CHAPTER 2

First Principles

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Inflation targeting implies inflation-forecast targeting. —L. E. O. Svensson (1997)

Inflation-forecast targeting represents the frontier of flexible inflation targeting. This chapter reviews its development as a monetary policy regime, particularly how that development was influenced by trends in economic theory, by pragmatic learning-by-doing, and by the experience of inflation-targeting central banks.[1] Box 2.1 provides some examples of how certain central banks transitioned to full-fledged inflation-forecast targeting.

THEORY AND PRACTICE

The volatile inflation of the 1970s made a lasting impression on the central bankers who came to run monetary policy in the succeeding decades. Two post–World War II regimes had failed to keep inflation under control. The Bretton Woods system, with fixed exchange rates pegged to the US dollar as the reserve currency, relied too optimistically on low inflation in the United States and did not provide an efficient means for adjusting to asymmetric international shocks. After the breakdown of the Bretton Woods system in the early 1970s, monetarist-inspired policies were adopted, directed at stable money growth, but these rapidly fizzled out, undone by financial innovations and instability in the demand for money. Neither system provided a reliable nominal anchor.

Lower but chronic inflation in the 1980s seemed to fit the Kydland and Prescott (1977) time-consistency theory, which predicted that discretionary monetary policy has a bias toward inflation because of the perennial temptation to boost output through surprise bursts of monetary expansion. To solve this alleged problem, Barro and Gordon (1983) proposed removing discretion from the central bank, to constrain it to a time-consistent price-stability objective. The idea did not resonate with central bankers, who were aware from experience that tactical room was needed to deal with complex and unpredictable developments. But they did see the practical logic in a binding commitment to price stability, defined as a state in which people expect a low rate of increase in consumer prices to

[1]This section draws on Alichi and others (2015) and Clinton and others (2015).

prevail over time. The practical issue raised by the time-consistency theory therefore became how to establish the credibility of the goal while retaining discretionary control over monetary policy instruments.

The Reserve Bank of New Zealand (RBNZ) introduced inflation targets as the foundation for its monetary policy in the heyday of time-consistency theory. However, this landmark reform was driven more by a pragmatic effort to address the country's chronic inflation problem than by any academic trend. Indeed, from the viewpoint of time-consistency theory, announcing a numerical target for low inflation was an incomplete solution to the alleged dilemma. Missing was a constraint to credibly commit the central bank to the target, that is, to prevent short-term actions to boost inflation and output.

Whether the theory was valid or not, the preceding decades of unstable inflation did mean that inflation-targeting policymakers faced a large initial credibility problem. They therefore put great store in getting inflation down to a rate no higher than the initial numerical targets. The RBNZ started out in 1990 with a rigid approach that succeeded in producing a rapid decline in inflation, down in fact to the long-term target, but also produced a recession. The approach paid insufficient attention to the lagged effects of policy actions. The short targeting horizon led to instability, with volatility in the policy interest rate, in the exchange rate (which at the time the RBNZ manipulated through interest-rate differentials as the effective policy instrument), and in output.

The Bank of Canada, which adopted explicit inflation-reduction targets a year later, also implemented a very tight monetary policy stance to bring inflation down fast. In the Canadian case, the focus on short-term results led to a steep recession and a slow recovery.

By the late 1990s, after inflation stabilized at the low target rates, it became clearer that the key to establishing confidence was not rigid adherence to numerical targets from one year to the next, but rather a transparent strategy to eliminate over time any deviations that arose. The idea of transparency as a credibility-building device moved to the forefront. Announcing an explicit numerical target was itself a major step toward clarifying what monetary policy was aiming to achieve. Central banks took further steps to open their communications through regular monetary policy reports (which are sometimes called inflation reports), speeches by senior officials on strategy, media briefings after interest rate decision meetings, and so on.

By the turn of the millennium, one could argue that the transparent pursuit of a low-inflation objective by politically accountable central banks had provided a solution to the time-consistency problem. That is, inflation targeting had apparently removed inflation bias from discretionary policy. Another interpretation of the evidence would be that successful control over inflation in many countries during the 1990s (not just in inflation-targeting countries) refuted the time-consistency theory: Central banks were showing no sign of reneging in favor of short-term output goals. Indeed, policymakers in general, governments as well as central banks, did not display the short-sighted bias at the heart of the argument. Governments left and right of center have since supported the low-inflation

Box 2.1. Learning from Experience

In 1990, New Zealand was the first country to embark on inflation targeting. Today it has a full-fledged inflation-forecast targeting (IFT) regime, and its monetary policy credibility has deepened over time.

As the pioneer, the Reserve Bank of New Zealand (RBNZ) had to learn by doing. Inflation fell quickly, to less than 2 percent in 1992, but the use of the exchange rate as the main policy instrument led to instrument instability. The RBNZ introduced the first fully structured framework for conducting policy under IFT, the forecasting and policy analysis system (FPAS), in 1997, and jumped straight to IFT, with immediate full disclosure of the central bank forecast. The RBNZ's implementation of the FPAS benefited from the experience of the Bank of Canada, which adopted the FPAS on its initial move to inflation targeting in 1991. Elements of Canada's FPAS—which includes a forward-looking forecasting model—were already being put in place as part of the existing policy of price stability, which was not defined numerically but was understood to involve a long-term objective for inflation below 2 percent. The program announced in early 1991 had an eventual target of 2 percent, which has been unchanged since. It took several years to anchor expectations, but after fiscal policy was put on a sustainable footing in 1995, long-term inflation expectations soon stabilized at the 2 percent target rate.

The Czech Republic adopted inflation targeting in 1998. The preceding year had brought the collapse of a fixed exchange rate policy and widespread bank failures. There were lingering difficulties in the transition to the post-communist market economy, with important prices yet to be liberalized. Inflation had been in the upper single digits since 1993 and was accelerating at the time inflation targeting was adopted. With assistance from Bank of Canada staff and the IMF, by 2002 the Czech National Bank was using a purpose-built FPAS with a model-based forecast. The Czech National Bank began publishing its quarterly forecast in detail, including the forecast path for the interest rate, in 2008. Surveys of inflation expectations for the past decade have shown strong public confidence in the 2 percent target.

The RBNZ and the Czech National Bank remain today at the forefront of monetary policy transparency.

objective, albeit in different ways: by a formal instruction where the central bank does not have goal independence (for example, the United Kingdom), by an endorsement where it does (for example, the Czech Republic), or by a statement of agreement where the government and central bank jointly assume responsibility for the goal (for example, Canada).

Under typical arrangements for inflation targeting, the central bank is accountable for its conduct of monetary policy to the government or parliament and, implicitly, to the public. This means that the central bank must have *instrument independence*—that is, unfettered authority to adjust its policy instruments sufficiently aggressively to anchor inflation and inflation expectations.[2] In large part because of the clear delegation of responsibility, implementation of inflation targeting has been accompanied by a vast increase in the transparency of the

[2]Some central banks, in addition, have *goal independence*—they may set their own objectives (Fischer 1995).

conduct of monetary policy, a good thing from the viewpoint of democratic governance. Central bank independence is not an end but a means to protect monetary stability from the risks of short-term political interference. On these grounds, the decisions of the central bank should be subject to political scrutiny, not day by day, but at regular intervals. If inflation targeting is a system of constrained discretion, then accountability provides the means to ensure that discretion is used within the designated constraints and to the specified ends. Accountability without transparency means nothing.[3]

Moreover, during the 1990s, central bankers realized that the better their policies were understood, the more effective they were—a remarkable turnaround within one generation for a profession formerly reputed (not entirely fairly) for its secrecy.[4] Regarding publication of explicit numerical forecasts, the debate has been about how much to disclose—in particular, which elements of the quarterly macroeconomic forecast the central bank should release. Publishing the forecast for inflation and output has not been controversial because policymakers have to show the public they have a plan for keeping inflation on target and that the plan recognizes the potential short-term implications for output.

In an influential contribution, Svensson (1997) pointed out that the central bank's inflation forecast represents an ideal conditional intermediate target, since it takes into account all available information, including the preferences of policymakers and their views on how the economy works. This implies balancing the deviations of inflation from target against deviations of output from potential—in effect recognizing a dual mandate in the implementation of policy.

The history of inflation targeting and of its transition to full-fledged inflation-forecast targeting follows a line of openness or accountability. Milestones along the way have been the following:

- The announcement of targets with a multiyear horizon—clarity on targets
- Precision on the policy interest rate setting—clarity on the instrument[5]
- Transparent communications on policy implementation[6]
- Publication of a complete macro forecast (including inflation)—clarity about the intermediate target
- Publication of a conditional forecast path, alternative scenarios, and confidence bands for the short-term interest rate (full-fledged IFT)

[3]Bernanke and others (1999) and Freedman and Laxton (2009) discuss the themes of this paragraph in more depth.

[4]Compare Acheson and Chant (1973) with Chant (2003).

[5]For most advanced economies, a short-term interest rate is used as the policy instrument. However, when central banks have been constrained by the effective lower bound, they have used either large-scale asset purchases (Chapter 12 on the United States) or the exchange rate (Chapter 10 on the Czech Republic). In some countries where their economies are very open (such as Singapore), the more effective instrument could be the exchange rate instead of the short-term interest rate even during normal times.

[6]See Chapter 5 for discussions related to monetary policy operations.

Newcomers to inflation targeting do not have to pass each one of these milestones; the road has been tested and smoothed over several decades. Depending on the available technical capacity, a central bank can enter the road at any point. An international survey of inflation targeters revealed that all started from unpromising initial conditions (Batini and Laxton 2007). None began with a reputation for stable low inflation. Many were emerging from a crisis that had shaken confidence in the monetary authorities (Czech Republic, Sweden, United Kingdom). Some were in the midst of economy-wide structural changes that would completely alter the transmission of monetary policy (Czech Republic, New Zealand). Special problems in certain countries enfeebled the monetary transmission mechanism (for example, dollarization in Peru and severe financial fragility in the Czech Republic). Among the early adopters, only the Bank of Canada had anything close to a forecasting and policy analysis system that was up to the task—a common omission being the lack of an appropriate policy model. None had the external communications program required to explain to a broad public how the monetary policy objective was to be achieved and maintained. Experience therefore denies that there is a demanding list of prerequisites—if you can conduct useful monetary policy at all, you can adopt inflation targeting. However, it is the case that central banks that adopted inflation targets quickly put in place a suitable framework for making the regime effective, even if those frameworks remain works in progress.

The level of development of the economy, and the technical tools available to the central bank, might well affect what form of inflation-targeting regime is most appropriate. For example, in an emerging market economy the central bank might not yet have a model on which it wants to rely for publishing forecasts, whereas the US Federal Reserve has for many years possessed robust, technical models that would support full and formal disclosure.

THE NUMERICAL LONG-TERM TARGET

Over the long term, the main choice variable for an independent monetary policy is the rate of inflation, at least in major advanced economies functioning without disruptive upheavals. If the mandate of the central bank has price stability as the overriding objective, defining an operational objective entails specifying the rate of increase in consumer prices deemed to be consistent with price stability.

Summers (1991), in a contribution that preceded the widespread adoption of inflation targets, lays out the main considerations. High rates of inflation—in the double digits or higher—impose significant costs on the economy through reduced growth, allocative inefficiencies, distortions to the tax system, inequitable redistributions of income, and labor market strife (see, for example, Sarel 1995). The evidence on the economic costs of slightly lower long-term rates of inflation—say, from 2 to 8 percent—is less clear-cut. However, a zero rate of increase for the consumer price index (CPI) over the long term would not be a good target, for a number of reasons. Measurement error produces an upward bias in the official, published CPI, so that a zero target would effectively mean deliberate long-term deflation, rather than price stability (Boskin and others 1996). A very low positive

CPI target—less than 1 percent—would be more consistent with literal price stability, but it would imply that the economy undergo deflation almost half the time. And deflation in advanced economies has usually (although not always) been associated with bad outcomes for employment and growth. For example, other chapters of this book explore how deflation, combined with the floor on the interest rate, may become a trap for the economy, locking in chronic underperformance.

Most advanced economies have settled on a long-term official target rate of 2 percent. This is ample to cover the upward measurement bias, and until the global financial crisis, it seemed high enough to avoid the deflation trap. Since then, however, prolonged below-target inflation and weak growth have led many economists to recommend a higher target (see Williams 2009, 2016; Blanchard, Dell'Ariccia, and Mauro 2010; Clinton and others 2010; Ball 2014; Kiley and Roberts 2017). A key underlying factor in their arguments is that the real equilibrium interest rate has fallen substantially this century, and may not be much above zero. With a near-zero floor on the nominal interest rate, and 2 percent expected inflation in the long term, conventional monetary policy would be hard pressed to provide appropriate stimulus in a recession. If the long-term target were, say, 1 to 2 percentage points higher, then conventional interest rate policy would be that much more effective in real terms. Proponents point out that the evidence does not suggest that such an increase in the target rate of inflation would have long-term negative effects on output.

Major central banks, however, have stuck with their original targets. Raising them would raise questions of credibility and time consistency. For example, having committed to a target of 2 percent for the long term, after you raise the target to 3 or 4 percent how do you convince the public that you will not raise it to 5 percent or 6 percent whenever it seems expedient?[7] More fundamentally, many central bankers take a conservative view of the mandate for price stability—and this conservatism may itself be an asset worth preserving for the credibility of policy (Rogoff 1985).

Lower-income countries experience larger inflation rate shocks than advanced economies because of the larger proportion of fresh food and energy in the consumer basket. Prices of these staples are subject to volatility resulting from developments in international markets, from year-to-year variations in harvests, and in some situations from changes in government controls. Divergences between core inflation (which excludes fresh food and energy) and headline inflation are wider than in advanced economies. This might justify a somewhat higher target for headline inflation (Chapter 11 covers the case of India).

While recognizing the initial success of inflation targeting, there were suggestions beginning in the late 1990s that price-level-path targeting might be an approach that is more consistent with the mandate for price stability, which is

[7]Structured research to compare the benefits and costs of choosing a particular inflation target is essential. For example, the Bank of Canada invites and conducts research every five years leading up to the Renewal of the Inflation-Control Target agreement between the Canadian government and the central bank.

largely meant to mean reducing long-term uncertainty over price levels. This approach has been put forward by several academics (Svensson 1999; Cecchetti and Kim 2005) and central bankers (King 1999; Dodge 2005).

The potential benefits of price-level-path targeting were again highlighted in response to the poor economic recovery after the global financial crisis. For example, Coibion, Gorodnichenko, and Wieland (2012) and Williams (2016) suggested that price-level-path targeting would have provided a framework to allow central banks to use their instruments more aggressively to eliminate economic slack faster by planning to have "lower-for-longer" interest rates and temporarily overshoot their long-term inflation objectives.

The Bank of Canada launched an ambitious research effort to investigate the possibility of price-level-path targeting in the renewal of the inflation-control target framework in 2006. Informed by the research, the bank reached the view that realizing the theoretical net benefits of the approach would likely be challenging in practice (Bank of Canada 2011). Interestingly, from the adoption of a 2 percent inflation target in the fourth quarter of 1999 until the global financial crisis, Canadian prices strayed very little from the trend path implied by the 2 percent inflation target, and they tended to revert to that path after temporary deviations—something that looks like a successful price-level-path targeting regime. Kamenik and others (2013) study the Canada case and show that some planned overshooting (or undershooting) of inflation over the target may be consistent with optimal monetary policy under uncertainty.

SOME PRINCIPLES OF INFLATION-FORECAST TARGETING

Underlying inflation-forecast targeting is the principle that, given a long-term objective for the rate of inflation, the central bank's own forecast of inflation is an optimal, conditional, intermediate target. This is because the forecast, in principle, embodies all the relevant information available to the central bank, including knowledge of the policymakers' preferences about the trade-off between deviations of inflation from target and output from potential and the bank's view of the monetary policy transmission mechanism.

The basic features of inflation-forecast targeting are these:

- Monetary policy uses the instruments (typically the policy interest rate) to achieve an official low-inflation target over the medium term (within about two years in practice).
- The central bank's economic forecast contains a path to the official target that is an ideal intermediate target for managing the short-term output-inflation trade-off.
- The staff forecast is a key input into the decision of the monetary policy committee, but only one input among others—committee members need not agree with the forecast and can incorporate other information into their decision-making.

- The staff uses a core model, with standard macroeconomic properties, to derive the forecast. The model-based forecast provides a basis both for policy decisions and for explaining the economic logic underlying these decisions in public communications. (The forecast path for the short-term interest rate—the policy instrument—is endogenous in the model, with the rate varying to achieve the long-term inflation target and to eliminate any output gap).

The last point should be emphasized: the policy interest rate responds to eliminate any deviations between actual inflation and its objective.

The forecasting and policy analysis system organizes the quarterly forecasting exercise around a core projection model (Laxton, Rose, and Scott 2009; see also Chapter 4). The typical core model is a quarterly macroeconomic model of moderate size that incorporates the central bank's knowledge of the policy transmission channels. It contains a reaction function for the policy interest rate that captures the preferences of the policymakers relative to the short-term trade-offs between the variability of inflation, output, and the interest rate.

Having an efficient forecasting and policy analysis system is essential. The staff presents a baseline forecast and alternative forecasts based on different assumptions about the economy or the policy reaction function. The monetary policy committee in effect receives a menu of alternative forecast paths for the policy rate. Each interest rate decision stems from the committee's view of the best path of the policy rate over the medium term, taking into consideration both the short-term trade-off against output that is implied and the requirement to ensure that actual inflation does not deviate too much from target over the medium term.

Many of today's inflation-targeting central banks, under this definition, would be considered inflation-forecast targeters. Examples of established and credible inflation-forecast-targeting central banks are the RBNZ, the Bank of Canada, the Central Bank of Chile, and the Czech National Bank. Developing a forecasting and policy analysis system from scratch has become easier because of the increased opportunities to learn from others. Indeed, as Norges Bank has shown, it has become possible for newer entrants to leapfrog the pack and jump straight to the frontier.

The pragmatic requirements within the central bank for an operational inflation-forecast-targeting regime are these:

- A structured forecasting and policy analysis system maintains relevant databases and produces a model-based staff forecast and associated economic analysis on a regular schedule.
- Policymakers and technical staff maintain communications to ensure that the forecast addresses the main broad concerns of the monetary policy committee.
- The forecast team presents policymakers with the forecast—which at least once a quarter would come from a full forecasting exercise, or in between

from an update just to the main variables—shortly before each rate-setting meeting.

Inflation-forecast targeting also implies a transparent communications strategy. A typical schedule following a policy decision is as follows:

- The same-day announcement (press release) sketches a brief rationale.
- The central bank governor gives a review of the policy decision and the economic outlook at a press conference. Staff members may answer the more technical questions.
- A monetary policy report or inflation report explains in greater depth the rationale for the policy actions. The report provides the baseline forecast path, usually quarterly, for the main goal variables, inflation and output growth, and for other macroeconomic variables. The latter include a conditional forecast for the short-term interest rate, for most central banks just in general qualitative terms, but for the *avant-garde* of inflation-forecast targeters it is an explicit numerical path.
- Presentations and publications underline conditionality and uncertainty by showing confidence bands around the baseline for relevant variables and by considering alternative scenarios with different assumptions for specific shocks germane to the economic conjuncture. These exercises do not just warn of the risks, they also give the public insight into how the central bank might respond to a range of shocks.

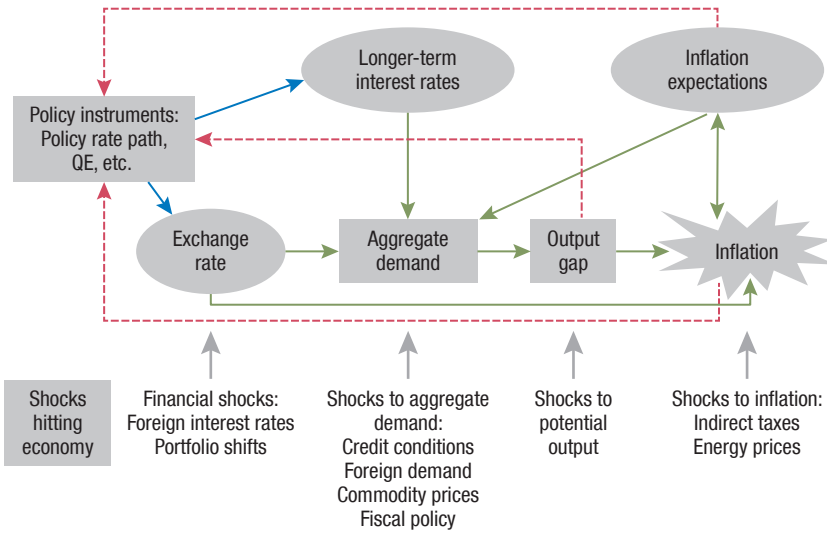
THE NOMINAL ANCHOR: AN ENDOGENOUS POLICY RESPONSE

The credibility of the long-term inflation target underpins inflation-forecast targeting. Everything pivots around the anchor provided by the firm public expectation that monetary policy will keep inflation stable and near the official target rate. This in turn requires that policy responds systematically to the requirements of this objective. Figure 2.1 depicts a model of the process.

With a forward-looking policy, the expected path of the policy interest rate is adjusted when unanticipated disturbances hit the economy in an attempt to bring inflation back to the target while keeping disruptions to output to a minimum. This policy feedback, through an endogenous short-term interest rate, is represented by the red dashed arrows in Figure 2.1. It ensures that the nominal anchor holds.

In the general situation, where the actual inflation rate differs from the long-term target, monetary policymakers have a choice as to how to respond. The approach may be more or less rapid, depending on the preferences regarding the short-term output-inflation trade-off. It might involve a smooth approach or a planned overshoot. Out of the available options, the central bank will implement the one that "looks best," that is, the one that reflects its judgment as to the best

Figure 2.1. Inflation-Forecasting Targeting: Feedback Response and Transmission



Source: Authors' construction.
Note: QE = quantitative easing.

outcome relative to the trade-offs between inflation and output and the variability of the interest rate.[8]

For example, consider a positive shock to energy prices. If policymakers put a high relative weight on stabilizing the inflation rate, they will respond with a relatively sharp increase in the policy rate to return inflation quickly to target and implicitly accept the negative short-term consequences for output as a necessary cost. The forecast team would take account of the ramifications on all external variables, for example, the demand from trading partners, and then use the core model to simulate the impact on the domestic economy. The baseline forecast, using the standard policy response of the model, would imply an interest rate path that, over the medium term, returns inflation to its long-term target rate, while taking into account the trade-off between the costs induced by inflation being away from target and the costs of output gaps. Other policy responses might also be simulated to provide policymakers with a menu of options. In each case, an entire chronology would be created for future short-term interest rates,

[8]For a discussion of the theory and practice of flexible inflation targeting, see Svensson (2010). In part, the judgment is equivalent to choosing among outcomes that impose a different weight on the relative importance of the deviation of output from potential relative to the deviation of inflation from its target along the path back to equilibrium. Qvigstad (2005) provides a Norwegian central banker's pragmatic description of this choice.

of which the next rate-setting decision would be the first step. The forecast team might also provide forecasts based on several scenarios in which very different assumptions are used for oil prices or, for that matter, for other exogenous variables. Associated with each simulation would be confidence bands for the key variables, reflecting the normal range of random factors that may affect the forecast. In making their decision, policymakers would decide on one of the alternative endogenous paths for the interest rate.

A full description of the central bank's policy decision would entail the entire future path of the policy rate, not just the current level of the policy rate. The likely course of the interest rate would be a theme for the subsequent round of external communications, through post-decision-meeting media briefings and press conferences, the monetary policy (or inflation) report, and so on. In the most transparent case, the central bank would publish the endogenous path for the short-term interest rate along with the confidence band.[9]

Expectations of future policy rate movements over the short to medium term play a crucial role in the transmission mechanism, as depicted by the blue arrows pointing at the ovals labelled *Longer-term interest rates* and *Exchange rate*. The cost of borrowing for businesses and households is not the very short-term rate directly controlled by the central bank. They borrow at longer terms. Policy affects the rates they pay more through the impact of the policy rates expected in the future, and hence the level of the whole yield curve, than through the current policy rate itself. This is reflected in the rectangle for the "Policy Rate Path"—the *whole path* expected for the medium term, not just the current setting, is what counts.

Use of an exogenous interest rate path (including a path derived from current market forward rates) in a forecast is inconsistent with inflation targeting. If the figure were modified to represent an exogenous interest rate path, the red dashed feedback arrows would be erased.

CONCLUSIONS

Inflation-forecast targeting constitutes a transparent, flexible approach to inflation targeting. Academic theorizing has influenced its development, but practical experience has built the main foundation of its principles.

Inflation-forecast targeting does not require rigid actions designed to hit the target from year to year. The approach recognizes that monetary policy has objectives for output and employment in the short to medium term, as well as for inflation, and that monetary policy takes effect with a considerable lag. Since the central bank's own forecast accounts for all relevant information, including policymakers' preferences about the short-term trade-off between output and employment, it is an ideal intermediate target for monetary policy.

[9]For example, see Clinton and others (2017) for a discussion of the Czech experience with publishing the path of the policy rate.

A guiding principle is that inflation-forecast targeting establishes confidence that inflation will converge to the official target rate. For this, the central bank must consistently use the policy instrument to return inflation to target. Since it may take a year or two to eliminate a substantial deviation, actual inflation might be off-target for prolonged periods. When the public understands this, long-term expectations hold firm to the target even through fluctuations in the actual rate of price increases—and the nominal anchor is stable. To this end, transparent communications are important, as discussed in detail in Chapter 8.

Efficient implementation relies on a forecasting and policy analysis system that is designed specifically to support inflation-forecast targeting. An essential part of this is a macroeconomic forecasting model in which the policy interest rate is determined by a systematic policy reaction. The instrument must respond to any disturbance to keep inflation on track to reaching the fixed official target.

Some important conditions must be met for inflation-forecast targeting to work effectively. These include a well-functioning monetary transmission mechanism, central bank instrument independence, and no fiscal dominance (Batini, Kuttner, and Laxton 2005). However, when monetary policy is constrained because interest rates remain at or close to zero (the "effective lower bound"), use of unconventional monetary policy instruments may be required as well as a fiscal backstop. These issues are discussed in detail in the chapters on Canada (Chapter 9) and the United States (Chapter 10).

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