 1752, "Of Money," reprinted in *Essays: Moral, Political and Literary*, 1758, p. 281.

Hyvonen, Markus, 2004, "Inflation Convergence Across Countries," Research Discussion Paper No. 2004–04 (June) (Sydney, Australia: Economic Research Department, Reserve Bank of Australia).

International Monetary Fund, 2005, "Table 22: Bank Regulatory Capital to Risk-Weighted Assets," *Global Financial Stability Report* (Washington, April).

Issing, Otmar, 2000, "Europe's Challenges After the Establishment of Monetary Union: A Central Banker's View," speech at CESifo Conference on the Issues of Monetary Integration in Europe, Munich, December 1–2.

Jácome, H. Luis Ignacio, 2001, "Legal Central Bank Independence and Inflation in Latin America During the 1990s," IMF Working Paper 01/212 (Washington: International Monetary Fund).

Jonas, Jiri, and Frederick S. Mishkin, 2005, "Inflation Targeting in Transition Countries: Experience and Prospects," in *The Inflation-Targeting Debate*, ed. by Ben S. Bernanke and Michael Woodford, Studies in Business Cycles, No. 32, Part III (Chicago: University of Chicago Press).

Khan, Mohsin, 2003, "Current Issues in the Design and Conduct of Monetary Policy," IMF Working Paper 03/56 (Washington: International Monetary Fund).

King, Mervyn, 2005, "Monetary Policy: Practice Ahead of Theory," Mais Lecture 2005, Cass Business School, City University, London, May 17.

Kohn, Donald, 2003, "Inflation Targeting: Prospects and Problems," panel discussion at the Federal Reserve Bank of St. Louis, St. Louis, Missouri, October 17.

Kumhof, Michael, 2002, "A Critical View of Inflation Targeting: Crises, Limited Sustainability, and Aggregate Shocks," in *Inflation Targeting: Design, Performance, Challenges,* ed. by Norman Loayza and Raimundo Soto (Santiago: Central Bank of Chile).

Leiderman, Leonardo, and Lars E.O. Svensson, eds., 1995, *Inflation Targets* (London: Centre for Economic Policy Research).

Levin, Andrew, Fabio Natalucci, and Jeremy Piger, 2004, "The Macroeconomic Effects of Inflation Targeting," *Federal Reserve Bank of St. Louis Review,* Vol. 86, No. 4, pp. 51–80.

Meyer, Laurence H., 2002, "Inflation Targets and Inflation Targeting," *North American Journal of Economics and Finance,* Vol. 13 (August), pp. 147–62.

Mishkin, Frederick S., 1999, "International Experiences With Different Monetary Policy Regimes," *Journal of Monetary Economics,* Vol. 43 (June), pp. 579–606.

———, and Klaus Schmidt-Hebbel, 2001, "One Decade of Inflation Targeting in the World: What Do We Know and What Do We Need to Know?" Central Bank of Chile Working Papers No. 101 (July).

Obstfeld, Maurice, and Kenneth Rogoff, 1995, "The Mirage of Fixed Exchange Rates," *Journal of Economic Perspectives,* Vol. 9 (Autumn), pp. 73–96.

Pianalto, Sandra, 2005, "The Power of Price Stability" (Cleveland: Federal Reserve Bank of Cleveland, Research Department, May).

Ramón-Ballester, Francisco, and Torsten Wezel, 2004, "International Financial Linkages of Latin American Banks: The Effects of Political Risk and Deposit Dollarization," paper presented at the preparatory workshop for the Second High Level Seminar of the Eurosystem and Latin American Central Banks, Lisbon, October.

Reinhart, Carmen, Kenneth Rogoff, and Miguel Savastano, 2003, "Addicted to Dollars," NBER Working Paper No. 10015 (Cambridge, Massachusetts: National Bureau of Economic Research).

Rich, George, 2000, "Monetary Policy Without Central Bank Money: A Swiss Perspective," *International Finance,* Vol. 3 (November), pp. 439–69.

———, 2001, "Inflation and Money Stock Targets: Is There Really a Difference?" revised version of paper presented at the International Conference on the Conduct of Monetary Policy, Taipei, Taiwan, June 12–13, 1998.

Rivlin, Alice, 2002, "Comment on *U.S. Monetary Policy in the 1990s,*" in *American Economic Policy in the 1990s,* ed. by N. Gregory Mankiw, Jeffrey Frankel, and Peter R. Orzag (Cambridge, Massachusetts: MIT Press).

Roger, Scott, and Mark Stone, 2005, "On Target: The International Experience with Achieving Inflation Targets," IMF Working Paper 05/163 (Washington: International Monetary Fund).

Sachs, Jeffrey, Aaron Tornell, and Andrés Velasco, 1996, "The Mexican Peso Crisis: Sudden Death or Death Foretold?" *Journal of International Economics,* Vol. 41 (November), pp. 265–83.

Solans, Eugenio Domingo, 2000, "Monetary Policy Under Inflation Targeting," speech at the Fourth Annual Conference of the Banco Central de Chile, Santiago, December 1.

Stone, Mark R., and Mark Zelmer, 2000, *Adopting Inflation Targeting: Practical Issues for Emerging Market Countries,* IMF Occasional Paper No. 202 (Washington: International Monetary Fund).

Svensson, Lars E.O., 1998, "Inflation Targeting in an Open Economy: Strict or Flexible Inflation Targeting," public lecture held at Victoria University of Wellington, November 1997, *Victoria Economic Commentaries,* Vol. 15, No. 1 (Wellington, New Zealand: Victoria University).

Truman, Edwin M., 2003, *Inflation Targeting in the World Economy* (Washington: Institute for International Economics).