C.D. Howe Institute
COMMENTARY

MONETARY POLICY

How Flexible Can Inflation Targeting Be?
Suggestions for the Future of Canada's Targeting Regime

Thorsten V. Koeppl

In this issue...
Ideally, the design of Canada's inflation targeting regime after 2011 will reflect an optimal degree of flexibility to help balance the need for active policymaking with the value of being committed to low inflation.

C.D. Howe Institute
Institut C.D. Howe

C.D. HOWE
INSTITUTE

50

1958–2008

INSTITUT
C.D. HOWE

The Study in Brief

In Canada, inflation targeting is widely agreed to have been a success story, but questions about how the regime might be fine-tuned in 2011 remain open. This *Commentary* asks how much discretion an inflation-targeting Bank of Canada can be allowed without compromising the credibility of its low inflation goal, and suggests a two-pronged approach to refining its procedures. One prong strengthens the commitment to inflation control by tightening the explicit design of the targeting framework, and the other adds policy flexibility.

Three specific suggestions are developed:

- The inflation target should be moved down to, say, zero to 2 percent, and 2 percent should become a cap on inflation that triggers a policy reaction, once inflation threatens to breach this bound. These changes would strengthen the Bank's commitment to price stability and more firmly anchor the public's inflation expectations. They might also lead to the Bank taking a more proactive role in response to financial market developments.

- Policy flexibility should be enhanced by permitting variation in the time horizon over which the inflation target is regained after a deviation. Large shocks could provide a rationale for lengthening this horizon, for example, but should the Bank resort to such event-contingent flexibility, it should offer an explicit justification for doing so and commit to a specific path for returning to the target.

- Explicit inflation-forecast targeting should be adopted. This would improve the transparency of policy decisions and establish better communication between the Bank and the public. Such targeting would involve regularly updating a forecast time path for inflation and for the interest-rate changes needed to achieve it. The publication of such a conditional time path for future policy would help to anchor the public's inflation expectations more firmly, and also make it easier to monitor policy and hence hold the Bank of Canada accountable for any deviations from what seems optimal in the light of past and current circumstances.

The Author of This Issue

Thorsten V. Koeppl is Assistant Professor in the Deparim ent of Econom ics at Queen's University.

Rigorous external review of every major policy study, undertaken by academics and outside experts, helps ensure the quality, integrity and objectivity of the Institute's research.

About the Institute

The *C.D. Howe Institute* is a leading independent, economic and social policy research institution. The Institute promotes sound policies in these fields for all Canadians through its research and communications. Its nationwide activities include regular policy roundtables and presentations by policy staff in major regional centres, as well as before parliamentary committees. The Institute's individual and corporate members are drawn from business, universities and the professions across the country.

INDEPENDENT • REASONED • RELEVANT

The issue of flexibility is at the centre of any targeting regime used to conduct monetary policy. Such a regime is often described as a form of "constrained discretion" in that it is designed to constrain a central bank to achieve low and stable inflation, while allowing it some freedom to react in a discretionary, but transparent fashion to shocks that hit the economy.

But once a central bank has established low inflation, how much discretion can it really afford without compromising its reputation for low inflation?[1]

In Canada, inflation targeting has been a success story since its inception in 1991. The targeting regime successfully reduced inflation, as measured by the consumer price index, to a level close to 2 percent. More important, the market perceived the commitment to this target as credible. By 1998, inflation expectations had started to fall well within the range of 1 to 3 percent in which the Bank of Canada intends to keep inflation in the medium run. And throughout the past decade, those expectations have remained well within this range (see Figures 1 and 2).[2] With inflation now credibly anchored at the 2 percent target, discussion has shifted toward the need to fine-tune Canada's monetary policy regime.[3] This *Commentary* revisits the question of how flexible inflation targeting should be, and derives implications for the review of Canada's targeting regime in 2011.

Flexibility for a targeting regime comes in different forms. An important one concerns whether the central bank should pursue goals other than inflation. The overriding opinion in the academic literature is that commitment to low and stable inflation either takes precedence over other goals (such as high output and employment) or is complementary to other goals (such as financial stability). But an equally important question is how best to implement and maintain such a commitment. Ideally, the design of Canada's future targeting regime will reflect an optimal degree of flexibility. Details such as the horizon over which to achieve the target, or when deviations from the target are possible, can help balance the need for active policymaking with the value of being committed to low inflation.

These considerations suggest a *two-pronged approach* for fine-tuning Canada's targeting regime. One prong is to put even more emphasis on keeping inflation under control and to signal this in a simple fashion by tightening the design of the targeting framework. The other prong is to add the *right flexibility* to the framework by providing room for discretion when it is most needed: a flexible horizon for achieving the target in response to large shocks.
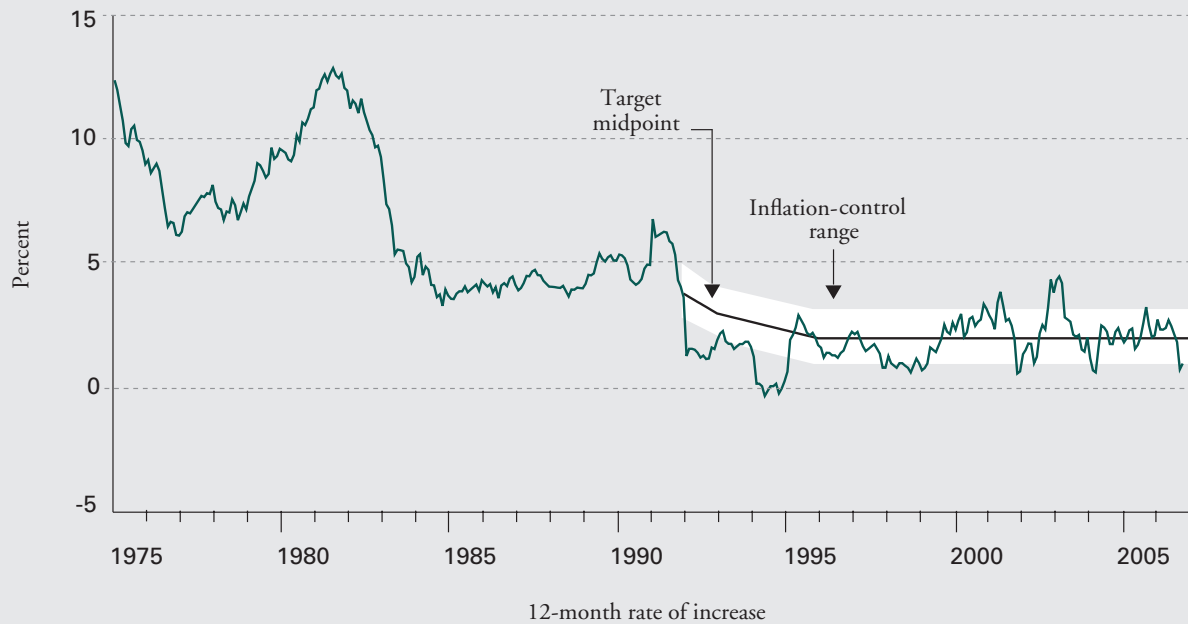
This *Commentary* offers three specific suggestions for improving the Bank of Canada's targeting regime.

- The level of the inflation target should be reevaluated. Moving the band down to, say, zero to 2 percent and emphasizing a cap on inflation at 2 percent seems to be an improvement over the current regime. A cap should be understood here as a trigger for a policy reaction, once inflation threatens to breach the upper bound of the band. This would strengthen the Bank's commitment to price stability and anchor people's inflation expec-

---

1   Murray (2006), reviewing the performance of inflation-targeting countries over the past two decades, argues that flexibility in targeting has increased somewhat over time. This could be explained simply by the fact that such a regime has to be quite rigid initially in order to start anchoring inflation expectations at a low level. Notwithstanding, there remains the question of what degree of flexibility a well-established, mature targeting regime can afford.

2   Survey-based measures of long-term inflation seem to have stabilized at 2 percent (see, for example, Bank of Canada 2006). Spreads between real and nominal bonds also have shown less volatility, even though one has to be careful in interpreting this evidence as reflecting more credible monetary policy (see, for example, Christensen, Dion, and Reid 2004).

3   See Bank of Canada (2006) for an outline of the issues regarding the overhaul of the targeting regime in 2011.
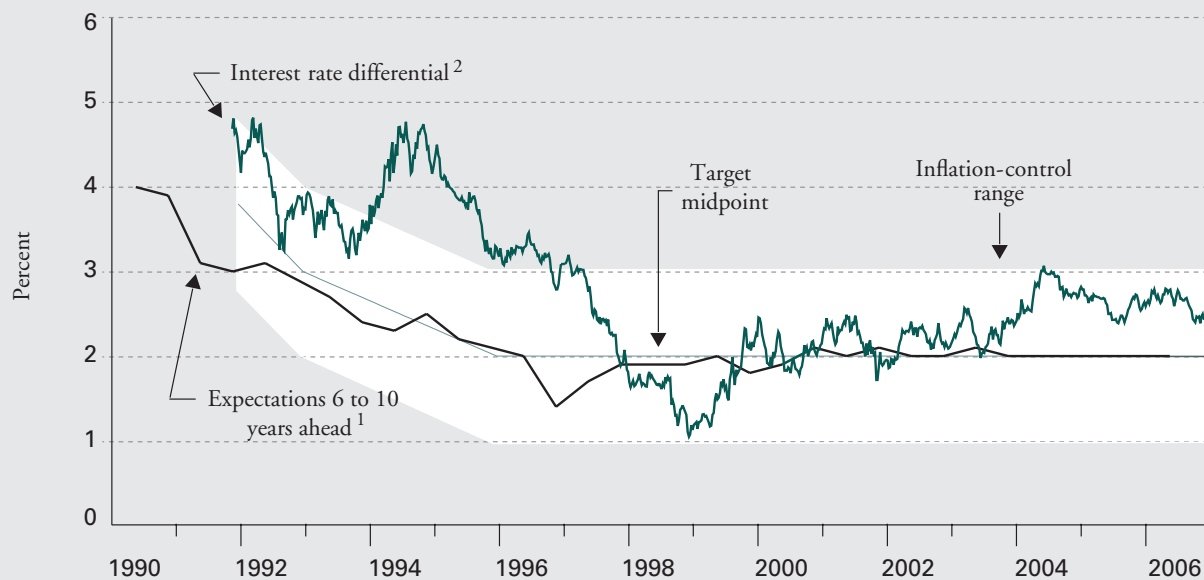
Figure 1: Consumer Price Index, 1975 – 2005

Note: Total CPI inflation is affected temporarily by changes in indirect taxes. The February 1994 tobacco cut reduced CPI inflation by 1.3 percent in 1994, and the July one-percentage-point cut in the Goods and Services Tax (net of a small contribution from two excise tax increases) reduced CPI inflation by 0.5 percentage points.

Source: Bank of Canada. 2006. "Renewal of Inflation Control Target – Background Information." November. Page 4.

Figure 2: Measures of Inflation Expectations, 1990 – 2006

1. Forecast 6 to 10 years ahead taken from the semi-annual survey by Consensus Economics Inc.

2. Interest rate differential on 30-year nominal and Real Return bonds (weekly).

Source: Bank of Canada. 2006. "Renewal of Inflation Control Target – Background Information." November. Page 5.

tations more firmly. It could also lead to a more proactive role in response to financial market developments.

- Flexibility for policy decisions could be retained by varying the horizon over which to achieve the target. Large shocks – for example, ones that threaten financial stability – could provide the rationale for lengthening the horizon, thus allowing for a temporary deviation from a tighter cap. Such a flexible *event-contingent* horizon, however, would require both a justification for any deviation and a commitment to a transition path that specifies how to return to the target over the horizon.

Inflation-forecast targeting (explained below) could improve the transparency of policy decisions and establish better communication. Outlining a conditional path for future policy responses would help to anchor inflation expectations more firmly when making a policy decision. It would also improve the enforcement of the targeting regime by revealing to the public any deviations from optimal policy actions in the light of past and current circumstances.

The *Commentary* is organized as follows. It begins with a discussion of what flexibility means in the context of a targeting regime. It then continues with a review of the academic literature dealing with the goals monetary policy should pursue. Less theoretically inclined readers might wish to refer only to the summary at the end of this section; others might benefit from the short appendix at the end of the paper that outlines a common theoretical framework for assessing monetary policy. The *Commentary* concludes with a discussion of whether the current parameters of Canada's inflation-targeting framework are appropriate, and reviews the target band, the horizon for the target, and its enforcement.

Three Types of Flexibility for a Targeting Regime

It is useful first to clarify what *flexibility* means within a targeting regime (a more formal development of some of the ideas presented here is given in the appendix). In general, there are three different layers of flexibility within a targeting regime. The first is the most elementary, and concerns the goals of monetary policy. The second layer refers to how a regime should achieve these goals, while the third layer refers to the actual implementation of these goals within the regime.

Goals other than Inflation

Flexibility can mean that monetary policy has objectives other than low and stable inflation. One can readily think here of an employment or output goal, but recent events have highlighted other relevant ends, such as exchange-rate stability or financial stability. Such goals for monetary policy can be derived from efficiency considerations or, alternatively, can be taken as mandated for the central bank by the political environment.[4] While the first approach corresponds to the economist's notion of optimal monetary policy, the second does not and serves mostly as a description of actual central bank behaviour.

A different distinction can be made between mandated (de jure) objectives and actual (de facto) objectives that the central bank pursues. De jure objectives are important, as they give a benchmark for holding the central bank accountable. A central bank, however, will often pursue other, intermediate or auxiliary goals that help it to achieve its mandate.[5]

Once the objective for a central bank includes some measure of inflation, the policy regime is often labelled as one that targets inflation. If it also contains other variables, it is often called a

---

4   One example is an "overambitious" (that is, inflationary) employment goal (see Svensson (1997b) who analyzes inflation targeting when a central bank receives such a mandate). Even though some inefficiencies or distortions could rationalize such a goal, it is reasonable to suggest that it is better to remove them at their source rather than through monetary policy. It is for this reason that I do not pursue the second view further here.

5   The Bank of Canada seeks to "contribute to solid economic performance and rising living standards for Canadians by keeping inflation low, stable and predictable" (see http://www.bankofcanada.ca/en/about/do.html). This low inflation objective is only tenuously related to the Bank's formal mandate as set out in the Bank of Canada Act. See Robson (2009, pp 1.2). To the contrary, the Federal Reserve has the more equally weighted objective of pursuing growth and low inflation, which derives from its governing legislation.

flexible targeting regime. The degree of flexibility then becomes an issue of how to weigh the different goals within the central bank's objective (see, for example, Svensson 1999). Tradeoffs among different goals depend on one's view of how policy and the economy interact and what type of shocks the economy faces. Ideally, then, these weights can be linked to some fundamentals in the economy, hence corresponding again to a notion of optimal policy. Alternatively, these weights can be viewed as imposed upon the central bank purely by political considerations.

In so far as achieving the goals involves a so-called time-consistency problem for the central bank, the weights themselves become design variables for a targeting regime. Such a problem arises whenever the central bank cannot commit to follow a particular conduct of policy and whenever there are incentives for it to deviate from such rules in order to realize short-term gains that are not optimal from a long-run perspective. By manipulating the weights, it is possible to curb flexibility, thereby realigning the central bank's incentives with the optimal long-run policy. For example, if one is concerned about future political pressure on the central bank to increase inflation in order to stabilize output, one could increase the emphasis on inflation in the bank's mandate.

Conditional Policy Rules

The second element of flexibility in a targeting regime refers to a description of how to achieve these different goals. Once an objective has been accepted as guidance for optimal policy, the task arises to formulate actual policy rules that enable the central bank to achieve its objective in light of shocks to the economy. In general, a policy rule specifies actions in a forward-looking manner as a function of past policy decisions, current circumstances, and projections into the future (see, for example, Woodford 2003). Actual policy is thus a full description of future actions that will be taken in response to economic developments. This aspect is especially important for a situation where long-run gains of commitment to a rule are endangered by short-run considerations.

Nonetheless, flexibility arises here in the sense that there is unlikely to be a single optimal, unconditional level for the variables that policy targets. Hence, a rule usually will give the central bank some leeway in its policymaking to achieve its specific objective (see, for example, Bernanke and Mishkin 1997).

The description of this optimal policy is likely to depend on the specific circumstances prevailing when it is taken. That is, it is flexible or *state dependent,* as it depends on how shocks impact the economy through time and how the economy reacts to the monetary policy action in the wake of these shocks. For example, a central bank will react differently to an increase in demand that is temporary and one that is relatively persistent. The central bank is likely to set its policy depending on how much pressure this increase will put on inflation – in other words, on how the state of the economy evolves. Similarly, the change in monetary policy required to keep inflation on track will depend on how much the economy reacts to it.

But this raises the more important issue that current optimal policy will depend on previous policy decisions, therefore being *history dependent.* To continue with the example, it might be optimal to react slowly to an increase in demand at first, following with further interest rate increases later. Suppose the economy reacts sharply to the initial change in interest rates, because there are expectations of further increases. Then, it would be still necessary and optimal to raise rates further in order to fulfill these expectations. If, in the meantime, some shocks affect demand negatively, any potential lowering of interest rates would have to take into account that interest rates originally were to rise further. Such dependence clarifies the reason inflation targeting is commonly regarded as a form of "constrained discretion."

Flexibility thus raises additional concerns of uncertainty and imperfect information at the time when a central bank makes its decisions. It is often the case that the nature and severity of shocks affecting the economy are uncertain or that information about how the economy adjusts through time to both shocks and policy emerges only with a lag. While these concerns tend to work against

flexibility in terms of what goals the central bank should pursue, they are of particular importance when the bank has an informational advantage over the general public. In this context, flexibility pins down how much monetary policy can and should rely on private information – that is, information that the general public does not have access to or cannot verify – without compromising the public's perception of the central bank's commitment to long-run optimal policy.

Implementing an Inflation Target

When a central bank makes an actual inflation target operational, the framework itself can be designed in a manner sufficiently flexible to take implicit account of considerations other than inflation. At the heart of the framework are the variable to target (for example, core inflation) and the level (for example, 2 percent per annum) the bank commits to achieve. But monetary policy need not explicitly specify secondary targets; instead, it can rely on other parameters that implicitly account for them. For example, the framework could specify an acceptable range or upper bound for inflation rather than using a point target of inflation (a regime sometimes called "strict targeting"). The time horizon over which to achieve the goal is another important element, with longer horizons allowing for a more gradual response to inflation and, hence, more concern for other variables. The framework could even lay down the circumstances under which deviations from the target are possible. Of course, these details are driven by the answers found in the first two layers, and thus will reflect the tradeoff between flexibility and commitment in the design of optimal monetary policy.[6]

A well-designed targeting framework should also outline the extent to which the central bank communicates its policy stance to the public. Requiring the bank to communicate details of

its policy stance tends to restrict the flexibility of policymaking, as it often pins down a (mostly conditional) path of further actions. As with all other parameters, flexibility ultimately depends on how independent the central bank is and how well the actual regime is enforced. A targeting regime might appear strict on the surface, even though political influence combined with weak enforcement leads to frequent misses of the target.

Monetary Policy Goals and Inflation Targeting

A general consensus has emerged in the academic literature that the overriding goal of monetary policy should be low inflation and that any persistent deviation from a long-run average level of inflation close to zero will lead to negative consequences for the economy. In particular, economists tend to agree that expansionary monetary policy cannot increase the trend of output or employment in the long run but instead will result in higher inflation and often lower growth for the economy even if, for political reasons, it is meant to counteract some inefficiency or market failure that affects the trend.

There is a lack of consensus, however, about whether it is optimal to stabilize inflation perfectly around a low average level or to permit temporary deviations from this level. This is based on the idea that monetary policy can help to alleviate impediments to well-functioning markets that amplify the effect of shocks to the economy or prevent the economy from responding efficiently to such shocks. In such an approach, the goals for monetary policy are usually derived from fundamentals such as society's preferences over economic outcomes and a particular model of the economy. A case can be made for three other goals: output stabilization, exchange-rate stability, and financial stability.

---

6   There are, of course, other important details, which this *Commentary* does not discuss. One concerns the price index to target, a topic discussed by Parkin (2009) and Smith (2009).

Output

Stabilizing output around some trend is the additional goal for monetary policy most discussed in the literature. In general, one can rationalize such a goal by deriving it from a welfare perspective (see the appendix). The simple objective for a central bank is then given by minimizing, with appropriately chosen measures, the volatility of both inflation and output around some long-run trend. The central bank takes the trend as given – for inflation, some low level, and for output, the *natural rate of output*, or some measure of potential output growth driven by productivity gains – and chooses its policy response to stabilize both variables around it.

As long as there is no tradeoff between the two goals, it is optimal to stabilize inflation perfectly and to achieve it by stabilizing the *output gap – the difference between actual output and its natural rate* – at zero. For example, a surge in demand will lead to a positive output gap, where actual output exceeds its natural rate, which puts upward pressure on prices. Removing this excess demand will stabilize prices automatically. More generally, removing all excess fluctuations beyond the ones captured by output trend – in other words, keeping the output gap at zero – stabilizes inflation. Hence, there is no conflict between the two goals, and making inflation stabilization the exclusive goal is optimal. Even though there is strong evidence that both inflation and output variability have declined simultaneously, there is an increasing consensus that this cannot be attributed necessarily to the goals' being complementary[7] but that a basic conflict between these two goals remains, especially at low rates of inflation.

A short-run tradeoff could arise because of shocks that affect inflation and the output gap in different ways. Such shocks are often perceived as shifting the Phillips curve that describes this tradeoff and are thus different from fundamental demand or supply (that is, productivity) shocks. To analyze the tradeoff correctly, one must specify the relative weights given to inflation and output. Ideally, a structural model of the economy is available to link the weights to fundamentals of the economy and empirically estimate them. In general, weights given to output are estimated to be relatively small, and they should be thought of strictly as an upper bound for various reasons.

The foremost reason for favouring a relatively large weight for inflation stabilization is a basic problem of commitment. If a central bank cannot commit to its future actions, it will place more weight on output stabilization than would be best from the perspective of long-run optimal policy. This so-called stabilization bias can be removed by lowering the weight on output, thereby increasing the policy response to deviations from the inflation target.[8] Interestingly, when shocks to the economy become more persistent, the commitment problem becomes more severe, and there is a more pressing need to focus on the targeted inflation rate. If actual policy concentrates more on inflation, it signals a credible commitment to optimal policy and anchors expectations – and thus inflation itself – more firmly on the intended level.

The commitment problem is often compounded by the fact that a central bank has better information than the public about the state of the economy. This information is private in the sense that, even with a lag, the general public cannot verify it. One can think of the central bank's forecasts as private information that cannot be credibly communicated to the public. A tradeoff then emerges where the benefits from letting the central bank react to such information are compared with the cost of monetary policy's deviating from its long-run optimal policy to realize short-run gains under the pretext of some information that cannot be verified. Optimal monetary policy in such a situation can be shown to correspond to a form of bounded discretion implemented through a cap

---

7 Blanchard and Simon (2001), for example, document a simultaneous drop in both output and inflation variability in the United States starting in the 1980s. This "great moderation" is sometimes attributed to a better conduct of monetary policy, whereas others point to lower variability in shocks (most recently, Smets and Wouters 2007) or to a change in the monetary policy regime (Nason and Smith 2007) as possible explanations.

8   The traditional commitment problem in monetary policy is given by an inflation bias that arises whenever policy tries to increase output beyond the trend determined by productivity growth.

or upper bound on inflation: as long as inflation is below a certain threshold, policy is allowed to stimulate output at the cost of higher inflation. Interestingly, this bound becomes more restrictive the more severe the problem of commitment and private information.[9]

A further caveat concerning trading off inflation and the output gap is the high degree of uncertainty associated with measuring the latter. Uncertainty about the type of shocks hitting the economy – for example, productivity versus shocks that alter the tradeoff between unemployment and inflation – is likely to lead to large deviations of the perceived gap from the actual gap. Simulation studies show that it can be better in such a situation to shift the emphasis of policy back towards inflation (see Ehrmann and Smets 2003). Similarly, one is often uncertain about the structure of the economy – and, hence, about the way monetary policy affects it – or about the parameters underlying the model of the real economy that forms the basis for policy decisions.[10] Unfortunately, no general consensus has yet emerged in the literature about whether this last type of uncertainty calls for a more cautious or more aggressive response to inflation.[11]

This leads to the conclusion that a central bank should place relative little weight on output stabilization relative to inflation. It also confirms the wisdom of "erring on the safe side" by shifting the primary focus of policy to inflation if the bank has incomplete information on the structure of the economy and the shocks affecting it. These principles receive further support from the fact that rules including some *appropriate* measure of inflation – and to a much lesser degree some measure of the *change* in the output gap across periods rather than the output gap itself – are good, approximate optimal policy descriptions

across different possible models of the economy. Hence, robust optimal policy tends to emphasize control of inflation.[12]

Exchange Rates

Targeting (or even pegging) the exchange rate necessarily sacrifices some monetary independence. Monetary policy then cannot react to domestic inflation pressures but instead must adopt to a large degree the policy stance of the country against whose currency its own is pegged. This compromises price stability if there is an inflation bias in that country. In general, it is also difficult to determine the appropriate (that is, the efficient) level of the exchange rate and maintain it against market forces. This is particularly a problem if there are large, periodic swings in the real exchange rate.[13]

The consensus in the literature seems to be that reacting directly to exchange-rate movements leads (if at all) only to small gains and might even compromise other goals (see, for example, Taylor 2001; and Gali and Monacelli 2005). Furthermore, inflation targeting already takes into account exchange-rate movements, at least implicitly, depending on what price index has been chosen as the target. In general, one should target a price index that reflects the relationship between the output gap and price stability. This implies that goods whose prices are more flexible should receive less weight in the index, as supply for such goods tends to equal demand and, hence, their output gap is close to zero. In an international context, the price index one targets should thus depend on the openness of the economy as measured by the pass-through of exchange-rate movements. With high-pass through, prices of imported goods respond quickly to changes in the exchange rate. The larger the pass-through, the

---

9 See Canzoneri (1985) and Athey, Atkeson, and Kehoe (2005) for a description of the problem and the optimal (time-consistent) policy solution, respectively.

10 For a basic discussion of how these considerations influence inflation targeting, see Svensson (1999).

11 Using the principle to safeguard against the least favourable model, however, hints at the latter, implying a lower relative weight on output (Giannoni 2002).

12 On this point, Giannoni and Woodford (2004) show that the structure of optimal monetary policy does not change across different models of the economy, with some measure of inflation and changes in the output gap at the centre of the optimal targeting rule.

13 In Canada, such swings seem to have become more important as the economy's dependence on the commodities sector has increased.

more appropriate it is to target a purely domestic price index (see, for example, Clarida, Gali, and Gertler 2001; and Corsetti and Pesenti 2005). Even though pass-through has declined recently in many countries, including Canada, this need not be attributed to prices having become less flexible; it could simply be a consequence of better monetary policy which lowers the need for frequent price adjustments. Hence, one needs to be cautious in interpreting this fact as an argument in favour for a price index that takes into account import prices and hence, indirectly, exchange-rate movements (see Devereaux and Yetman 2003).

When the exchange rate moves, there are direct and indirect effects on aggregate demand. Hence, concentrating exclusively on inflation and aggregate demand forces monetary policy to evaluate the factors that cause exchange rates to change. As such, it contributes to the choice of the appropriate policy reaction depending on the nature and persistence of the exchange-rate shock. For example, an appreciation in the exchange rate could signal an increase for domestic goods or more foreign direct investment, but it could also simply be linked to speculation or to a temporary shift in financial portfolios towards the domestic currency. While these shocks are associated with similar exchange-rate movements, they might require different policy responses: the former has a direct positive impact on aggregate demand, but the latter has only an indirect negative impact where the appreciation makes exports temporarily more expensive. If policy places a lot of emphasis on an exchange-rate target, however, both developments require similar policy responses. In Canada, this discussion has often been framed as the distinction between so-called "Type 1" and "Type 2" movements in the exchange rate.[14] Some commentators doubt that it is possible to make such a distinction consistently calling into question its usefulness as a policy guideline (see for example Robson 2009).

This still leaves open the question of whether a central bank should react to a persistent misalign-ment of its currency with that of a major trading partner. It has been argued that optimal monetary policy should take this into account when setting interest rates (see, for example, Engel 2008). When exporters set their prices in local currencies, prices for the same good can differ across countries. In the aggregate, this causes price levels – and hence the exchange rate and aggregate demand – to be out of line with fundamentals across countries. Monetary policy should then remove this problem. Most interestingly, when a home currency is overvalued but inflation runs high, there is a conflict for an inflation-targeting central bank between these two goals. Nonetheless, critics point out that it is usually impossible to determine when and by how much currencies are misaligned.[15] An alleged misalignment then might just provide a convenient excuse for discretionary policy.

Financial Stability

The central banks of all major industrialized countries state that financial stability is an important goal alongside the control of inflation. On the surface, there is no conflict between these two goals. Indeed, a commitment to stable inflation at a low level is a prerequisite for a sound and stable financial system: it aids long-term financial planning and reduces excess volatility in nominal asset prices and interest rates that could arise in the wake of policy uncertainty.

Stabilizing inflation in the short run, however, involves perhaps frequent changes in the policy instrument – typically, a short-term interest rate. Such changes tend to feed into other interest rates, especially in a regime where monetary policy is credibly committed to stabilize inflation perfectly. This, in turn, is likely to increase volatility in asset prices and interest rates, with negative consequences for financial planning by firms and households.

---

14 In the context of Canada's targeting regime, Ragan (2005) provides a detailed discussion of how monetary policy should take into account these different types of exchange-rate movements.

15 To take this argument further, monetary policy actually should react to a misalignment of its currency with a basket of currencies, where the weights reflect the importance of a particular trading partner. Such an approach is hard to implement, however, as the basket would need constant rebalancing, making it even harder for the central bank to detect a misalignment.

These considerations have led to suggestions that monetary policy should aim for reduced interest-rate volatility in a tradeoff with perfect and immediate stabilization of inflation. Inertial responses and the associated gradualism of monetary policy thus have become important elements of inflation targeting. It is noteworthy, however, that this does not mean compromising inflation as an overriding concern for monetary policy. Suppose a central bank can commit to its future policy actions and that people's expectations are forward looking. It then would be possible to spread out the response of interest rates over the time necessary to bring inflation back to the targeted level. In this way, one could avoid sharp moves in interest rates precisely because people would anticipate further changes in interest rates in the future. Hence, inflation targeting by its very nature allows for smooth changes in interest rates.[16]

Another concern for central banks is whether to react to asset-price developments. The danger here is that a run-up in asset prices with a subsequent collapse – a so-called boom-bust cycle – causes a severe recession in the economy. The conventional wisdom has been that a central bank should not react to such asset-price movements, as it would have to infer the reasons prices increase in the first half of the cycle. If underlying productivity growth has accelerated, monetary policy should be accommodative, while a departure of asset prices from fundamentals would call for sharp increases in rates (for a review of these arguments, see Detken and Smets 2004). Furthermore, policymakers often cannot detect whether asset prices are deviating from fundamentals in the early stages of the cycle, when policy would be most effective against potential asset-price bubbles. As a consequence, policymakers would be condemned to take a sit-and-wait approach during the run-up in prices, and to clean up after the bust in order to weaken the macroeconomic impact of the asset-price collapse.

In the wake of the US subprime mortgage crisis, however, such an asymmetric response – leaning against sharp asset-price declines, but not against sharp increases – has been challenged, and arguments for a more proactive response have again started to emerge (see, for example, Issing 2008). Such a response would always react against any sharp and prolonged move in asset prices, taking the edge off such a development irrespective of its rationale. A different approach would require a central bank to use additional information to evaluate asset-price developments and to react to sharp and prolonged increases in asset prices that are unlikely to be productivity related. Looking at credit growth and monetary aggregates that describe the amount of liquidity beyond aggregate demand and inflation forecasts can yield additional information for monetary policy to react appropriately (see Christiano, Motto, and Rostagno 2007).

An intriguing argument has been made in favour of incorporating asset prices into a broader price index called a *dynamic price index,* which would be appropriate for anyone who wished to index retirement income to protect against future increases in the cost of living (see Reis 2006). Such an index could be targeted by a central bank, since a targeting regime in any case is supposed to protect the real wealth of households and provide a sound basis for long-run financial planning, and thus could be a partial solution to how monetary policy should take into account asset-price movements.

Finally, any large shock that threatens the entire financial system (a systemwide shock) or that causes a defaulting institution to endanger the survival of other financial institutions (a contagious or systemic shock) requires a prompt response by the central bank. In such a situation, the bank has to provide either ample liquidity or even longer-term credit to financial institutions unconditionally. As long as these measures involve a mere redistribution of liquidity, these activities are neutral and do not compromise price stability. If, however, the central bank absorbs or reduces private losses, the goal of price stability arguably might be compromised, at least temporarily, as

---

16 Another argument for keeping interests stable instead of adjusting them aggressively downward is the effect of a zero lower bound on nominal interest rates and the danger of a deflationary spiral associated with it. There are, however, several ways to conduct an expansionary monetary policy in such a scenario; thus, by itself, the problem does not threaten financial stability (see Goodfriend 2001).

these losses have to be financed somehow. Such a deviation from targeting seems justified to avoid the collapse of the financial system. Of course, in such a scenario, the challenge would be to induce expectations that policy will return to its main goal of price stability in the medium term by outlining a forward-looking path for future policy actions.[17]

In the current financial crisis such concerns were initially pushed aside, as the problems in the financial sector were accompanied by a sharp fall in aggregate demand. Deflation seemed to be a bigger threat than inflation arising from the bailout of financial institutions. In the meantime, however, the threat of deflation has diminished and the focus has shifted to designing exit strategies to prevent a spike in inflation that could unhinge inflation expectations. Since bringing down inflation expectations is very costly for the economy (see for example Canada's experience when the targeting regime was introduced in the early 1990s), a central bank cannot afford to hesitate undoing its interventions after the financial system has stabilised, even though this might weaken the recovery in the real economy.

Summary

It is useful to summarize briefly the lessons from the theoretical literature on inflation targeting regarding the question of if and to what degree a central bank should pursue other goals, such as output stabilization and exchange-rate and financial stability. There are four main conclusions.

- Even if there is a tradeoff with stabilizing output, controlling inflation should remain the overriding goal of monetary policy. Focusing exclusively on inflation alleviates a commitment problem that is complicated by the presence of private information for the central bank that the public cannot verify easily. It is also a robust description of optimal policy when a central bank faces uncertainty about the shocks and the structure of the economy.

- An inflation target and an exchange-rate target are mutually exclusive, as the latter interferes with monetary independence. Nonetheless, inflation targeting naturally will take into account exchange-rate movements insofar as they have implications for aggregate demand and inflation pressures. To increase the importance of exchange-rate effects, one could extend the domestic price index to directly include import prices or to have monetary policy react to currency misalignments. This approach is problematic, however, as it requires a clear understanding of the reasons import prices change or currencies become misaligned.

- The optimal tradeoff with goals other than inflation can be accounted for largely through the design of the targeting regime – that is, the measure of inflation to target, at what level, and the time over which to achieve the target. Point targets are unlikely to be an appropriate policy prescription when a central bank has imperfect control over inflation and when its commitment to an optimal policy depends on its past decisions.

- A key challenge for any targeting regime is how to take into account concerns about financial stability. Recent events suggest a more proactive policy with respect to financial market developments that is characterized by "leaning against the wind" in both boom and bust situations. Concerns about financial stability can provide a reason for compromising price stability temporarily, as a central bank assumes the role either of a lender- or a market-maker-of-last-resort. Policy then needs to be forward looking and to indicate a commitment to restoring the inflation goal in the future.

---

17 Unfortunately, the consequences of a central bank acting as lender-of-last-resort or market-maker-of-last resort are not well understood in the framework of inflation targeting, and theoretical work along these lines is largely absent.

Are the Parameters of Canada's Current Targeting Regime Appropriate?

In an inflation-targeting regime, price stability is commonly the only formal goal of monetary policy. Hence, the central parameter of the regime is some level or trend of a price index.[18] Other considerations, such as stabilizing output, financial stability, or the exchange rate, are usually taken into account when designing the details of the targeting regime. These details matter a great deal, as they determine the actual degree of policy discretion the central bank has.

Any targeting regime is described by three broad parameters. First, there is a quantitative measure of the target that monetary policy is supposed to achieve. Second, there is the period of time and the circumstances under which the target is to be achieved. In the discussion that follows, the optimal degree of flexibility, as described above, is implemented through these aspects of the regime. A third variable, however – how to enforce hitting the target – is equally important, but unfortunately often omitted in discussions. The remainder of this *Commentary* looks at how Canada's targeting regime might be improved along these three dimensions.

Is a Band of 1-to-3 Percent Inflation Appropriate?

A central bank is given flexibility mainly by allowing monetary policy to keep inflation within a band around the target. Such flexibility gives the bank the freedom to take into account other variables and further strengthens inflation targeting by acknowledging that the bank has imperfect control over any measure of inflation. A larger value for average long-run inflation, however, weakens the case for low inflation. Similarly, a larger band gives more room for stabilizing output. Hence, leeway in both variables is linked inextricably to the degree of commitment of monetary policy.

The main concern here is that inflation might drift towards the upper end of the band. This corresponds to an inflationary bias in monetary policy arising from society's pressure for more output growth. Based on the experience of inflationary periods after 1970, many economists therefore view violations of the band to be more likely at the upper bound than at the lower one. A targeting regime concerned with the optimal degree of commitment should thus emphasize the upper bound as a *cap* on inflation. After all, this is how to implement optimal monetary policy in a setting where political pressures to inflate and private information compromise a central bank's credibility (see Athey, Atkeson, and Kehoe 2005).

It is worth emphasizing that a "cap" on inflation is understood here as a trigger for a policy response. Once inflation nears or reaches the upper bound, a policy reaction is required to prevent it from breaching the target band. In this sense, reaching the upper bound of the target severely limits the possibility for discrete policy action. There still can be violations of the band due to policy mistakes, but a cap forces the central bank into action to correct them, resulting in even more firmly anchored inflation expectations. Interestingly, such considerations are less prevalent at the lower end of the band, implying a subtle asymmetry between the two bounds. If there is a threat of deflation as inflation falls towards the lower end, central banks tend to do everything possible to raise inflation again. The brief deflation scare in the wake of the current financial crisis demonstrated this quite vividly, with central banks reacting very aggressively to the prospect of falling prices.

This is an important distinction from viewing the band as a mere confidence interval for monetary policy. In this view, monetary policy aims to keep inflation within the band most of the time. But misses can occur quite frequently without the central bank acknowledging past mistakes through appropriate tightening of policy. Having a band then undermines the main benefit of anchoring inflation expectations by opening the backdoor

---

18   A discussion is currently ongoing about whether Canada should adopt a price-level or an inflation target. Similarly, questions remain about the appropriateness of the consumer price index as the formal target and of core inflation as an operational target (see Smith 2009).

for too much discretion. Despite Canada's impressive overall record, over the past few years prior to the current recession there were some concerns that inflation resided more in the upper half of the band. Over the same time, some measures of inflation expectations also moved up considerably towards 3 percent (look back at Figure 2).[19]

These concerns might be compounded by allowing considerable volatility in inflation when the band is too large. Ideally, one would have a narrow band that has an upper bound very close to zero. There are several arguments against such a conclusion, ranging from an upward bias in the measurement of inflation to the fact that nominal wages cannot easily be adjusted downwards. The most pressing issue, however, is that zero average inflation increases the risk of a prolonged deflation as nominal interest rates get too close to zero and cannot become negative. Nonetheless, such a scenario, often described as a zero lower-bound problem, should occur only in extreme circumstances, which, in any case, require special policy considerations (see below).[20]

Given the current regime in Canada, a more conservative stance on monetary policy seems appropriate, suggesting both to lower the band and to focus more on the upper bound. The strategy of the European Central Bank could serve as a guideline, even though it does not explicitly refer to inflation targeting. Hence, capping inflation at 2 percent with the understanding of keeping inflation on average close to this upper bound might be an improvement over the current band. This stance would reinforce Canada's focus on low inflation and lead to a more aggressive stance on inflationary pressures than currently is the case.[21]

Such a change in design would have two important by-products. First, it might make a shift from inflation to price-level targeting less important, since capping inflation to some degree would force the Bank of Canada to undo past policy mistakes; after all, a policy trigger is likely to reverse inflation sharply and quickly. Second, the Bank would be less likely to take for granted its credibility with respect to low inflation, which by itself could well lead to a more proactive approach in dealing with developments in financial markets and thus would aid financial stability.

What Is the Optimal Time Period in which to Achieve the Target?

A more conservative stance on inflation need not restrict flexibility. The time period for achieving the inflation goal serves as an auxiliary parameter to retain some flexibility in targeting inflation. Targeting regimes traditionally have used a medium-term horizon (say, two years), reflecting mainly operational reasons, such as imperfect control over inflation or the lag between a policy decision and its effect on inflation and the real economy.

Ideally, the horizon should be chosen to reflect an optimal degree of flexibility. In general, the longer the period in which to achieve the target the larger the degree of flexibility (see Svensson 1997a). Furthermore, one can also use the time horizon to realign the incentives for a central bank that cannot credibly commit to optimal policy as it faces pressure to stimulate the economy.[22] Hence, if stabilizing inflation is the main concern, a shorter horizon tends to be more appropriate. In addition, a short horizon avoids giving policymak-

---

19 In this context, Laidler and Banerjee (2008) also make a case for strengthening the upper bound.

20 In a deflation (or low inflation) scenario, negative nominal interest rates might be required to achieve a sufficiently negative real interest rate to stabilize output at its efficient level. Goodfriend (2001) discusses taxing bank reserves and aggressive open market operations as possible ways to achieve such negative interest rates.

21 The Bank of England also emphasizes the upper bound of its inflation-target range, as violations of this bound require the governor to explain to the chancellor of the exchequer the reasons for the violation and, more important, to outline the policy actions that are being considered to bring inflation back within the band. Hence, an upper bound helps to maintain the independence of the central bank against political pressure. Indeed, the European Central Bank has faced immense political pressure over the past few years to conduct a more active monetary policy, but has been able to ward off these demands by referring to its mandate to respect an upper bound on inflation. While these upper bounds might have caused a somewhat slower response on the part of both the European Central Bank and the Bank of England to the current financial crisis, they certainly did not prevent sharp cuts in interest rates or even a temporary violation of the bound.

22 Smets (2003) studies the problem of using the horizon and the target variable — price level versus inflation — to induce a central bank to make optimal policy decisions.

ers an incentive to defer unpopular decisions in the hope that future developments will eliminate the need to make them.

Nonetheless, there are several arguments for choosing a longer time horizon. Some circumstances might require more inertial responses in interest rates, implying a policy that is more drawn out. Similarly, policy actions from the past often influence current policy decisions, so that it becomes optimal to deviate from the target for some time. These considerations gain in importance when targeting the price level, rather than inflation, or when extraordinarily large shocks hit the economy.

There is a tendency for the optimal horizon to be longer when targeting the price level, since such a regime shifts volatility towards output (see Smets 2003). Since past deviations from the target are not bygones, missing the target has to been undone over time. This accentuates the question of the optimal horizon, as undoing such mistakes puts additional strain on the public acceptability of the targeting regime. Sharp corrections at the cost of temporary, but significant, output losses simply might not be acceptable politically. To the contrary, longer horizons can allow for deviations to accumulate, making it tougher to return to the target and, as a result, might damage the system's credibility.

A large shock, such as a crisis in the financial system or a significant change in commodity prices, might require a temporary shift away from price stability. Rather than abandon the target altogether, a softening of the horizon generally is more benign. Such an event-contingent lengthening of the horizon allows for additional flexibility when it is most needed.[23] For example, it would allow the central bank to stabilize the financial system in times of a crisis by assuming losses and monetizing them later on. Nonetheless, event contingency endangers the very nature of a

targeting regime unless checks are put in place to prevent its frequent use. One solution might be to require the central bank to justify any lengthening of the horizon in response to an extraordinary event. The bank should also have to make such deviations conditional on committing to a path for future policy that leads it back to the target.

The horizon for targeting inflation in Canada likely would need to be adjusted along these lines if a more conservative level of inflation were to be adopted. An inflation cap at 2 percent can work well with the usual horizon of one to two years, as long as it is flexible enough in the wake of large shocks. Finally, such event-contingent flexibility could introduce moral hazard in financial markets, but this should be less of a concern if policy becomes more proactive in response to the adoption of an inflation cap.

How Should the Target Be Enforced?

The success of inflation targeting is a function of its enforcement. Most regimes do not have a formal or clearly defined means of enforcement in the sense that they specify rewards for meeting the target or punishment for violating it. Still, there might be *implicit* enforcement. A conservative, low-inflation target in the form of a cap with a tight, downward band would aid the independence of a central bank simply by mandating less room for flexibility. Having a cap on inflation is pivotal here, as the targeting band is not seen as a mere confidence interval for appropriate monetary policy. Breaching the upper bound would signal a clear violation of the mandate. Once a central bank's credibility has been damaged, inflation expectations would change. As such, a change would be costly to correct, and the bank likely would be less tempted to conduct short-run discretionary policy.

---

23 The gold standard in place in the late nineteenth and early twentieth centuries can be understood as a monetary policy regime with very little discretion. It was sometimes abandoned in response to events such as wars or financial and economic crises. Such event contingency did not necessarily cause problems in normal times, as people perceived a strong commitment of policymakers to returning to the standard once any crisis had been resolved.

A simple framework such as the one currently used in Canada also supports credibility, as assessing the commitment to the inflation target is relatively straightforward. One can observe violations of the band and assess whether these were caused by occasional policy mistakes or are pathological.[24] In principle, optimal policy could be fully described based on an empirically estimated, reasonable model of the economy, assumptions about the shocks the economy is facing, and forecasts of policy-relevant variables. This could be translated into a value for the policy instrument, such as the overnight rate in Canada. Notwithstanding this possibility, there is wide agreement that, in reality, such an approach is counterproductive: it is hard to communicate the approach and it is still possible to fail to hit the target, given the uncertainty regarding the precise nature of the shocks or the economy's structure.

Nonetheless, it would be possible to improve the enforcement of Canada's targeting regime by increasing the transparency of policy decisions and communicating them better to the public. Once flexibility has been introduced into the targeting horizon, it is essential for a central bank to publish a detailed forecast of inflation over a particular horizon. This is equivalent to pinning down a transition path for future interest rates so that, over this horizon, the forecast of inflation hits the target. It therefore would commit policy implicitly to particular future decisions conditional on current information.[25]

Such inflation forecast targeting with a flexible horizon would fully specify conditional future policy actions, given current and past circumstances, and would clarify the history dependence of future decisions and anchor inflation expectations even more effectively. But it also would signal a future policy stance that would be conditional on other information as it became available. Interestingly, the Bank of Canada recently used such a strategy when announcing to keep

its policy rate at the lower bound for a certain period of time. As already pointed out, such a procedure might be indispensable, for example, to implement a more proactive policy in response to financial market developments that requires the cross-checking of productivity variables with credit or monetary indicators (see Issing 2008). In short, forecast targeting would increase the costs of discretionary policy by making transparent any deviations from such a history-dependent and conditional path. Once the public detects deviations, they become self-defeating, which would restrain the central bank and implicitly enforce the targeting regime.

Conclusions

When Canada's inflation-targeting regime comes up for renewal in 2011, there is a danger that policymakers will have become complacent about its past successes. Recent increases in and subsequent diminishing of inflation demonstrate the public pressures the Bank of Canada faces, with many calling for it to focus more consciously on output and growth. As inflation targeting is often defined as "constrained discretion," there is a natural tendency for the Bank to yield to political influence and pursue a suboptimal policy that overstimulates the economy relative to its potential and is too permissive of inflation.

The upcoming review, which will focus on fine-tuning the regime, should reiterate the Bank's commitment to low and stable inflation and aim to tighten the targeting regime along two lines. First, greater emphasis should be placed on the upper bound of the target band by interpreting it as a *cap* on inflation, violations of which should trigger a policy response. Second, the upper bound should be lowered from its current level of 3 percent to 2 percent which would reinforce the commitment to low and stable inflation in Canada. Indeed, in its original design the target was supposed to be

---

24 The Bank of Canada usually outlines why the current policy decision is compatible with meeting the inflation target in the future.

25 Hitting the target with its inflation forecast is the best a central bank can achieve (see Svensson 1997a). Indeed, Giannoni and Woodford (2004) show that optimal monetary policy with commitment corresponds to a goal of hitting an optimally weighted forecast at different

"below 2 percent" from 1995 onwards.

A neglected area of the current regime is the way in which it communicates its policy stance. If the regime were to move closer to price stability with an inflation cap, it necessarily would place more importance on the need to clarify how the Bank of Canada takes into account other goals, such as stabilizing output, in its day-to-day decisions and in special situations that could justify a temporary deviation from the cap. Publishing inflation forecasts with every decision would help the Bank to outline its policy stance relative to the overriding goal of low inflation. Transparency and credibility would be further enhanced if the Bank were to explain how past, current, and future circumstances pin down a conditional path for future overnight rates.

What is needed, then, is a *two-pronged approach* to refining the current inflation-targeting regime; one that emphasizes the formal inflation goal more heavily, so that actual inflation can serve as a crude test of how well the Bank of Canada does its job, while improving the communication of policy decisions in order to increase transparency and more firmly anchor inflation expectations. Most important, such an approach, without endangering the Bank's long-term commitment to low inflation, would give the Bank the room for additional flexibility when it is most needed: in extreme situations such as financial instability or large swings in the exchange rate.

Appendix: A Welfare-based Approach to Inflation Targeting

In recent years, thinking about monetary policy has been heavily influenced by so-called new neoclassical synthesis, the hallmark of which is to have a real model of the economy that describes its efficient evolution as well as imperfections, such as price or wage rigidities that cause it to deviate from this trend in response to shocks. In this model, monetary policy is perceived as mitigating such imperfections in order to allow the economy to evolve efficiently.[26]

For illustrative purposes, the basic elements of this approach can be described by outlining what is often called a "new Keynesian model" of monetary policy, referring to particular assumptions about the real economy and its frictions.[27] The goals of monetary policy are explicitly derived from the preferences for consumption and leisure of the households that make up the economy. Using an appropriate approximation, one obtains a criterion for optimal monetary policy that is often described by a loss function of the form

$$L = E \sum_{t=0}^{\infty} \beta^t \left(\left(\pi_t - \bar{\pi} \right)^2 + \lambda \left(x_t - \bar{x} \right)^2 \right)$$

which penalizes deviations of inflation π_t and the output gap x_t from their respective targets. Such a function has several important characteristics. First, it takes trend inflation and the trend of output in the form of an output target as given. This acknowledges the benefits of low inflation and the fact that monetary policy cannot influence the long-run prospects for growth in the light of low inflation. Second, it is forward looking in the sense of minimizing today's expected losses and those of the indefinite future weighted by a discount factor, β. Third, it weights the importance of variations in inflation relative to those in the output gap according to a parameter, λ. A positive value of this parameter

implies flexible targeting, in the sense that there are goals other than inflation.

This type of loss function and its parameters are derived within the context of a model economy that yields a relationship between aggregate supply and aggregate demand. This relationship also can be obtained within the model from decisions of households and firms, where one makes explicit the frictions that cause these decisionmakers to respond inefficiently to shocks. Importantly, all parameters (denoted by β, λ, and below κ, σ) can be estimated from data, as they correspond to actual parameters of the model's micro foundations. The aggregate demand equation is given by

$$x_t = E_t x_{t+1} - \sigma \left(i_t - E_t \pi_{t+1} - r_t^n \right)$$

where the term in brackets refers to deviations of the actual real interest rate – the nominal interest rate i_t, less expected inflation – from the one associated in an economy without distortions, also called the natural rate of interest r_t^n, and E_t represents expectations for these variables at time t. The policy variable for the central bank is a short-term nominal interest rate, and supply and demand shocks are captured in fluctuations of the natural rate. The aggregate supply relationship is given by what is classified as a "new Keynesian Phillips curve" of the form

$$\pi_t = \kappa x_t + \beta E_t \pi_{t+1} + u_t$$

which relates inflation to the output gap, expectations about future inflation, and what is sometimes labelled a "cost-push shock." This shock causes fluctuations in the distortions that monetary policy tries to remove without influencing the trend growth in the economy.

Optimal policy is described by choosing values for inflation and the output gap in order

horizons. Practically, this boils down to specifying a transition path conditional on current information.

26 The outline of the approach presented here borrows heavily from Gaspar and Smets (2002) and Woodford (2003).

to minimize the loss function, while taking as given the Phillips curve as a single constraint. The actual policy instrument, or short-term interest rate i_t, that implements an equilibrium is then set such as to fulfill the aggregate demand equation.

One can show that, for this model, both inflation and the output gap are functions of the cost-push shock. Without such a shock, there would be no conflict between the two goals; perfectly stabilizing inflation also stabilizes output. Furthermore, it can be shown easily that there is an incentive for the central bank to change its decision every period, given the realization of the cost-push shock. Hence, a commitment problem arises, as the optimal monetary policy takes into account that it can influence expectations about future inflation when committing to future policy actions. Without such a commitment, the central bank cannot influence expectations, as it will reoptimize its loss function every period. Compared to the optimal policy, this leads to too much stabilization of the output gap relative to inflation.[28]

Interestingly, the optimal policy with commitment can be described by a simple optimal *targeting rule* given by

$$\pi_t + \lambda/\kappa\left(x_t - x_{t-1}\right) = 0$$

This rule implies a reaction function for the central bank to set its nominal interest rate as a function of current inflation and the output gap.[29] This reaction function is often called a "Taylor rule."[30] Whether nominal interest rates are actually set according to such a simple or modified Taylor rule depends on the particular model describing aggregate demand.

This description is remarkably robust in the sense that it emerges in a variety of models that alter the aggregate supply and demand relationship in the economy. Such changes simply tend to influence the definition of the inflation variable one uses and the parameter values one estimates for the targeting rule. The key observation of this rule is that optimal policy does not keep inflation always at its target – here, zero. As long as λ is positive, it is optimal to let inflation vary in response to shocks that move the output gap over time. The rule is *state dependent* and targets inflation in a flexible way. Finally, as last period's output gap matters, the policy is also *history dependent:* it takes into account not only current shocks but also past shocks to the economy.

---

27 Assuming a different model of the economy leads not only to different loss functions, but also to different relationships between inflation and output that describe equilibrium in the economy as a function of policy.

28 One could also introduce the classic version of the commitment problem — an inflationary bias — by targeting an inefficient level of output above trend.

29 Woodford (2003) points out that this policy rule is also "timeless" — that is, it does not depend on the time that has elapsed since an initial period when a long-run policy rule was adopted.

References

Athey, S., A. Atkeson, and P. Kehoe. 2005. "The Optimal Degree of Discretion in Monetary Policy." *Econometrica* 73 (5): 1431-1475.

Bank of Canada. 2006. "Renewal of the Inflation-Control Target." Background Information. Ottawa: Bank of Canada. November.

Bernanke, B., and F. Mishkin. 1997. "Inflation Targeting: A New Framework for Monetary Policy?" *Journal of Economic Perspectives* 11 (2): 97-116.

Blanchard, O., and J. Simon. 2001. "The Long and Large Decline in US Output Variability." *Brooking Papers on Economic Activity* 1: 135-64.

Canzoneri, M. 1985. "Monetary Policy Games and the Role of Private Information." *American Economic Review* 75 (5): 1056-70.

Christensen, I., F. Dion, and C. Reid. 2004. "Real Return Bonds, Inflation Expectations and the Break-Even Inflation Rate." Working Paper 2004-43. Ottawa: Bank of Canada.

Christiano, L., R. Motto, and M. Rostagno. 2007. "Two Reasons Why Money and Credit May Be Useful in Monetary Policy." Department of Economics, Northwestern University. Manuscript.

Clarida, R., J. Gali, and M. Gertler. 2001. "Optimal Monetary Policy in Open versus Closed Economies: An Integrated Approach." *American Economic Review* 91 (2): 248-52.

Corsetti, G., and P. Pesenti. 2005. "International Dimensions of Monetary Policy." *Journal of Monetary Economics* 52: 281-305.

Detken, C., and F. Smets. 2004. "Asset Price Booms and Monetary Policy." Working Paper 364. Frankfurt am Main: European Central Bank.

Devereaux, M., and J. Yetman. 2003. "Price Setting and Exchange Rate Pass-Through: Theory and Evidence." In *Price Adjustment and Monetary Policy: Proceedings of a Conference Held at the Bank of Canada*. Ottawa: Bank of Canada.

Ehrmann, M., and F. Smets. 2003. "Uncertain Potential Output: Implications for Monetary Policy." *Journal of Economic Dynamics and Control* 27 (9): 1611-38.

Engel, C. 2008. "Currency Misalignments and Optimal Monetary Policy: A Reexamination." Department of Economics, University of Wisconsin-Madison. Manuscript.

Gali, J., and T. Monacelli. 2005. "Monetary Policy and Exchange Rate Volatility in a Small Open Economy." *Review of Economic Studies* 72 (252): 707-34.

Gaspar V. and F. Smets 2002. "Monetary Policy, Price Stability and Output Gap Stabilisation." International Finance 5: 193-202.

Giannoni, M. 2002. "Does Model Uncertainty Justify Caution? Robust Optimal Monetary Policy in a Forward-Looking Model." *Macroeconomic Dynamics* 6 (1): 111-44.

Giannoni, M., and M. Woodford. 2004. "Optimal Inflation-Targeting Rules." In The Inflation-Targeting Debate, edited by B. Bernanke and M. Woodford. Chicago: University of Chicago Press.

Goodfriend, M. 2001. "Financial Stability, Deflation, and Monetary Policy." *Monetary and Economic Studies* 19 (S1): 143-67.

Issing, O. 2008. "In Search of Monetary Stability: The Evolution of Monetary Policy." Basle: Bank for International Settlements.

Laidler, D., and R. Banerjee. 2008. "Unstable Foundations: Asset Markets, Inflation Targets, and Canada's 2011 Policy Choices." *C.D. Howe Institute Commentary* 278. Toronto: C.D. Howe Institute.

Murray, J. 2006. "Future Trends in Inflation Targeting: A Canadian Perspective." Ottawa: Bank of Canada.

Nason, J., and G. Smith. 2007. "Great Moderation(s) and US Interest Rates: Unconditional Evidence." Working Paper 1140. Kingston, ON: Queen's University, Department of Economics.

Parkin, M. 2009. "What Is the Ideal Monetary Policy Regime? Improving the Bank of Canada's Inflation-targeting Regime." *C.D. Howe Institute Commentary* 279. Toronto: C.D. Howe Institute. January.

Ragan, C. 2005. "The Exchange Rate and Canadian Inflation Targeting." Working Paper 2005-34. Ottawa: Bank of Canada.

Reis, R. 2006. "A Cost-of-Living Dynamic Price Index, with an Application to Indexing Retirement Accounts." Princeton University. Manuscript.

Robson, W. 2009. "To the Next Level: From Gold Standard to Inflation Targets – To Price Stability?" *C.D. Howe Institute Commentary* 285. Toronto: C.D. Howe Institute. March.

Smets, F. 2003. "Maintaining Price Stability: How Long Is the Medium Term?" *Journal of Monetary Economics* 50 (6): 1293-1309.

Smets, F., and R. Wouters. 2007. "Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach." *American Economic Review* 97 (3): 586-607.

Smith, G. 2009. "The Missing Links: Better Measures of Inflation and Inflation Expectations in Canada." *C.D. Howe Institute Commentary* 287. Toronto: C.D. Howe Institute. April.

Svensson, L. 1997a. "Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets." *European Economic Review* 41 (6): 1111-46.

—— 1997b. "Optimal Inflation Targets, Conservative Central Banks, and Linear Inflation Contracts." *American Economic Review* 87 (1): 98-114.

—— 1999. "Inflation Targeting as a Monetary Policy Rule." *Journal of Monetary Economics* 43 (3): 607-54.

Taylor, J. 2001. "The Role of the Exchange Rate in Monetary-Policy Rules." *American Economic Review* 91 (2): 263-67.

Woodford, M. 2003. *Interest and Prices: Foundations of a Theory of Monetary Policy.* Princeton, NJ: Princeton University Press.

August 2009   Johnson, David. "Ontario's Best Public Schools Between 2005/06 and 2007/08: An Update to Signposts of Success (2005)." C.D. Howe Institute e-brief.

August 2009   Busby, Colin, Alexandre Laurin, and David Grey. "Back to Basics: Restoring Equity and Efficiency in the EI Program." C.D. Howe Institute e-brief.

July 2009   Siklos, Pierre L. *As Good As It Gets? The International Dimension to Canada's Monetary Policy Strategy Choices.* C.D. Howe Institute Commentary 292.

July 2009   Busby, Colin, and William B.P. Robson. "Equipping Ourselves in Tough Times: Canada's Improved Business Investment Performance." C.D. Howe Institute e-brief.

July 2009   Banerjee, Robin, and William B.P Robson. "Faster, Younger, Richer? The Fond Hope and Sobering Reality of Immigration's Impact on Canada's Demographic and Economic Future." C.D. Howe Institute Backgrounder 117.

June 2009   Crow, John. "A Bank for All Seasons: The Bank of Canada and the Regulatory Challenge." C.D. Howe Institute e-brief.

June 2009   Busby, Colin, and Alexandre Laurin. "Getting Off the Rollercoaster: A Stable Funding Framework for the EI Program" C.D. Howe Institute e-brief.

June 2009   Doern, Bruce, and Robert Morrison. *Canada's Nuclear Crossroads: Steps to a Viable Nuclear Energy Industry.* C.D. Howe Institute Commentary 290.

May 2009   Steele, Marion, and François Des Rosiers. *Building Affordable Rental Housing in Unaffordable Cities: A Canadian Low-Income Housing Tax Credit.* C.D. Howe Institute Commentary 289.

May 2009   Dachis, Benjamin. "Low-Carbon Fuel Standards: Driving in the Wrong Direction." C.D. Howe Institute e-brief.

May 2009   Moussaly-Sergieh, Karim, and François Vaillancourt. "Extra Earning Power: The Financial Returns to University Education in Canada." C.D. Howe Institute e-brief.

May 2009   de Oliveira, Claire. *Good Health to All: Reducing Health Inequalities among Children in High- and Low-Income Canadian Families.* C.D. Howe Institute Commentary 288.

April 2009   Busby, Colin, and William B.P Robson. "Near Hits and Big Misses: Canada's 2009 Fiscal Accountability Rankings." C.D. Howe Institute Backgrounder 117.

April 2009   Laurin, Alexandre. "Débâcle à la Caisse : Que faire avec le Régime de rentes du Québec?" C.D. Howe Institute e-brief.

April 2009   Smith, Gregor. *The Missing Links: Better Measures of Inflation and Inflation Expectations in Canada.* C.D. Howe Institute Commentary 287.

C.D. **Howe Institute**
67 Yonge Street
Toronto, Ontario
M5E 1J8