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## Inflation Targeting Regimes

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## **IMF Working Paper**

Monetary and Exchange Affairs Department

### **Inflation Targeting Regimes**

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#### **Abstract**

<p>The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.</p>
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This paper classifies countries that define their monetary policy framework by an inflation target into full-fledged inflation targeters, eclectic inflation targeters and inflation targeting lite regimes. This classification is based on indicators of the clarity and credibility of the commitment to the inflation target. The three regimes can be viewed as corresponding to different welfare maximizing combinations of policy objectives, each conditional on a country's "endowed" level of credibility. The credibility of the regimes is related empirically to structural differences. Policy implications are drawn, especially for emerging market countries aiming at full-fledged inflation targeting.

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## I. INTRODUCTION

An inflation target is being used by an increasing number of countries to define their monetary framework. They choose not to adopt a fixed exchange rate to limit their vulnerability to an exchange rate attack and maintain an independent monetary policy. At the same time, a monetary target is not practical owing to instability in money demand. Some 42 medium and large country central banks have some sort of a floating exchange rate arrangement, leaving their degree of commitment to an inflation target as the defining monetary objective.

This paper classifies these countries into three separate inflation targeting regimes to gain insights into the appropriate design of monetary policy conditional on a country's circumstances. The regimes are classified by the clarity and credibility of the central bank's commitment to the inflation target. Clarity is gauged by the public announcement of the inflation target and by the institutional arrangements in support of accountability to the target. Credibility is proxied by the actual inflation outturn and by market ratings of long-term local currency government debt.

Countries in the first regime practice *full-fledged inflation targeting* (FFIT), which is the best-known form of inflation targeting. FFIT countries have a medium to high level of credibility, clearly commit to their inflation target, and institutionalize this commitment in the form of a transparent monetary framework that fosters accountability of the central bank to the target. For these countries, an FFIT monetary regime seems to ameliorate the central bank time inconsistency problem that can result in higher inflation for a given level of output. New Zealand was the first country to adopt FFIT, and by 2001 some seven industrial and eleven emerging market countries were practicing this regime (Figure 1).<sup>2</sup>

*Eclectic inflation targeting* (EIT) countries have so much credibility that they can maintain low and stable inflation without full transparency and accountability with respect to an inflation target. Their record of low and stable inflation and high degree of financial stability affords them the flexibility to pursue the objective of output stabilization, as well as price stability. Five developed country central banks are classified here as practicing EIT, including the European Central Bank and the United States.

*Inflation targeting lite* (ITL) countries announce a broad inflation objective but owing to relatively low credibility are not able to maintain inflation as the foremost policy objective.<sup>3</sup> Their relatively low credibility reflects their vulnerability to large economic shocks and

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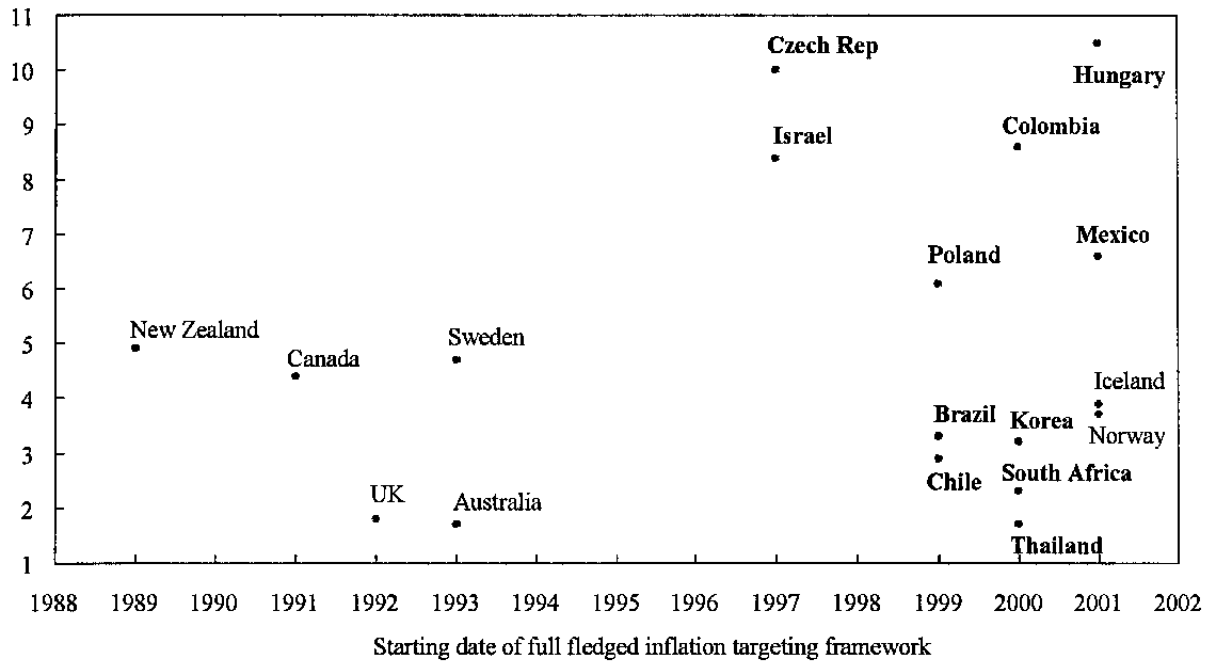
<sup>2</sup> The starting date for the adoption of inflation targeting is the date at which a country is deemed to have had in place most of the elements of a full-fledged inflation targeting framework (Schaechter and others, 2000).

<sup>3</sup> The term "inflation targeting lite" arose during a conversation with Mark Swinburne.

financial instability and a weak institutional framework. ITL can be viewed as a transitional regime during which the authorities implement the structural reforms needed for the credible adoption of a single nominal anchor. The number of ITL countries is nineteen and all are emerging market countries.

Figure 1. Adoption of FFIT Framework:  
Starting Date and Annual Inflation Rate 1/

Monthly CPI inflation (year over year) .



1/ Emerging market countries are in bold.

Source: Updated Schaechter and others (2000).

The inflation targeting regimes can be viewed as corresponding to different welfare maximizing combinations of policy objectives, each conditional on a country's "endowed" level of credibility. The ultimate purpose of monetary policy is to maximize social welfare by attaining high and stable growth in the long run. Monetary policy can support long run growth through a combination of inflation in the low single digits, financial stability, and output stabilization. The welfare maximizing combination of these three objectives in the policy framework depends on a country's level of credibility. The empirical analysis of this paper suggests that the different levels of credibility across the regimes correspond to GDP per capita and the level of financial development, which are highest for EIT countries and lowest for the ITL countries.

The three inflation targeting regimes can be described in terms of the weights of the three possible policy objectives and in the clarity of the commitment to the inflation target. FFIT have medium or high levels of credibility and enjoy a large degree of financial stability, but

are not able to maintain low inflation without a clear commitment to an inflation target. Their clear and transparent commitment to the inflation target comes, however, at the price of less flexibility for output stabilization. EIT countries already have low inflation and financial stability, and thus are able to credibly aim at price stability, and also have flexibility to smooth output. Their dual objectives mean that they cannot operate with as much transparency as FFIT countries. ITL countries do not have sufficient credibility to maintain low inflation and are more exposed to financial and cyclical shocks. Thus, they do not aim at low inflation, but, rather, afford themselves full flexibility to deal with shocks.

Analysis of the regimes offers some practical guidance for switches from one regime to another. The main policy implications of this paper are for emerging market countries moving from ITL to FFIT. Econometric analysis suggests that these switches are facilitated by a deep and broad financial sector, which reduces systemic risks and potential policy conflicts, provides for market-based monetary policy implementation, and allows the government to raise the bulk of its funding in financial markets. A switch from FFIT to EIT would be warranted if the inflation-fighting credibility of the central bank was so well entrenched that it reduce the clarity of its commitment to its inflation target without an increase in inflation expectations, but no country has actually undertaken this regime change.

This paper can be seen as a refinement of the applied inflation targeting literature. Detailed discussions of pros and cons of FFIT and country experiences can be found in Bernanke and others (1999), Mishkin and Schmidt-Hebbel (2001), and Landerretche and others (2001). FFIT for emerging market countries is the subject of Masson and others (1997), Mishkin (2000), Schaechter, Stone, and Zelmer (2000), Blejer and others (2001), and Carare and others (2002). This paper appears to be the first to define and analyze three inflation targeting regimes.

This paper is also related to the recent literature on exchange rate regimes. This paper truncates the exchange rate spectrum rigidity more or less in the middle, and deals with those countries in the flexible half of the spectrum. Further, the focus here is on policy design rather than the veracity of the self-reported exchange rate regime. Calvo and Reinhart (2002) ask whether countries that say they float actually do so; they conclude that the answer is often no, owing to a “fear of floating.” Hausmann and others (2001) find that floating exchange rate emerging market countries tend to have higher reserves and greater exchange rate stability, and conclude that these differences are explained by their inability to issue debt in their own currency (“original sin”). Other important papers in this literature include Fischer (2001) and Obstfeld and Rogoff (1995).

The paper is organized as follows. The selection of the inflation targeting countries and their classification into three regimes is described in the next section. The structural underpinnings of the different inflation targeting regimes are examined empirically in Section III. The policy implications of inflation targeting regimes are discussed in Section IV, and the adoption of FFIT by ITL countries is examined in detail in Section V. Section VI concludes with an emphasis on the policy implications and areas for future research.

## II. CLASSIFICATION OF INFLATION TARGETING COUNTRIES INTO THREE REGIMES

This section describes the selection of the 42 IMF member countries<sup>4</sup> that operate with an inflation target and their classification into three regimes. The process involves the elimination of small and less-developed countries, the selection of the 42 inflation targeting countries, and the classification of these countries into three regimes based on the clarity and credibility of their commitment to their inflation target. The selection and classification is based on the design of the monetary regime in March 2001.

### **Elimination of small and less developed countries**

Small and less-developed countries are eliminated because they face a different set of monetary regime options. They have undeveloped financial sectors and concentrated production profiles and so they tend to choose a fixed exchange rate or adopt the currency of their largest trading partner (Mussa and others, 2000). Thus, the 89 countries with GDP under US\$4 billion and countries with per capita GDP less than \$720 were dropped from the 185 IMF member countries (the data are available from the authors)<sup>5</sup>. In addition, Belarus, Paraguay, Trinidad and Tobago, and Tunisia were dropped owing to lack of data, and Turkey was eliminated owing to the turbulent circumstances during 2001.

### **Selection of inflation targeting countries**

Next, the inflation targeting countries were selected based on the presumption, which is documented below, that countries with a floating exchange rate make a commitment to an inflation target.<sup>6</sup> Therefore, countries with one of the five fixed exchange rate arrangements in the *International Financial Statistics* (IFS) of the IMF were dropped. This leaves 42 central banks with some sort of a floating exchange rate, which encompass the arrangements of independently floating, managed floating with no preannounced path for exchange rate, and exchange rates within crawling bands (Table 1). Although those countries have inflation targeting in common, they are obviously an extremely diverse group with regard to size, level of development and vulnerability to shocks.<sup>7</sup>

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<sup>4</sup> 41 member countries and the European Economic and Monetary Union.

<sup>5</sup> GDP data from the WEO database, end-2000 observations.

<sup>6</sup> While four of the countries were classified in the IFS as using a monetary aggregate target (Slovenia, Colombia, Peru, the Philippines), their inflation objective is assumed to generally take precedence over their monetary aggregate. Indeed, more generally, countries that announce a commitment to a money target rarely do so in practice (c.f., Mishkin, 1999).

<sup>7</sup> Alternatively, historical exchange rate and reserve data could be used to split the countries into fixed and floating exchange regimes. For example, Levy-Yeyati and Sturzenegger (2000) found discrepancies between the IFS classifications and exchange rate and reserve

Table 1. Inflation Targeting Countries, Exchange Rate Regime, March 2001

Exchange Rates within Crawling Bands	Independently Floating	Managed Floating
Honduras	Albania	Algeria
Hungary	Australia	Croatia
Israel	Brazil	Czech Republic
Uruguay	Canada	Dominican Rep
Venezuela	Chile	Guatemala
	Colombia	Jamaica
	Iceland	Kazakhstan
	Indonesia	Norway
	Japan	Romania
	Korea	Russian Fed
	Mauritius	Singapore
	Mexico	Slovak Republic
	New Zealand	Slovenia
	Peru	Sri Lanka
	Philippines	
	Poland	
	South Africa	
	Sweden	
	Switzerland	
	Thailand	
	United Kingdom	
	United States	

Source: IFS.

### Classification of the 42 inflation targeting central banks into three regimes

The classification of the inflation targeting countries into three regimes is motivated by their fundamental diversity. This diversity suggest that treating inflation targeting countries as a homogenous group would not be appropriate for understanding the design and operation of monetary policy under inflation targeting conditional on a country's circumstances. Therefore the countries are classified in terms of the clarity and credibility of their commitment to an inflation target.

data over 1975–99. However, the IMF has recently made efforts to ensure that the self-reported exchange rate regimes in the IFS are realistic (Johnston and Swinburne, 1999, and Fischer, 2001). In addition, any confounding of fixed and flexible exchange rate arrangements would have limited implications for the comparisons across inflation targeting regimes because selection of the entire population of inflation targeting countries entails the use of only the two broad categories of fixed or flexible, rather than a larger number of classifications as in the “fear of floating” literature. Finally, a backward historical analysis is less useful as the aim of this paper is to draw forward-looking policy conclusions.



### *Clarity of the commitment to an inflation target*

The degree of clarity of the commitment to an inflation target is a crucial difference between inflation targeting and regimes founded on an exchange rate or monetary objective. A central bank can easily be held accountable to an exchange rate objective because policies aimed at influencing the exchange rate have an immediate impact and the exchange rate is reported every day. Similarly, a monetary target is relatively easy to monitor as monetary operations quickly influence the monetary aggregates, which are reported with a lag of perhaps one or two months. The attainment of an inflation objective, in contrast, can be observed only with long and variable lags owing to the time between a change in the policy stance and its impact on inflation. Clarity is thus an indispensable facet of the inflation targeting monetary policy framework.

The clarity of an inflation target can be viewed as consisting of two elements. The first is the authorities' public description and communication of the inflation target—detailed and effectively communicated *ex ante* and *ex post* policy descriptions allow the central bank to be held accountable for meeting the target. The second element is the transparency of the institutional framework, which is needed for the public and markets to hold the central bank accountable to its inflation target.

The clarity of the commitment to an inflation target is documented here in terms of the central bank's own public description of its policy objective as of 2001 together with the institutional transparency of the institutional framework. The central bank descriptions of their inflation targeting objective are from either their own websites, or from IMF country reports, publication of which is agreed to with the country governments (the sources are available from the authors). Institutional transparency is gauged by the communication vehicles employed by the central bank, including the release of inflation reports and the frequency and detail of these reports, the announcement of changes in the stance of monetary policy via press release, reviews of inflation performance and changes in monetary policy, the publication of inflation forecasting models, and the use of media and other public presentations. These communication vehicles are documented in Schaechter and others (2000) and were updated by the authors.<sup>8</sup>

Examination of these gauges of clarity leads to the separation of the 42 inflation targeting countries into groups that do and do not make a clear commitment to the inflation target. The clear commitment group consists of 18 countries that make an explicit commitment to an inflation target and implement a transparent framework to ensure that the central bank is accountable for the target (top panel of Table 2). They have numerical inflation targets expressed as a point target or as a range defined in terms of end-year inflation or as average

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<sup>8</sup> Schmidt-Hebbel and Tapia (2002) also provide a detailed description of the transparency of the institutional framework of FFIT countries.

annual inflation (except for Australia, which aims to achieve its inflation target on average over the business cycle).

Table 2. Inflation Targeting Central Banks, Clarity of Commitment to Inflation Target, 2001

Countries with a Clear Commitment	
Brazil	2–6 percent inflation target
Canada	1–3 percent inflation target
Chile	2–4 percent inflation target
Colombia	8 percent for 2001, 6 percent for 2002
Czech Republic	2–4 percent inflation target
Hungary	5–7 percent inflation target
Iceland	2.5 percent inflation target with $\pm 1.5$ percent tolerance limits
Israel	1–3 percent inflation target for 2003 on
Korea	2.5 percent inflation target
Mexico	6.5 percent for end-2001, 4.5 percent for end-year 2002
New Zealand	0–3 percent inflation target
Norway	2.5 percent inflation target
Poland	5.4–6.8 percent inflation target
South Africa	3–4 percent inflation target
Sweden	1–3 percent inflation target
Thailand	0–3.5 percent core inflation target range
U.K.	2.5 percent underlying inflation target
Australia	2–3 percent inflation target on average over business cycle.
Countries without a Clear Commitment	
Albania	2–4 percent inflation target range; aim to adopt formal inflation targeting in the future.
Algeria	The final monetary policy objective is a low level of inflation in the medium-term; this level is not specified but considered to be 3 percent.
Croatia	Monetary policy is primarily focused on price stability.
Dominican Republic	No stated inflation target. Objective: maintaining low inflation.
European Central Bank	The primary objective of the ECB is the maintenance of price stability over the medium term, as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) for the euro area of below 2 percent.
Guatemala	Monetary program that has a target for inflation (4–6 percent) and international reserves to maintain the value of the domestic currency.
Honduras	One of the principal objectives of the government is disinflation: 10 percent in 2001; 8 percent in 2002; 6 percent in 2003. Other objectives: moderate growth, preserve external competitiveness.
Indonesia	Inflation objective: 9–11 percent, to keep real interest rates at adequate position levels, to sustain and build market confidence. Achieved through reducing base money growth by 12.5 percent per year.

Table 2. Inflation Targeting Central Banks, Clarity of Commitment to Inflation Target, 2001  
(Continued)

Jamaica	IMF program, multiple targets: net domestic assets, net international reserves, foreign short-term borrowing, etc. Inflation: 5 percent for 2001/02.
Japan	The Bank of Japan continues its monetary easing measures until the CPI (excluding perishables) registers stably a zero percent or an increase year on year.
Kazakhstan	Price stability and avoid excessive real exchange rate appreciation, interpreted as inflation around 10–12 percent in the future.
Mauritius	Price stability is not the primary objective of the Bank of Mauritius. The medium-term objective of the bank is to keep the inflation rate in line with the trading partners and it does not have an exchange rate target. For 2001/02 the inflation target is 4.5–5 percent.
Peru	Price stability. Each year the end-year inflation target range and average rate of growth of base money is decided. 2001: 2.5–3.5 percent.
Philippines	2002: 5–6 percent; 2003: 4.5–5.5 percent. Adopted IT starting 2002, announced in Dec. 2001.
Romania	Mixed objective, inflation target 22 percent at year-end 2002, in the context of a managed float. The National Bank of Romania will attach more weight to the inflation objective, while not putting at risk the viability of the external accounts.
Russia	Main objective: protect the ruble and ensure its stability. Each year the central bank presents the monetary program for the year. The primary objective of the monetary policy is disinflation. In 2000 the inflation target was 18 percent.
Singapore	Price stability as a sound basis for sustainable growth.
Slovak Republic	Each year the National Bank of Slovakia presents the monetary program for the year. The primary objective of the monetary policy is disinflation. For 2002 the inflation rate expected by the bank is 4.1–4.9 percent, while the approved State Budget Act inflation rate is 6.7 percent.
Slovenia	The monetary policy is given a formal long-term inflation target, i.e., the European level of inflation by accession to the EMU at the latest, 4 percent by the end of 2003.
Sri Lanka	The central bank is bolstering price stability as its main objective. Inflation expected to be 6.5 percent in 2002 and 5.5 percent in 2003, if strong reforms are implemented; 8.5 percent and 7.5 percent otherwise.
Switzerland	Price stability defined as CPI inflation of less than 2 percent per annum.
United States	Maximum sustainable growth with low inflation.
Uruguay	Crawling band of 15 percent, economy highly dollarized, therefore primary objective of the monetary policy is to keep the currency stable.
Venezuela	Monetary policy has an anti-inflationary orientation geared towards achieving an inflation rate within the target range set by economic authorities at the beginning of the year (for 2000: 15–17 percent). This strategy was based on the use of the exchange rate as the nominal anchor for prices, thereby promoting its orderly behavior within the framework of a scheme of floating exchange bands.

Sources: Central bank websites, IMF reports, Schaechter and others (2000).

The other 24 countries do not explicitly commit to an inflation target and some have other stated objectives as well (bottom panel of Table 2). They announce some sort of inflation objective or intention to aim at general price stability, with thirteen of the countries announcing a numerical inflation target. Many explicitly specify other objectives, such as the nominal exchange rate, real exchange rate, and international reserves. The multiplicity of targets and their imprecise definition renders their commitment to an inflation target much less clear compared to the first group of inflation targeting countries.

Further, the group of countries without an explicit commitment to an inflation target is strikingly more diverse than that of the clear commitment countries. The former covers a much wider spectrum in terms of size and the level of development. Indeed, the wide diversity of the countries that choose a less explicit commitment to an inflation target is a puzzle, which raises important questions regarding how a country should design its monetary policy framework conditional on its circumstances. For example, are the determinants of the monetary policy framework for the U.S. really the same as for Albania and Sri Lanka?

### *Credibility of the Inflation Targeting Regime*

Even if a country establishes a clear commitment to an inflation objective, it may not be viewed as a serious inflation targeter if inflation is high and the markets have a poor perception of the central bank vis-à-vis other inflation targeting countries. Thus, the countries in this second nonexplicit group of inflation targeting countries are further divided by the credibility of the commitment to low inflation. Credibility is measured here using two gauges.

The first credibility gauge is simply the actual rate of inflation. Low and positive inflation is supportive of high and stable long term growth (Sarel, 1996; and Gylfason and Herbertsson, 2001). A monetary policy supportive of long run growth can be viewed as more credible. Thus, countries with relatively low rates of inflation are considered here as having a more credible monetary policy.<sup>9</sup> The time period over which inflation is reported here is relatively recent—January 1999 to May 2002—because many of the inflation targeting countries have only recently changed their monetary regime and because historical data is less useful for forward looking policy analysis. The data are monthly changes in the seasonally adjusted CPI index reported at an annual rate.

The wide dispersion of inflation indicates that credibility varies quite a lot across countries with a less clear commitment to an inflation target (first three columns of Table 3). Recent inflation for the 24 countries ranges from -0.9 percent for Japan to 40.4 percent for Romania,

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<sup>9</sup> A market-based measure of central bank credibility—such as a gauge of inflation expectations—would have been preferable, but such measures are available only for a few countries (Scholtes, 2002). In addition, comparisons of actual with targeted inflation are precluded by the absence of firm quantitative targets for many of the countries.

Table 3. Indicators of Credibility, Selected Inflation Targeting Countries

Inflation, Jan. 1999–May 2002			S & P Long-Term Domestic Currency Government Debt Rating, 2001				
Country	Average	Rank	Country	Rating	Rank	Average Rank	
Japan	-0.9	1	United States	AAA	1	<u>High Credibility</u>	
Singapore	0.6	2	Switzerland	AAA	1	Singapore	1.5
Switzerland	1.3	3	Singapore	AAA	1	Switzerland	2.0
Algeria	2.1	4	EMU	AAA-	4	Japan	3.0
Peru	2.4	5	Japan	AA-	5	EMU	5.0
EMU	2.6	6	Slovenia	A	6	United States	5.5
U.S.	2.6	7	Slovak Republic	BBB-	7		
Albania	3.7	8	Croatia	BBB-	7	<u>Low Credibility</u>	
Philippines	4.8	9	Philippines	BB+	9	Croatia	9.0
Uruguay	4.9	10	Jamaica	B+	9	Peru	9.0
Croatia	4.9	11	Kazakhstan	BB	11	Philippines	9.0
Mauritius	5.6	12	Guatemala	BB	11	Uruguay	10.0
Guatemala	5.7	13	Uruguay	BB-	13	Slovenia	11.5
Dominican Rep	6.9	14	Peru	BB-	13	Algeria	12.0
Jamaica	7.2	15	Dominican Rep	BB-	13	Guatemala	12.0
Indonesia	8.2	16	Russia	B+	16	Jamaica	12.0
Slovenia	8.4	17	Romania	B+	16	Slovak Rep.	12.5
Slovak Rep	9.3	18	Venezuela	B	18	Dominican Rep.	13.5
Honduras	9.5	19	Indonesia	SD	19	Albania	14.0
Sri Lanka	10.6	20	Sri Lanka	No rate	20	Kazakhstan	16.0
Kazakhstan	11.6	21	Mauritius	No rate	20	Mauritius	16.0
Venezuela	17.1	22	Honduras	No rate	20	Indonesia	17.5
Russia	26.2	23	Algeria	No rate	20	Honduras	19.5
Romania	40.4	24	Albania	No rate	20	Russia	19.5
						Romania	20.0
						Sri Lanka	20.0
						Venezuela	20.0

Sources: IFS, Bankscope.

and five countries have double-digit inflation.<sup>10</sup> Of course, inflation over a relatively short time period will reflect exogenous shocks as well as credibility, and, to the extent that the vulnerability to shocks differs across country groups, the comparisons are less informative in

<sup>10</sup> Using actual inflation as a credibility gauge erroneously makes Japan look more credible than a country with zero or small positive inflation since deflationary policy is not a policy objective. However, omitting Japan does not alter the overall regime comparisons (Table 4).

the absence of a model. Still, the wide inflation range suggests qualitative differences within this group of countries.

Table 4. Inflation Targeting Countries, Credibility Gauges

Average	Inflation Jan. 1999–May 2002	S&P Long-Term Domestic Currency Gov. Debt Rankings 2001
EIT	1.2	2.0
EIT excluding Japan	1.8	1.3
FFIT	4.4	7.2
Industrial countries	2.9	2.9
Emerging market countries	5.4	10.0
ITL	10.0	14.7

Sources: IFS, Bankscope.

The second gauge of credibility is the debt ratings of long-term local currency denominated government debt. The ratings address some of the pitfalls of the using inflation as a measure of credibility in that they are forward-looking and directly capture market perceptions of the degree of long-term market confidence in the stability of a currency, which ultimately is the responsibility of the central bank. At the same time, the ratings reflect factors beyond the scope of monetary policy, especially the strength of the fiscal position, which also bear on the credibility of a commitment to an inflation target.

Again, the dispersion of this gauge of credibility is quite wide across the 24 inflation targeting countries that do not make a clear commitment to their inflation target. The Standard and Poor's long-term local currency government debt ratings for 2001 are used here (middle three columns of Table 3). The alphabetical ratings are rated in inverse order, with the countries with no rated debt assigned a value of one. The ratings range from selective default, which is scored here as two, to AAA, which is scored as nineteen. The United States, the United Kingdom, and Switzerland enjoy an AAA rating, whereas the debt of five countries is not rated, and one is in selective default.

Construction of an overall ranking of credibility separates the 24 countries that do not make a clear commitment to an inflation target into two distinct groups. The overall ranking of credibility is formed by constructing a simple average of the inflation and rating rankings (last three columns Table 3). A high credibility group consists of Singapore, Switzerland, Japan, the EMU, and the United States. The largest gap between successive index values is that between the United States (5.5) and Croatia/Peru/Philippines (9). A relatively low credibility group consists of nineteen countries with values between 9 and 20. The distinction between the low and high credibility countries would seem point to useful policy implications regarding design of the monetary framework.

### *Classification into three inflation targeting regimes*

Examination of clarity and credibility of the commitment to the inflation target leads to the separation of the inflation targeting countries into three regimes (Table 4). The first regime consists of the 18 countries that make an explicit commitment to an inflation target and implement a transparent framework to ensure that the central bank is accountable for the target. These countries are called *full-fledged inflation targeters* because they make a full commitment to their inflation target. Interestingly, the FFIT countries are either small or medium-sized industrial countries, or medium and large middle-income emerging market countries.

The second group of five central banks is those that are highly credible and make a less clear commitment to an inflation target. These countries share highly successful inflation records, but they are rather heterogeneous in their monetary policy frameworks with regard to the definitions of price stability and the operation of monetary policy.<sup>11</sup> They seem to have extra scope for flexibility to attain objectives other than an inflation target and thus they are called *eclectic inflation targeters*. All EIT central banks are those of industrial countries.

Countries in the third regime announce an inflation objective, but owing to a low level of credibility do not make a clear commitment. They also are relatively heterogeneous in the objectives and operation of monetary policy. This regime is called *inflation targeting lite* because these countries are not able to make a credible commitment to an explicit inflation target. The number of ITL countries is nineteen, and all are emerging market countries.

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<sup>11</sup> The ECB is rather difficult to categorize, but it can be viewed as closer to EIT than FFIT. The primary objective of the ECB is “the maintenance of price stability over the medium term, as a year-on-year increase in the Harmonized Index of Consumer Prices (HICP) for the euro area of below 2 percent.” The successful inflation record of the ECB establishes a high degree of policy credibility. The ECB views itself as not having an explicit inflation target. Further, the ECB describes itself as using two “pillars” to achieve its objective: a quantitative reference value for the growth rate of a broad monetary aggregate, and a broadly based assessment of the outlook for price developments and risks to price stability. In contrast, FFIT countries use only an inflation forecast—akin to the second pillar—as an intermediate target. This definition of EIT also aims to be consistent with the policy of the Federal Reserve Bank, which in pursuit of its dual objectives recognizes that price stability is a prerequisite for maximum long-term sustainable economic growth and maximum employment, and therefore in practice accords a higher priority to its price stability goal.

### III. STRUCTURAL UNDERPINNINGS OF THE DIFFERENT INFLATION TARGETING REGIMES

This section empirically analyzes the basic structural differences that underpin the three different regimes. The varying monetary policy objectives and degrees of clarity raise the question of what explains the differences. Insight into this question could be used to help inform the appropriate design of monetary policy conditional on a country's circumstances. The analysis is based on cross-country differences in structural macroeconomic indicators, and econometric analysis.

#### A. Macroeconomic Comparisons

The first set of comparisons is based on simple comparisons of cross-country macroeconomic data. The use of cross-country data over the same time period is used to control for time-specific international events. The differences are examined by comparing the within-regime median value of each indicator across three regimes.

The EIT countries have the highest level of GDP and GDP per capita and ITL countries the lowest (Table 5). All of the EIT countries are industrial, all of the ITL countries are classified as emerging market, and the FFIT countries are a mix. The median per capita GDP of the EIT countries is larger than that of the FFIT countries by a factor of 4½, and the median per capita GDP of the FFIT countries, is, in turn, 4½ times larger than that of the ITL countries. The ITL countries are also generally smaller than the FFIT emerging market countries. These comparisons raise the possibility that the revealed preference for different inflation targeting regimes can be explained to some degree by the overall level of development.

The fiscal position, as measured by the government debt to GDP ratio, is strongest for the FFIT countries. The EIT countries have the relatively largest median fiscal debt at 66 percent of GDP (50 percent excluding Japan). The FFIT countries have the lowest debt ratio; perhaps because they need to credibly commit to an explicit inflation target. The ITL countries have an intermediate level of debt.

Importantly, the regimes match up with two gauges of restrictions on central bank financing of the government.<sup>12</sup> First, the ITL country central banks reported that they provide the relatively most amount of financing to the government (Table 6). By contrast, the EIT countries and both subgroups of FFIT countries provide little or no financing to their governments. The second gauge is a more direct ordinal measure of legal restrictions on central bank government financing (Table 5). Central bank laws with less restrictive limits are assigned higher values. The emerging market FFIT countries have the strongest limits, and the EIT countries have the weakest limits. The central bank financing restrictions of industrial FFIT countries and EIT countries are intermediate.

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<sup>12</sup> A recent measure of central bank independence is not available for the inflation targeting countries.



Table 5. Median Values of Structural Indicators Across Inflation Targeting Regimes 1/

	Per Capita GDP \$US 2000	GDP US\$ Billions 2000	Gov. Bal. to GDP 1996–2000	Gov. Debt/GDP 1999–2000	Cen. Bank Financing to Gov.	Legal Restriction Cen. Bank Gov. Fin. 2/
<b>Macroeconomic Indicators</b>						
Eclectic inflation targeting (5)	33,589	4,753	-0.63	59.1	100.0 3/	1.5 3/
Full-fledged inflation targets (18)	7,695	142	-0.98	37.5	100.0	0.8
Industrial (7)	23,844	227	0.69	37.3	100.0	1.1
Emerging market (11)	4,728	122	-3.27	37.5	100.0	0.5
Inflation targeting lite (19)	1,720	19	-2.83	50.4	62.5	0.9
	Broad Money to GDP 1998–2000	Stock Mkt Capital. to GDP 1998–99	Reserve Money to Broad Money 1999–2000	Real Int. Rate 1998–99	Prv. Ext. Dcibt to GDP 1998–99	Port. Flows to GDP 1995–99
<b>Financial Indicators</b>						
Eclectic inflation targeting (5)	115.4	168.2	10.4 3/	5.1 3/	NA	NA
Full-fledged inflation targets (18)	56.2	47.8	11.2	8.1	NA	NA
Industrial (7)	53.8	97.1	7.1	6.0	NA	NA
Emerging market (11)	58.6	31.8	20.2	9.9	20.2	0.5
Inflation Targeting lite (19)	41.6	10.5	32	12.4	3.7	0.1

Sources: IFS, World Economic Outlook and World Bank Global Economic Indicators databases for macroeconomic and financial indicators; Fry and others (2000) for central bank indicators; Schaechter and others (2000) and IMF Central Bank Legislation database for central bank financing of government.

1/ Number of countries with available data in parentheses.

2/ Ordinal indicator with central bank financing: not allowed=0, limited=1, and no limits=2; averages across inflation targeting regimes are reported.

3/ Excludes EMU.

Table 6. Inflation Targeting Central Banks,  
Self-Reported Monetary Policy Objectives 1/

	Inflation Focus	Financial Stability Focus	Multiple Objectives
Eclectic inflation targeting (4)	19.0	25.0	51.5
Full-fledged inflation targeting (16)	88.0	25.0	19.0
Industrial (7)	94.0	16.0	6.0
Emerging market (9)	88.0	33.0	28.0
Inflation Targeting lite (12)	44.0	37.5	47.0

Source: Fry and others, 2000.

1/ Number of countries with available data in parentheses. Central bank frameworks that aim at the objectives receive a higher score.

The EIT countries have well-developed financial systems, in marked contrast to the ITL countries. EIT countries exhibit much higher levels of monetization and have much larger stock markets than FFIT countries, which, in turn, have deeper markets than the ITL countries. In a similar vein, real interest rates, an indicator of the cost and risk of financial transactions, are relatively high for the ITL countries and low for the EIT countries.

In sum, the descriptive comparisons suggest that the greater credibility of the EIT compared to the FFIT countries reflects the sharp differences in financial development and the overall level of development. This raises the further question as to what are the specific aspects of the overall level of development that help shape the credibility needed for EIT.

## B. Econometric Analysis

The structural underpinnings of the different inflation targeting regimes are examined next econometrically.<sup>13</sup> The regressions are based on cross-sectional data, rather than panel data, because the focus here is on differences across countries rather than over time, and because the time period over which inflation targeting has been in place for most countries is rather short. In the absence of a structural model, the results can be viewed only as broadly indicative of what underlies the different inflation targeting regimes. In particular, there may be two-way causality between the credibility of the inflation targeting regime and several of the right hand side variables.

<sup>13</sup> Studies of the determinants of the adoption of FFIT versus regimes for selected countries include Gerlach (1999), Schaechter and others (2000), and Schmidt-Hebbel and Mishkin (2001).

The maintained hypothesis is that monetary policy credibility is increasing from the ITL to the FFIT to the EIT countries. Thus, the dependent variable takes on a value of 0 for the ITL countries, 1 for the FFIT countries, and 2 for the EIT countries. The estimator is ordered probit maximum likelihood. The candidate independent variables are those discussed in the previous section. The ECB is excluded owing to the lack of comparable macroeconomic data.

Overall, the regressions have a reasonable degree of explanatory power, judging by the pseudo r-squareds and the number of correctly predicted dependent variable observations (Table 7). The first column shows that per capita GDP in and of itself is a significant determinant of regime choice, indicating that the overall level of development is a fair proxy for inflation targeting regime credibility macroeconomic indicators. Per capita GDP may be proxying for important elements of credibility and the choice of monetary regime pertaining to structural rigidities (Walsh, 2002) and central bank independence.

Table 7. Inflation Targeting Regime, Trinomial Ordered Probit Regression Results 1/

	1	2	3	4	5	6
Per capita GDP, log	1.3205 (3.84)	1.2006 (3.12)	1.2839 (2.43)	1.2862 (2.46)	1.375 (2.52)	
Inflation, 1996–2000		-0.005056 (0.22)	0.00580 (0.23)	0.005380 (0.22)		
Government balance, 1996–2000				-0.02234 (0.25)		
Government debt to GDP		0.00432 (0.43)	-0.001146 (0.14)			
Broad money		0.02132 (2.06)				
Stock market capitalization, 2000			1.2438 (2.36)	1.2206 (2.41)	1.4639 (2.52)	1.4765 (3.75)
Central bank financial restrictions					-0.5945 (1.49)	-0.39610 (1.25)
Number of observations	41	41	41	41	41	41
Pseudo R2	0.427	0.513	0.614	0.615	0.643	0.485
Count of observations with probability > 0.5: 2/						
0 = ITL	19 of 19	20 of 19	19 of 19	19 of 19	19 of 19	17 of 19
1 = FFIT	22 of 18	18 of 18	18 of 18	19 of 18	19 of 18	22 of 18
2 = EIT	0 of 4	3 of 4	4 of 4	3 of 4	3 of 4	2 of 4

1/ Z-statistics in parentheses; excludes ECB.

2 / Gives number of observations for each category “correctly” fit by the model based on probability greater than 50 percent.

However, financial depth and government financing also help explain regime credibility even after controlling for GDP per capita. The parameter estimates for the two indicators of financial depth—broad money to GDP and stock market capitalization to GDP—are significant in all the specifications. The significance of the financial depth indicators is attributable to its association with financial stability and the use of the sophisticated framework of monetary policy needed for EIT and FFIT. The restrictions on central bank financing of the government indicator show up as marginally significant. Surprisingly, the inflation performance in and of itself is not highly correlated across inflation targeting regimes. Nor are the two indicators of the strength of the fiscal position significant, another surprising result. The lack of explanatory power of inflation and the fiscal position may be because these indicators are backward looking, and forward looking indicators are more important, but difficult to introduce empirically.

#### **IV. THE POLICY IMPLICATIONS OF DIFFERENT INFLATION TARGETING REGIMES**

The correspondence between the three inflation targeting regimes and underlying economic structures suggests that countries choose the regime that best fits their circumstances. This section aims to draw out the implications of this correspondence for the design of the monetary policy framework. The key policy questions are: what is the appropriate monetary regime for a country given its circumstances? And, when and how should a country switch from one regime to another? This section first elaborates a conceptual framework for thinking through these questions, then examines the regime switches that are relevant for policy.

##### **A. The Revealed Preference for Inflation Targeting Regimes**

The inflation targeting regimes can be viewed as corresponding to different welfare maximizing combinations of policy objectives, each conditional on a country's "endowed" level of credibility. The ultimate purpose of monetary policy is to maximize social welfare by attaining high and stable growth in the long run. Monetary policy can support long-run growth through a combination of inflation in the low single digits, financial stability, and output stabilization. The welfare maximizing combination of these three objectives in the policy framework depends on a country's level of credibility. The three inflation targeting regimes can be described in terms of the weights of the three possible policy objectives and in the clarity of the commitment to the inflation target.

A clear commitment to an *inflation target objective* is seen as ameliorating the classic time inconsistency problem that can lead to higher than necessary inflation. The problem is caused by asymmetric information and rigidities that can lead the central bank to raise output in the short run, but at the cost of a higher level of inflation for the same level of output in the long run. A clear and credible commitment to an inflation target reduces the incentive of the central bank to raise output, thereby addressing the time inconsistency problem and leading to lower long-run inflation (c.f., Bernanke and others, 1999).

However, a highly credible central bank may choose not to be explicit in its commitment to inflation because this would reduce its flexibility with respect to an *output stability objective* without an offsetting gain in price stability (Jensen, 2001). A high credibility country with entrenched low inflation and financial stability can afford to be more flexible with respect to output stability. In practice, this means assigning a relatively large weight to output stability.

Can monetary policy be fully transparent and accountable if the central bank pursues an objective in addition to inflation? The answer is probably no owing to a signal extraction problem: observers cannot tell the weight assigned to each objective and which objective is motivating a particular policy action. In theory, a central bank could announce weights and the parameters underlying each policy action, but this may not be desirable in theory and would not be feasible in practice.<sup>14</sup> This is not to say that multiple objectives are bad, since the ultimate goal of monetary policy is to attain the objectives consistent with maximizing social welfare, as opposed to attaining maximum transparency and accountability.

Greater flexibility is also needed for a central bank that must worry about a *financial stability objective*. In practice, financial stability compels the central bank to account for exchange rate volatility over and above the impact of the exchange rate on inflation, and serve as a lender of last resort to prevent a run on the deposits of one bank from leading to a general run on banks. Again, a high degree of clarity is not always optimal when financial stability is an ongoing concern. The foreign exchange intervention practices of many central banks are less than transparent, which may reflect information asymmetries and short-run exchange rate targets (Bhattacharya and Weller, 1997). Constructive ambiguity, or a deliberate lack of clarity, is needed in the lender-of-last-resort role of the central bank to address the contagion and moral hazard problems inherent in potential bailouts of banks that can be deemed “too big to fail” (Goodhart and Huang, 1999; Goodfriend and Lacker, 1999; Enoch and others, 1997). The less clear commitment to an inflation target of ITL central banks provides more scope for dealing with financial crises.<sup>15</sup> Table 8 summarizes the discussion so far on the revealed preference for an inflation targeting regime, based on the credibility of the central bank, the clarity with respect to inflation objective, and the flexibility with respect to other objectives.

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<sup>14</sup> For a different view on this issue see Svensson (2002).

<sup>15</sup> In addition, EIT countries seem to be becoming more vulnerable to homegrown potential financial stresses associated with low inflation or deflation. Indeed, Borio and Lowe (2002) argue that a high degree of monetary policy credibility can actually increase vulnerability to financial instability by reducing uncertainty about the future, which can lead to excessive increases in asset prices. In the past five years Japan, Singapore, and Switzerland experienced deflation in the year over year change in the monthly CPI.

Table 8. Inflation Targeting Regimes, Monetary Framework

	Full-Fledged Inflation Targeting	Eclectic inflation Targeting	Inflation Targeting Lite
Credibility	Medium and high	High	Low
Clarity with respect to inflation objective	High	Fairly low	Low
Flexibility with respect to other objectives	Low	High	High

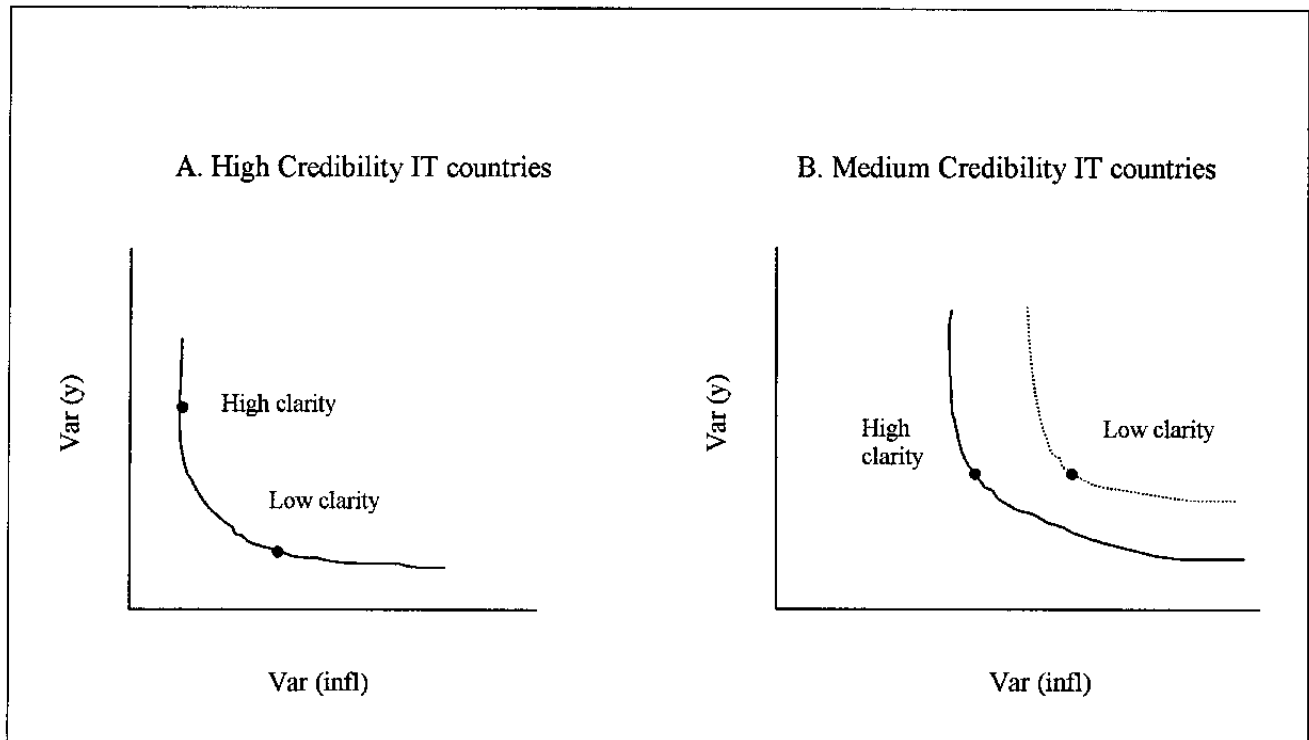
The interplay between credibility, clarity and objectives can be graphically (if simplistically) represented using the Taylor Curve, which shows the feasible combinations of inflation and output variability attainable by monetary policy (Taylor, 1979) (Figure 2). The distance between the origin and the Taylor Curve represents the minimal potential level of output and inflation stability, which can be interpreted as a metric of the credibility of monetary policy. Points to the northeast of the Taylor Curve, owing to a time inconsistent monetary policy for example, are not efficient in that either or both inflation and output variability can be reduced. The optimal point on the Taylor Curve is the preferred mix of inflation and output variability. Assuming that inflation and output variability are equally weighed then the optimal point on the Taylor Curve is where inflation and output variability (measured in equivalent terms) are the same.

The Taylor Curve of a highly credible central bank is relatively close to the origin (Figure 2A). Further, it is reasonable to assume that time inconsistency is less of an issue owing to relatively fewer rigidities and less political pressure for unsustainable expansions. Thus, the highly credible central bank can be presumed to operate on the curve. A clear commitment to the inflation target would put such a central bank on the upper, non-optimal, part of its Taylor Curve. Reducing the clarity of the commitment to inflation would provide for a decrease in the variability of output greater than the increase in the variability of inflation, or movement down the curve to the EIT point. A less clear commitment to inflation would also provide greater scope for addressing financial stability issues, which are gaining importance for EIT countries in the context of deflationary pressures.

For medium credibility central banks the Taylor Curve is farther away from the origin (Figure 2B). Since time inconsistency is a more important issue for these countries, the lack of a clear commitment to an inflation target will put them off their curve. The adoption of FFIT, or an increase in the clarity and weight of the inflation objective will reduce inflation variability and perhaps also lower output variability and shift them horizontally to their Taylor Curve.

Finally, the Taylor Curve of the low credibility country is not only the farthest away from the origin but they also have an important third dimension: financial stability. Since clarity is not always good for financial stability, determination of the optimal degree of clarity is too complex to be shown here using the Taylor Curve. However, the revealed preference of ITL countries suggests that for the low credibility central bank the benefits of lower output variability and enhanced financial stability from a less clear/more flexible framework exceed the costs of more variable inflation.

Figure 2. Inflation Targeting Countries, Taylor Curves



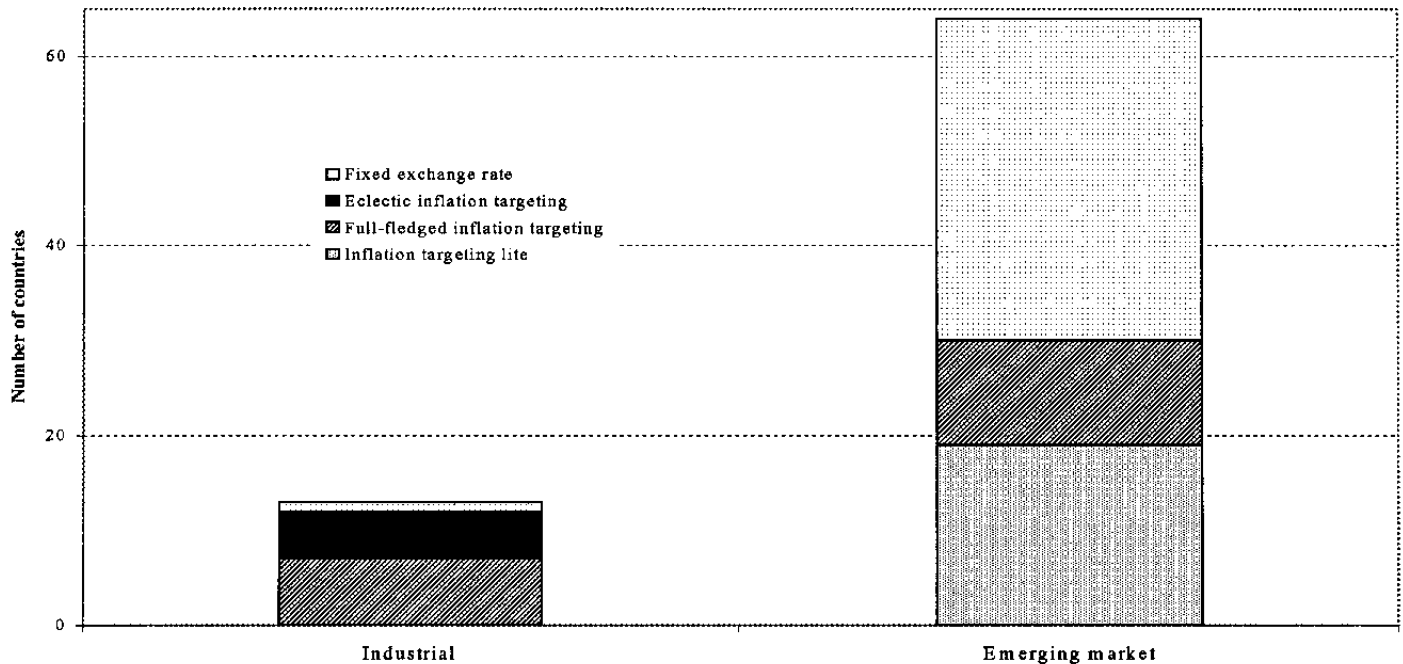
### B. Inflation Targeting Regime Switches

The above conceptual framework can be used to help address the policy question of when and how a country should switch from one inflation targeting regime to another. Six switches between the three regimes are possible. However, switches from EIT and FFIT to ITL can be precluded from consideration since countries will not choose to go from a higher credibility to a low credibility regime.<sup>16</sup> In addition, a low credibility ITL country cannot credibly switch to FFIT, leaving three possible regime switches.

<sup>16</sup> In the terminology of Masson (2000) ITL is a closed state.

The policy relevance of these three switches can be further narrowed by considering emerging market and industrial countries separately (Figure 3). Of the 13 IMF member industrial country central banks—subsuming for the purposes of monetary policy the 12 EMU countries under the ECB and including Singapore as an industrial country—7 practice FFIT, 5 practice EIT, and Denmark has a fixed exchange rate arrangement. This leaves switches between EIT and FFIT as the only relevant regime changes for industrial countries. Turning to the emerging market countries, 11 practice FFIT, 19 use ITL, and the rest maintain a fixed exchange rate arrangement. Thus, the choice set of possible inflation target regime switches are: EIT to FFIT for industrial countries, FFIT to EIT for industrial countries, and ITL to FFIT for emerging market countries.

Figure 3. Monetary Regime, Larger and Developed IMF Member Country Central Banks, 2001



1/ EMU countries classified here as under a single central bank. Singapore included as industrial country.

Source: IFS.

### EIT to FFIT

Strictly speaking, no country has made the switch from switch from EIT to FFIT. Further, this paper will not take a view on whether any of the EIT countries should switch to FFIT. Bernanke (1999) and Mishkin (1999) have recommended that the U.S. adopt FFIT to depersonalize and institutionalize its high level of credibility. Japan has been urged to adopt FFIT as a means to get out of its disinflationary spiral (Krugman, 1998). The ECB has also



been urged to make clear its commitment to its inflation target, which would qualify it as an FFIT central bank (Bernanke, 1999). The general point is that the switch from EIT to FFIT depends on whether the long run gain in inflation-fighting credibility outweighs the loss in flexibility to achieve other objectives.

### **FFIT to EIT**

Since no country has switched from FFIT to EIT the discussion here is necessarily speculative. None of the 18 FFIT countries now appear to be considering such a switch, although given the relatively short history of FFIT a switch to EIT may well happen in the future. A switch would be warranted if the inflation-targeting credibility of the central bank was so well entrenched that it could change to a new regime where it could temporarily shift its objective away from price stability—but without a shift in the mean or an increase in the variance of inflation expectations. Although FFIT has been adopted to reduce inflation, a switch from FFIT to EIT should be assessed not only in terms of an increase in inflationary expectations, but also with respect to a decrease in inflation, as evidenced by the emergence of deflation in Japan.

In practice, a switch from FFIT to EIT could be implemented either by reducing transparency and accountability modalities or by keeping these modalities and announcing multiple objectives. Either way, the inflation target would be much harder for the public and markets to monitor. The industrial FFIT countries look to be the most likely candidates to move to EIT as they have more empirically credible monetary frameworks.

### **ITL to FFIT**

The inflation targeting regime switch of most immediate policy interest is the move from ITL to FFIT, which is relevant for emerging market countries only. As long as the adoption of FFIT is credible, and the supporting fiscal and structural policies are in place, the adoption of FFIT can boost credibility in a virtuous circle, reflecting behavioral changes induced by a successful switch (Bernanke and others, 1999; and Sargent, 1999).

FFIT is fast gaining popularity with emerging market countries. From 1997–2001 the number of emerging market countries with FFIT rose from zero to eleven, during 2002 Peru and the Philippines adopted this framework, and other emerging market countries are considering the adoption of FFIT for 2003 and beyond. In addition, emerging market countries with some sort of fixed rate regime may view ITL as a policy option. In fact, ITL can be viewed as a transitional monetary regime during which the central banks aims to maintain nominal stability long enough for the implementation of structural reforms in support of a single nominal anchor (Stone, 2002).<sup>17</sup>

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<sup>17</sup> An empirical literature is beginning to emerge on inflation targeting for emerging market countries. Schaechter and others (2000) found that inflation targeting emerging market countries compared to other emerging market countries are: larger and more developed, have

A quick way to address the question of when FFIT is appropriate for an emerging market country is to look at already established minimum GDP and GDP per capita thresholds for the adoption of FFIT. The lowest level of GDP for an FFIT country at the time of adoption has been declining steadily from US\$42 billion of New Zealand in 1989 to US\$7.5 billion for Iceland in 2001. Similarly, the minimum threshold for GDP per capita has fallen from the US\$12,800 of New Zealand in 1989 to US\$3,200 for Brazil in 1999 and Thailand's US\$1,950 in 2000. Around 90 emerging market countries lie below these thresholds. Moreover, these cutoffs are declining over time, suggesting that more countries are potentially eligible for inflation targeting. Of course, at some point in the future a cutoff point will be reached for the relatively sophisticated FFIT framework.

## **V. EVIDENCE ON THE SWITCH FROM ITL TO FFIT**

This section reports evidence on the switch from ITL to FFIT that is aimed to inform the policy decision of emerging market countries considering this move. First, emerging market FFIT and ITL countries are compared, then the monetary operations of inflation targeting countries are briefly reviewed, followed by a review of changes prior to the adoption of FFIT.

### **A. Comparison of Emerging Market FFIT and ITL Countries**

This section compares and contrasts emerging market FFIT and ITL countries to discern the differences between the two that could be useful for policymakers of ITL countries considering a switch from ITL to FFIT.

#### **Macroeconomic comparisons**

The emerging market FFIT countries are larger and more developed than the ITL countries (Table 5). The median FFIT country level of real GDP exceeds that of the ITL countries by a factor of six. Further, median per capita GDP of the FFIT countries is almost three times larger than the ITL countries. Thus, size and level of development seem to matter for the choice of regime.

The FFIT countries are more monetized and have considerably more sophisticated financial markets vis-à-vis the ITL countries. Broad money to GDP is about 40 percent higher for the FFIT countries. Stock market capitalization is much higher, and real interest rates are lower for the FFIT countries. This relatively high level of financial sector development may help

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more developed domestic financial systems according to standard indicators of financial market development, have broadly similar indicators of the external position, and have higher sovereign credit ratings. In contrast, Amato and Gerlach (2001) find few differences between inflation targeting and non-inflation targeting emerging market countries, suggesting that preconditions for this regime play little role in practice, and are established after the adoption of inflation targeting.

explain why all the FFIT are able to conduct monetary policy with indirect instruments and short-run interest rates as operating targets, as discussed below. Further, capital market openness, as captured by private external debt to GDP and portfolio inflows to GDP is higher for the EMFFIT countries by an order of magnitude, reflecting their greater level of market development.

The EMFFIT countries have a stronger fiscal position and stricter limits on central bank financing. While the median fiscal balances are about the same between the two country groupings, the ITL countries have a considerably higher level of government debt. This is important because a strong fiscal position is a key prerequisite for a credible inflation target. Further, the EMFFIT countries have generally stricter limits on central bank financing of the government. Thus, restrictions on financing seem to be more important than the amount to be financed.

### **Econometric analysis**

The differences between the emerging market FFIT and ITL countries are examined next with binary dependent variable regressions. Again, monetary credibility is assumed to be increasing from the ITL to FFIT, so that the dependent variable is 0 for the ITL countries and 1 for the emerging market FFIT countries. The estimator is probit maximum likelihood. The results of these regressions provide some interesting comparisons with the regressions across all three inflation targeting regimes.

The fiscal indicators generate a positive parameter estimate and show up more strongly compared to the previous regressions, but are still not significant at the 5 percent level (Table 9). Per capita GDP is not at all significant, in marked contrast to the three regime regressions. Again, the level of inflation does not show up as an important determinant of the regime. The most robust result is for the two indicators of financial development, especially stock market capitalization, as with the previous set of regressions. Interestingly, the government debt indicator enters with a marginal level of significance. Finally, the restriction on central bank financing of the government indicator has the highest z-statistic of all the indicators, and considerably improves the fit of the regression.

The message from the descriptive comparisons and econometric analysis is that the level of financial intermediation and fiscal financing are the crucial factors for an emerging market country that wants to move from ITL to FFIT. The lower significance of per capita GDP in the regressions indicates that there are fewer omitted variables correlated with GDP. Perhaps the shift from ITL to FFIT for an emerging market country is mainly shaped by financial and fiscal considerations, while the differences in credibility across the three regimes reported in Table 7 reflects variables that are harder to capture empirically.

Table 9. Emerging Market FFIT and ITL Regimes, Binomial Probit Regression Results 1/

	1	2	3	4	5	6
Per capita GDP	-0.0349 (1.20)	-0.03627 (0.29)	-0.031523 (0.35)	-0.091382 (1.03)	0.083099 (0.72)	
Inflation, 1996–2000		-0.013815 (0.63)	-0.009286 (0.45)	-0.015230 (0.75)	0.009837 (0.37)	
Government balance, 1996–2000				0.016868 (0.19)		
Government debt to GDP		-0.01326 (1.35)	-0.019058 (1.54)		-0.039741 (1.62)	-0.02463 (1.72)
Broad money		0.016315 (1.18)				
Stock market capitalization, 2000			0.038222 (2.05)	0.029939 (1.96)	0.065692 (1.93)	0.060992 (2.36)
Central bank financial restrictions					-1.3991 (2.35)	-1.0776 (2.35)
Number of observations	30	30	30	30	30	30
Standard error	0.496	0.473	0.431	0.450	0.360	0.360
Count of observations with probability > 0.5: 2/						
0 = ITL	19 of 19	16 of 19	17 of 19	16 of 19	16 of 19	17 of 19
1 = EMFFIT	0 of 11	4 of 11	5 of 11	5 of 11	10 of 11	7 of 11

### B. Monetary Policy Targets and Instruments

A supporting monetary operations framework is an important element of a credible framework for the adoption of FFIT because of the lag between a policy change and its impact on inflation. These lags have led to the description of monetary policy under inflation targeting as “constrained discretion,” which stands in contrast to the “automatic pilot” approach seen to hold under strict exchange rate or monetary aggregate targeting. The emphasis in this section is on comparing FFIT and ITL countries, although the EIT countries are included for completeness.

The revealed preference of FFIT and EIT central banks is for a short-term interest rate operating target and open market operation monetary instruments (Table 10) (Stone, 2002).

Every FFIT and EIT central bank except for Mexico uses a short-term interest rate as its operating guide, ranging in maturity from overnight to three-months. The popularity of a short-term interest rate-operating guide reflects the preference of central banks for stable interest rates and the use of reserve or settlement balances as the short run liquidity shock absorber. Turning to the main instrument of monetary policy, almost all the FFIT<sup>18</sup> and all EIT central banks use open market operations either on an outright or repo basis to maintain domestic liquidity conditions in line with the announced operating interest rate.

Table 10. Monetary Operations, Late 2001, Inflation Targeting Countries

	Operating Target			Open Market Operations as Main Instrument
	Interest Rate	Quantity	Exchange Rate	
EIT (5)	5	0	0	5
FFIT				
Industrial (7)	7	0	0	7
Emerging market (11)	10	1	0	10
ITL (19)	6	10	3	7

Sources: Carare and others (2002); Stone (2002), central bank websites; IMF documents.

For ITL countries the operating targets and instruments are a mixed bag. Short-term interest rates, the exchange rate, and quantity targets including not just bank balances with the central bank but also base money growth are all employed. This wide spectrum of operating targets presumably reflects the dual policy objectives, as well as the range of financial sector development. ITL countries use a variety of market and non-market instruments.

The elements of the monetary operations framework in support of FFIT are clear-cut: short-term interest rate operating target and open market operations. The differences in the targets and instruments of monetary operations between FFIT and ITL countries imply relatively sophisticated operations are needed for an ITL country to credibly adopt FFIT.

<sup>18</sup> Exceptions include Israel, which uses auctions of bank deposits/loans; Canada, which uses standing facilities to maintain a narrow interest rate corridor; and Australia and New Zealand, which have begun using foreign exchange swaps in addition to repos.

### **C. Before and After the Adoption of FFIT**

This section presents descriptive data on the structural and policy changes that FFIT countries chose to make prior to adopting this framework to better inform policymakers considering a switch to FFIT. The degree of credibility needed for FFIT as a monetary framework almost always requires structural and policy changes prior to its adoption. Most countries need to lay groundwork to establish the macroeconomic stability, fiscal rectitude, transparency and accountability of monetary policy, and sophisticated financial system used to implement monetary policy required for FFIT. The changes are gauged as the increase in indicator average over year  $t-1$  and  $t$  relative to the average in year  $t-3$  and  $t-4$ . Stock indicator changes are reported in terms of percent change, while flows or interest rates are reported as differences.

Emerging market countries adopt FFIT during a period of disinflation, while there is no corresponding pattern for industrial countries (Table 11). Without exception, all of the EMFFIT countries adopted the new regime while inflation was on the decline, presumably to enhance credibility. Only three of the seven industrial countries adopted FFIT during a disinflationary phase, possibly because they have greater credibility prior to adopting FFIT, as indicated by debt ratings.

Government debt to GDP improves during the run up to the adoption of FFIT. For industrial countries, declining government debt probably reflects both fiscal adjustments (e.g., New Zealand) and economic upturns. For the emerging market countries the improving debt situation may reflect improvements in debt management as well as lower inflation.

Surprisingly, the government balance actually worsens prior to the adoption of FFIT. Ideally, the analysis would be based on "structural" fiscal balances (adjusted for cyclically sensitive revenues and expenditures) but structural fiscal balances are not available. The unadjusted government balance on average worsens during the five years up to the adoption of FFIT for most countries, especially for the industrial countries. This result is surprising in that establishment of the requisite strong fiscal position would suggest an improving fiscal balance.

Financial indicators convey the strong message that countries undergo significant financial deepening before adopting FFIT. Broad money to GDP increased prior to the adoption of FFIT for 14 of the 18 countries, with larger increases for the emerging market countries. Stock market capitalization increases by almost a third for the EMFFIT countries.

In sum, there is a pattern of structural and policy changes prior to the adoption of FFIT for emerging market countries, but less so for industrial countries. Before adopting FFIT, emerging market countries reduce inflation, consolidate their fiscal position, and experience significant financial deepening. Industrial countries exhibit no strong pattern regarding changes in inflation or in their fiscal position and level of financial deepening prior to adopting FFIT. These results suggest that emerging market countries have to work harder at improving credibility before adopting FFIT.

Table 11. Changes in Key Indicators Prior to Adoption of FFIT 1/

	t (year of Adoption of FFIT)	CPI Inflation 3/	Fiscal Indicators		Financial System Indicators	
			Gen. Gov. Bal. to GDP 3/	Central Gov. Debt to GDP 2/	Brd. Mon. to GDP 2/	St. Mkt. Cap. to GDP 2/
Australia	1993	-6.0	-5.3	15.7	6.6	38.8
Canada	1991	1.0	-2.2	25.8	15.1	-11.2
Iceland	2001	4.1	2.2	-19.1	15.5	N/A
New Zealand	1989	-19.1	3.3	-19.6	109.0	N/A
Norway	2001	0.7	9.6	-21.8	-2.4	N/A
Sweden	1993	-5.0	-14.3	24.9	3.5	-14.8
United Kingdom	1992	0.5	-5.1	-18.4	6.8	-4.4
Brazil	1999	-36.9	-2.5	61.2	11.9	4.3
Chile	1999	-3.6	-4.3	-20.1	18.6	-17.7
Colombia	2000	-9.6	-2.4	81.7	-5.9	-25.5
Czech Republic	1997	-6.8	-1.6	-33.4	0.8	92.0
Hungary	2001	-6.8	1.3	-11.0	1.6	51.7
Israel	1997	-1.5	-2.3	-13.4	14.7	-32.5
Korea	2000	-3.1	-0.2	70.0	69.2	327.4
Mexico	2001	-10.3	3.5	-19.3	-12.3	31.0
Poland	1999	-14.3	-0.3	-16.0	19.7	203.4
South Africa	2000	-2.7	2.6	-1.9	10.4	23.4
Thailand	2000	-4.8	-2.8	389.7	8.1	33.1
Median						
Industrial countries		0.5	-2.2	-18.4	6.8	
Emerging market countries		-6.8	-1.6	-7.7	10.4	27.2
Countries with negative values						
Industrial countries		3	4	4	1	3
Emerging market countries		11	8	6	2	3

Sources: IFS, World Economic Outlook, and World Bank Global Economic Indicators databases.

1/ Difference between indicator average over years t-1 and t over indicator average in years t-4 and t-3. These calendar year figures may differ from fiscal year figures reported by the authorities.

2/ Difference in terms of percent change.

3/ Difference in terms of difference.

4/ Output gap is difference between actual real GDP and its five year centered moving average.

## VI. CONCLUSION

This paper exploited the increasing number of inflation targeting countries to gain insights into the appropriate design of monetary policy conditional on a country's circumstances. Inflation targeting countries choose not to adopt a fixed exchange rate so as to maintain an independent monetary policy and limit their vulnerability to an exchange rate attack, while a monetary target is not practical owing to instability in money demand. Some 42 medium and large countries use an inflation target as their defining monetary objective.

These countries separate into three separate inflation targeting regimes based on the clarity and credibility of the central bank's commitment to the inflation target. Clarity was gauged by the public announcement of the inflation target and by the institutional arrangements in support of transparency and accountability to the target. Credibility was proxied by the actual inflation outturn and by market ratings of long-term local currency government debt.

Empirical analysis suggested that the different levels of credibility across the regimes correspond to underlying economic structure. In particular, the overall level of development, the level of financial development, and the severity of restrictions on central bank financing of the government are highest for EIT countries and lowest for the FFIT countries.

The inflation targeting regimes can be viewed as corresponding to different welfare maximizing combinations of policy objectives, each conditional on a country's "endowed" level of credibility. The ultimate purpose of monetary policy is to maximize social welfare by attaining high and stable growth in the long run. Monetary policy can support long run growth through a combination of inflation in the low single digits, financial stability, and output stabilization. The welfare maximizing combination of these three objectives in the policy framework depends on a country's level of credibility.

The three inflation targeting regimes can be described in terms of the weights of the three possible policy objectives and the clarity of the commitment to the inflation target. FFIT have medium or high levels of credibility and enjoy a large degree of financial stability, but are not able to maintain low inflation without a clear commitment to an inflation target. Their clear and transparent commitment to the inflation target comes, however, at the price of less flexibility for output stabilization. EIT countries already have low inflation and financial stability, and thus are able to credibly aim at price stability, and also have flexibility to smooth output. Their dual objectives mean that they cannot operate with as much transparency as FFIT countries. ITL countries do not have sufficient credibility to maintain low inflation and are more exposed to financial and cyclical shocks. Thus, they do not aim at low inflation, but, rather, afford themselves full flexibility to deal with shocks.

The analysis of the different regimes offers guidance for switching from one regime to another. This paper does not take a view on the switch from EIT to FFIT by countries like the U.S. and Japan, which has been recommended elsewhere. The switch from FFIT to EIT would be warranted if the inflation-fighting credibility of the central bank was so well



entrenched that it could temporarily shift to other objectives without an increase in inflation expectations, but no country has actually made this switch.

The paper provides policy implications for the switch from ITL to FFIT by emerging market countries. Reforms to develop deep and sophisticated financial markets should be formulated and implemented before adapting FFIT to allow the use of a short-term operating interest rate target and open market operations (Carare and others, 2002). Transparent and enforceable restrictions on central bank financing of the government should be introduced, ideally through changes in the legal framework.

The general results of this paper, especially the importance of the level of financial development, ties in with the recent literature on foreign exchange rate regimes. Hausmann and others (2001) concludes that exchange rate instability is rooted in the inability to issue debt in their own currency ("original sin"), which is corrected mainly through financial sector development. In a similar vein, Caballero and Krishnamurthy (2001) explicitly model the role of limited financial development in emerging market country financial crises. This paper provides evidence that domestic financial market development is central not only to exchange rate and financial stability, but also to the revealed preference for different inflation targeting regimes.

The emergence of separate inflation targeting regimes combined with the fading of monetary targeting may suggest a new perspective on nominal anchors. Today, monetary regimes can be classified for analytical purposes into six categories along a spectrum defined at each end by hard commitments to an exchange rate and inflation targets: (i) dollarization, (ii) currency board, (iii) pegged exchange rate, (iv) EIT, (v) ITL, and (vi) FFIT. This choice set provides another way to look at nominal anchors as an alternative to the traditional exchange rate/monetary target/inflation target classification. A single spectrum for nominal anchors could help countries choose the appropriate nominal anchor conditional on their circumstances.

Finally, the emergence of inflation targeting regimes looks to raise potentially important issues for future research. The explanatory power of real GDP per capita in the trinomial regressions suggest that it is serving as a proxy for structural factors that underlie credibility, such as labor market flexibility, that merit further research. The conflict between the clarity needed for the inflation objective under FFIT and the constructive ambiguity characteristic of financial stability policies warrants further analysis. Research on whether financial stability should be explicit in the central bank objective function (via the central bank law) and on how central banks can intervene in foreign exchange markets to maintain stability while not impairing the credibility of the inflation target would be of interest to central banks. The role of time inconsistency in the motivation for medium credibility countries to adopt FFIT is not well understood. Finally, there is relatively little research on the challenges to monetary policy under an ITL regime (Stone, 2002).

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