Bank of Canada Review

Summer 2006

Special Issue
Inflation Targeting

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SPECIAL ISSUE
INFLATION TARGETING

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Irish Gun Money

by David Bergeron, Curator

Throughout history, issuing authorities have found ingenious and practical methods of supplying currency in times of emergency. In New France, money printed on playing cards was temporarily used to pay soldiers. During the Boer War in South Africa, Lord Baden-Powell issued notes to furnish the inhabitants of the besieged town of Mafeking with currency. In Ireland, James II resorted to melting down old cannons to make coins.

James, who had been deposed from the English throne in the Glorious Revolution of 1688, landed in Ireland in 1689. In need of currency to pay the 5,000 French troops he had brought with him in an attempt to regain his throne, he first tried to raise the value of British and French coinage to encourage their circulation in the area. When that scheme failed, he resorted to the production of "gun money": coins made of brass and copper from old cannons and other sources were struck in denominations of sixpence, shillings, half-crowns, and crowns. At that time, coins of these denominations were typically struck in sterling silver.

To ensure the acceptance of the emergency coinage, James issued a proclamation at Dublin on 18 June 1689, that all copper and brass money be "made current for the present necessity." The public were reassured that the brass coins would eventually be exchanged for their equivalent in gold and silver. Gun money was issued for just over a year, from July 1689 to October 1690. The short duration was not, however, a consequence of James's promise.

Equipment and tools had been seized to convert the old cannons into coins. As more were produced, brass became scarce, and its value increased. To remedy the problem, half-crowns and shillings were reduced in size, and coins struck before May 1690 were recalled and replaced with others of almost half the weight and one-quarter the size.

Pictured on the cover are a crown and half-crown. The obverse of the crown depicts James on horseback as he appeared riding into Dublin. On the reverse is the coat of arms of England, Scotland, France, and Ireland. The half-crown bears the portrait of the king and the legend IACOBVS II DEI GRATIA (James II by the Grace of God) on the obverse, while the reverse (shown in the background) bears the king's crown, his monogram, and the value (in pence). In an unusual departure, the month in which the coin was minted was included on the smaller denominations to confirm the currency value of the coins until a new proclamation was issued.

To the public's dismay, gun money failed because James II was soon overthrown when William III invaded Ireland. William subsequently ordered that all gun money be redeemed at a fraction of its face value: crowns and large half-crowns for one penny, smaller half-crowns for three farthings, shillings for a halfpenny, and so on. On 23 February 1692, gun money was totally abolished, bringing this unhappy episode to an end.

The coins pictured on the cover are part of the National Currency Collection of the Bank of Canada.

Photography by Gord Carter

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Inflation Targeting

John Murray, Guest Editor

Fifteen years of experience with inflation targeting in Canada have provided convincing evidence that such a framework can make an important contribution to the economic performance of the country. Indeed, performance under the current arrangements has met, and typically exceeded, the expectations of many early inflation-targeting proponents. The Bank of Canada nevertheless continues to investigate and monitor various aspects of its inflation-targeting framework to ensure its continued effectiveness and to search for ways of improving it. The articles in this special issue reflect some recent research in this area.

"Credibility with Flexibility: The Evolution of Inflation-Targeting Regimes, 1990–2006" examines the collective experience of the industrialized countries that have adopted inflation targeting in order to identify significant changes in the targeting arrangements over time and to draw some possible lessons. The article gives particular attention to the increased flexibility that many central banks have managed to incorporate into their targeting arrangements while maintaining the credibility of their monetary policy.

Since monetary policy affects the economy with long and variable lags, it is neither feasible nor desirable for inflation-targeting banks to respond to every deviation of inflation from target. It is important, therefore, to have an accurate measure of inflation that indicates underlying inflationary pressures and distinguishes between longer-term changes and those that are brought on by temporary shocks to the economy. "Evaluating Measures of Core Inflation" explains the importance of a reliable measure of core inflation and re-evaluates the Bank of Canada's official measure as well as several others that the Bank monitors on a regular basis.

The inflation-target horizon is the time interval during which monetary policy actions are expected to return inflation to target following a shock. "Another Look at the Inflation-Target Horizon" reports on the results of two recent Bank of Canada studies that have examined the inflation-target horizon from a Canadian monetary policy perspective with a view to identifying how long the horizon should be, given the kinds of shocks that typically hit the Canadian economy. It concludes that a target horizon of six to eight quarters remains appropriate in most cases, but notes that situations may arise where a longer-term time frame may be necessary.

Credibility with Flexibility: The Evolution of Inflation-Targeting Regimes, 1990–2006

Graydon Paulin, International Department

- *Most industrialized economies now have an explicit inflation objective as a key component of their monetary policy framework.*
- *Although definitive guides to the appropriate design of an inflation-targeting framework were lacking in the early 1990s, the frameworks have nevertheless changed relatively little since their inception.*
- *Supported by improved credibility, design changes have tended to increase flexibility within the frameworks, allowing for a more nuanced response to economic shocks.*

Inflation targeting is about 15 years old, so there is now much to learn from the collective experience of the industrialized countries that have adopted inflation targeting as the centrepiece of their monetary policy. The impact of inflation targeting (IT) on inflation and other economic variables has been studied extensively. This article focuses on changes in the *design* of IT regimes.[1] Which countries, having introduced inflation targeting at some point, subsequently changed the original makeup of their IT regime, and why? Lessons from their experience can help to identify unexpected problems and highlight the preferred features of an IT regime.

A key issue in the design of an IT regime is how much flexibility it allows. There is widespread agreement that it is not possible for central banks to achieve a specific numerical inflation target all—perhaps even most—of the time. Indeed, it is not even considered desirable. A too-rigid determination to hit the target, even in the face of economic shocks, can generate detrimental volatility in both interest rates and economic outcomes. Yet central banks want to maintain confidence in the IT regime, even if measured inflation is off target, possibly for extended periods. This leaves IT central banks with a significant problem: If they both expect and condone divergences from the target—the essence of flexibility—how can they maintain the credibility of the IT framework?

IT central banks usually resolve this tension by specifying a set of components for the IT regime that go beyond a simple numerical target. This can include ranges around the target (or ranges without a target),

1. As part of the work to inform the renewal of the agreement on Canada's inflation-control target, this article focuses on what can be learned from the experience of industrialized countries other than Canada.

caveats for particular circumstances, varying policy horizons, and different price indexes for the target, all of which may be combined with various institutional arrangements and communications initiatives. Together, these elements form an inter-related framework that becomes part of the monetary authority's overall strategy for communicating with the public and financial markets.

Striking the right balance has not been easy for many central banks. Nevertheless, the rising credibility of the relatively new IT frameworks has, over time, facilitated their flexible application and influenced the design choices of the authorities. This article begins with the introduction of inflation targeting in industrialized economies and then examines how countries have drawn on their own experience and the expanding literature on inflation targeting to change their IT frameworks over time.

The Spread of Inflation Targeting

Today, inflation targeting is a broadly accepted approach on which to base monetary policy, yet it was quite revolutionary in the early1990s.[2] At that time, dissatisfaction with both exchange rate and money-growth targets fuelled the search for alternatives, but the analysis of inflation targeting was relatively limited.[3] Indeed, little of the extensive literature on inflation targets that is now available preceded their introduction in the first half of the 1990s. As a result, the precise framework adopted by early IT countries depended heavily on the judgment developed from past experience and on the prevailing circumstances.

Today, inflation targeting is a broadly accepted approach on which to base monetary policy, yet it was quite revolutionary in the early 1990s.

The first wave: 1990 to 1994

A "first wave" of inflation targeters adopted the then-novel framework in the first half of the 1990s.[4] As a group, these countries had a relatively unsatisfactory history of inflation (see Chart 1). The initial countries, New Zealand and Canada, wished to facilitate disinflation, in part by promoting a reduction in inflation expectations. As low rates of inflation took hold among the industrialized economies, the emphasis shifted to locking in the gains and preventing a reacceleration of inflation.

As **New Zealand's** inflation rate fell in the late 1980s, there was some uncertainty as to how far this decline should be pursued, and concern that inflation expectations were stabilizing at a relatively high level (around 7 per cent).[5] When, in 1988, the then-finance minister began to ruminate publicly about desired inflation of "around 0 or 0 to 1 per cent" his comments were greeted with some surprise (Reddell 1999, 67). Despite this somewhat ambivalent reaction, revised central bank legislation was enacted in 1989. It was followed in March 1990 by the first Policy Targets Agreement (PTA) between the finance minister and the Governor-designate of the central bank, which specified an explicit 0 to 2 per cent inflation objective.

New Zealand was followed by **Canada** in February 1991, when the Bank of Canada and the government jointly announced the adoption of explicit targets for reducing inflation. As the Bank had been without an explicit framework for monetary policy since the abandonment of monetary targeting in 1982, Governor John Crow made the case in 1988 for lowering inflation towards the longer-run objective of price stability, although no numerical definition was given (Crow 1988; see also Thiessen 2000 for a longer perspective). As in New Zealand, there was a desire to lower expectations to foster disinflation. This desire was heightened by concern about the possible impact of a large price-level shock stemming from the introduction of the Goods and Services Tax at the beginning of 1991 (as well as from the sharp rise in oil prices following the Iraqi invasion of Kuwait in 1990).

2. Some observers have identified various antecedents to the current IT regimes, as well as important related work in the literature (e.g., on the trade-off between output and inflation and early work on the benefits of low inflation). Nevertheless, the adoption of inflation targeting in the early 1990s represented a sharp, and somewhat surprising, break from previous generally accepted practice.

3. This is in part because the focus was on finding intermediate targets on which monetary policy had a more direct and timely influence.

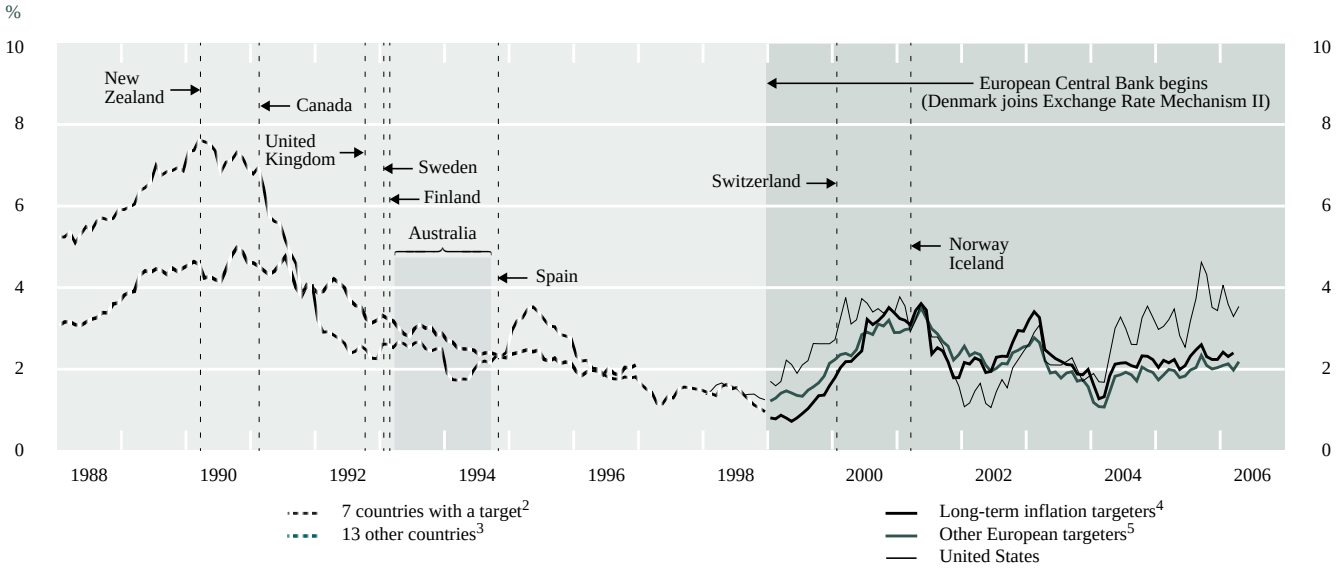
4. We include as inflation targeters those industrialized countries that have become generally identified as such in the literature, although some countries may not define themselves thus. Discussions on the definition of an inflation-targeting country abound. See, for example, Mishkin and Schmidt-Hebbel (2001).

5. A particularly comprehensive analysis of the beginning of inflation targeting in New Zealand, and the circumstances which led to it, can be found in Reddell (1999). See also Sherwin (1999).

Chart 1

Inflation Outcomes

CPI Y / Y[1]



Note: Vertical lines indicate start of inflation targeting.

1. Aggregate series are unweighted averages of CPI inflation in the specified countries.
2. 7 countries: Australia, Canada, Finland, New Zealand, Spain, Sweden, and the United Kingdom
3. 13 countries: Austria, Belgium, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Switzerland, and the United States
4. Long-term targeters: Australia, Canada, New Zealand, Sweden, and the United Kingdom
5. Other European targeters: euro zone (Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain), Denmark, Norway, and Switzerland

Pressure on the exchange rate arrangements in place within Europe, and the subsequent loss of the exchange rate as a nominal anchor for policy, prompted several European countries to move to inflation targeting. It was introduced in the **United Kingdom** soon after that country's departure from the Exchange Rate Mechanism[6] in September 1992. The new framework announced in October by the Chancellor of the Exchequer (who remained responsible for interest rate decisions) specified an inflation target of 1 to 4 per cent. In a similar fashion, **Sweden** adopted inflation targeting soon after its fixed exchange rate regime was abandoned in November 1992 (with the krona quickly declining by about 15 per cent). In the context of a very weak economy and a faltering banking system, inflation was already low, but a new basis was needed on which to formulate monetary policy. In January 1993, the Riksbank announced that it would focus on a 2 per cent inflation target, with a tolerance interval of ±1 percentage point. Governor Bäckström later observed that, given the need to put the new framework rapidly in place, "not all aspects of the new framework, such as how monetary policy should react to various types of shocks, could be thoroughly examined."[7]

The turbulence among European currencies in the early 1990s was particularly problematic for **Finland** and its strong post-war commitment to a fixed exchange rate regime. Like Sweden, Finland faced a deepening recession and a growing banking crisis. Persistent pressure on the markka developed, and it was floated in September 1992. The Bank of Finland adopted inflation targeting six months later, following a period of some policy confusion, with the objective of stabilizing inflation at 2 per cent by the end of 1995. The announcement "was not well received by the public," which responded with skepticism, despite inflation already being close to the announced target (Åkerholm and Brunila 1995).

The adoption of an IT regime in **Australia** followed a relatively informal process, leaving some uncertainty as to its precise timing. In March 1993, the Governor

6. The Exchange Rate Mechanism was originally established in 1979 by the European Community to specify limits on the amount that the value of member countries' currencies could move against each other.

7. See Bäckström (2003). Heikensten (2002) describes subsequent efforts to solidify the new framework.

of the central bank voiced his view that, from the perspective of price stability, inflation of "an average of 2 to 3 per cent over a period of years . . . would be a good outcome" (Stevens 1999). Subsequent speeches added progressively more detail to the framework, including the view that the target should be assessed "on average, over the cycle," reflecting the position that inflation was hard to control precisely. This tentative beginning led to some difficulty in convincing market participants that Australia had a meaningful target. The original specification was "initially widely thought to be a bit too soft" (Stevens 2003). This uncertainty was resolved in 1996 when the agreement between the Governor and the Treasurer was formalized by the first *Statement on the Conduct of Monetary Policy* (subsequently updated in 2003).

The Governor of the central bank of **Spain** announced the adoption of an inflation target in November 1994, following the implementation in June of a revised law that had granted the central bank full autonomy, in line with the requirements of Spain's pending participation in the European Monetary Union (EMU). The central bank was also at least partly motivated, as in Canada, by concern over the possible impact of a price-level increase arising from an increase in the Value-Added Tax, which took effect in January 1995.

The second wave: 1999 to 2001

A "second wave" of inflation targeters began when 11 countries (including Finland and Spain, noted above) created the EMU and, as a result, the euro zone. The **European Central Bank** (ECB) began operations on 1 January 1999, with a monetary policy framework that was already fully delineated. The ECB's Governing Council interpreted the legislated objective of price stability as requiring an inflation rate for the euro area of "below 2 per cent" over the medium term. Note, however, that the ECB does not consider itself an inflation targeter, at least not in the way countries such as New Zealand, the United Kingdom, and Sweden do. Emphasis is given to "a broadly based assessment of the outlook for price developments," drawing on a range of information, together with a "second pillar" focusing on monetary developments.

Switzerland had used monetary targeting as a nominal anchor for policy, shifting to multi-year monetary targets in the early 1990s as a way to respond more flexibly to shocks. Problems persisted, however, and by the late 1990s, monetary targets were no longer considered best practice (e.g., they were not a good vehicle for explaining policy decisions to the public). At the end of 1999, the Swiss National Bank (SNB) announced that policy would be based on price stability as defined by inflation of less than 2 per cent, although money was to play an important role. The SNB did not view its new approach as inflation targeting, although Rich (2000, 21) suggests that "the differences between the SNB's new approach and inflation targeting involve mainly questions of semantics."

In **Norway**, attempts to maintain short-term exchange rate stability became increasingly untenable in the 1990s, influenced, in part, by large swings in the price of oil. Inflation concerns mounted in response to a prolonged economic upturn, and, in March 2001, the government introduced the *Regulation on Monetary Policy*, which indicated that the policy objective should be price stability, with an operational inflation target of approximately 2 1/2 per cent over time. The government's decision to adopt an IT regime was also linked to a fundamental change in the fiscal policy framework, which limited the scope for using public finances to manage aggregate demand. In March 2001, inflation targeting was also introduced in **Iceland** through a joint declaration by the central bank and the government. Price stability is defined as 2 1/2 per cent, and the central bank is required to issue a public report if inflation deviates more than 1 1/2 per cent above or below this.

A third wave? 2006 to –

Two major industrialized countries have yet to adopt explicit inflation targeting, or at least to define an inflation rate consistent with price stability—the United States and Japan. In both countries, however, inflation targeting as a basis for monetary policy has been the subject of active debate for several years. In the **United States**, the Federal Open Market Committee (FOMC) discussed inflation targeting on numerous occasions in the mid-1990s, spurred perhaps by the adoption of inflation targeting among the first wave of countries described above. More recently, the debate has received impetus from the replacement of Chairman Alan Greenspan by Ben Bernanke, who is considered generally supportive of a more explicit inflation target for U.S. monetary policy.

U.S. monetary policy in recent years has been widely regarded as successful, acquiring considerable credibility in the pursuit of low inflation. Some observers are therefore skeptical about the benefits to be gained from an explicit IT regime. They suggest that the perceived policy constraints imposed by a specific target are problematic, in part because of the Fed's legislated "dual mandate" of price stability and full employment. Nevertheless, inflation targeting has received

considerable support among both academics and policy officials, who tend to view a specific target as a means of further enhancing an already successful framework. Supporters note that inflation targeting as actually practised is implemented flexibly and is consistent with output stabilization.[8] Since Chairman Bernanke's term began in February 2006, public commentary has emphasized an intermediate option, which focuses on the announcement of a numerical definition of price stability that would be relevant over the longer term (see Meyer and Sack 2006a, 2006b, or Gramlich 2003 for an earlier discussion).

The monetary authorities in **Japan** have also discussed inflation targeting on several occasions in recent years, as revealed in the recorded minutes of their monetary policy meetings. Substantial changes to the Bank of Japan Act implemented in 1998 clarified the objective of price stability, but did not define it quantitatively. Suggestions by some observers that Japan adopt an explicit IT framework have been made in a very different environment than in the United States. With persistent deflation over the period 1998 to 2005, inflation targeting was thought to be a means of returning to a low but positive inflation rate.

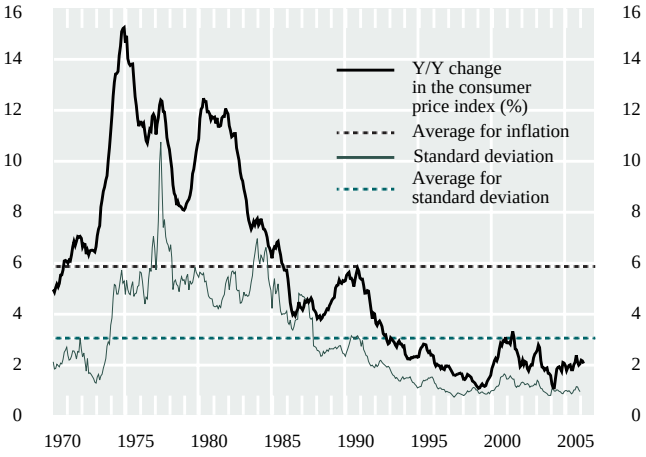
Although the Bank of Japan adopted various monetary policy measures in the first half of the 2000s (Ito 2004), it did not include explicit inflation targeting. In March 2006, however, an announcement of changes to the Bank's operating procedures was accompanied by a statement that members of the Bank's Board of Directors considered price stability to be consistent with measured inflation in a range of 0 to 2 per cent over the medium-to-long term. They emphasized that this did not imply a policy of explicit inflation targeting, but was simply a reference range for price stability.

Early experience with IT frameworks

As described above, the proximate cause of the shift to inflation targeting has varied across countries and has included such factors as the loss of previous nominal anchors, the desire to lower inflation expectations during a disinflationary period, concern over the impact of increases to indirect taxes, monetary union in Europe, and fiscal reforms. The collapse of fixed exchange rate regimes has in some cases led to a particularly rapid shift in the policy framework. Nevertheless, underlying most countries' shift was a growing consensus on the desirability of low inflation. Inflation targeting has also spread to an expanding group of emerging-market economies, despite earlier fears that it would be too difficult for these countries to successfully implement an IT regime (see box).

Chart 2

Inflation in 20 Industrialized Countries



Note: Unweighted average of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States

The frameworks might therefore have been expected to undergo extensive revision as experience was gained and the relevant literature expanded.

Numerous analyses have examined outcomes for inflation under IT regimes in the industrialized economies, and for other variables, such as inflation expectations and volatility in output and policy instruments (for relevant surveys, see Kuttner 2004; Mishkin and Schmidt-Hebbel 2001; and Roger and Stone 2005). In general, two broad results emerge. First, inflation targeters have successfully achieved and maintained low inflation, but it is difficult to discriminate between the outcomes of IT and non-IT regimes. Indeed, the 1990s saw a general shift to low inflation, with an evident convergence in inflation rates across countries (Chart 2). Second, inflation expectations appear to be well anchored in both IT and non-IT countries, but there is evidence that the impact of economic shocks on

8. Many supporters argue that an IT regime actually promotes output stabilization by reducing uncertainty and allowing the monetary authorities to act more aggressively to stabilize output, owing to gains in credibility.

Inflation Targeting in Emerging-Market Economies

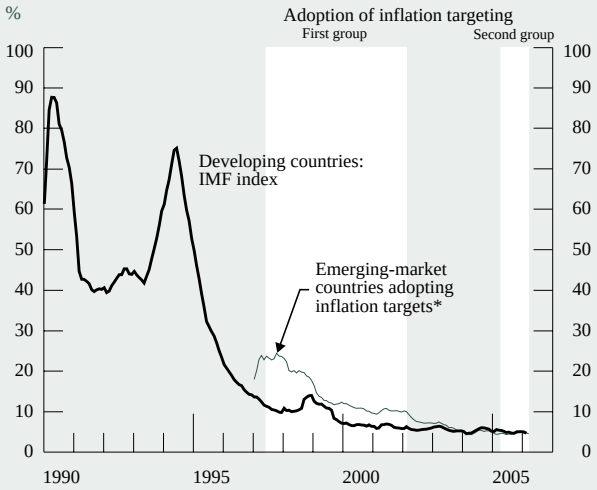
Despite the serious inflation problems in the developing world, or perhaps because of them, inflation targeting was initially considered inappropriate for emerging-market economies. Implementing an IT framework was perceived as a daunting task, requiring, among other things, a level of policy expertise, smoothly functioning markets, and institutional infrastructure that did not appear to exist in most of these economies. Other monetary regimes, such as an exchange rate peg, were suggested as more suitable. Over time, however, the emerging economies have come to be seen as the largest potential beneficiaries of inflation targeting, which would provide them with the clear nominal anchor and, ultimately, the policy credibility they lacked. Following the successful disinflation achieved within the developing world during the mid-1990s (see Chart B1), inflation targeting was also viewed as a way of "locking in" the hard-won progress. Between 1997 and early 2002, at least 13 emerging-market economies (including Israel, the Czech Republic, Poland, Brazil, Chile, Colombia, South Africa, Thailand, Korea, Mexico, Hungary, Peru, and the Philippines) adopted an explicit IT regime.[1] In 2005–06, at least four other economies also moved to inflation targeting (the Slovak Republic, Indonesia, Romania, and Turkey).

Although explicit inflation targeting was adopted recently among the emerging economies, it is possible to assess its impact, given the large pool of non-IT emerging economies that can be used for comparison (this is very difficult among the industrialized countries, since only a few of them do not have an inflation target or a definition of price stability). A recent study by the International Monetary Fund (IMF), for example, compared macroeconomic performance among the first 13 emerging-market economies identified above against 29 comparable non-IT emerging-market countries (IMF 2006). It finds evidence that macroeconomic performance in the economies with inflation targeting has been superior to that in countries which use other monetary policy regimes. While further analysis is necessary to confirm these results, they suggest that inflation targeting can indeed be successfully applied among a broader group of countries than earlier believed.

Chart B1

Inflation in Emerging-Market Economies

(Y / Y-CPI)



* Unweighted average of Brazil, Chile, Colombia, Czech Republic, Hungary, Indonesia, Israel, Korea, Mexico, Peru, Philippines, Poland, Romania, Slovak Republic, South Africa, Thailand, and Turkey

1. We adopt the classification of developing countries with IT regimes as defined in IMF (2006).

inflation expectations is lower in IT countries (see Gürkaynak, Levin, and Swanson 2006; and Levin, Natalucci, and Piger 2004).

Overall, countries have been far more successful in minimizing the deviations of outcomes from targets than might have been expected, based on earlier experience. Yet inflation targeting remains a reasonably new policy regime, one that Kenneth Kuttner (2004) describes as "still very much in its adolescence." The frameworks might therefore have been expected to undergo extensive revision as experience was gained and the relevant literature expanded. In the next section, we discuss how the various components of the IT frameworks have evolved.

Components of the IT Framework

Inflation targeting is one way to help the public and financial markets understand the central bank's objectives and actions. In response to criticism that this regime may lead to a narrow emphasis on controlling inflation over short time horizons, all IT central banks stress that they implement the targets with some degree of flexibility—a necessary response to uncertainty about the future behaviour of economic variables

and, in particular, shocks to the economy. This reflects the fact that inflation targeting is not simply about controlling inflation, but is ultimately about achieving good outcomes in the economy.

In some cases, economic shocks may pose relatively little difficulty for the monetary authorities, such as demand shocks that push prices and output in the same direction. Here, stabilizing the price level would also work to stabilize output at its potential (although an important consideration is how quickly to achieve this). However, the problems that can be associated with a narrowly implemented IT regime (one that rigidly adheres to a numerical target over a short period) are more apparent in the face of cost-push shocks, or supply shocks, which can shift output and inflation in opposite directions. In such cases, there is a risk of responding to a one-time shift in the price level as opposed to a trend inflationary disturbance. In a narrowly implemented IT regime, where the central bank focuses on returning inflation to the target level as soon as possible, the shock to output may be exacerbated. Another type of shock, which some analysts suggest that central banks (both IT and non-IT) should explicitly incorporate into their policy response, is asset-price misalignments.[9] Some proponents of placing a stronger emphasis on asset prices argue that they can be accommodated within the traditional IT framework by lengthening the policy horizon over which inflation is returned to the target.

The challenge of dealing with shocks in an IT regime is further complicated by uncertainty over the nature of the shock itself, since "shocks do not come with labels" (Trichet 2004, 4). Thus, the overall design of the various elements of the framework, and their interrelationships, becomes critical. For example, combining a relatively short policy horizon with a narrow target

9. For a discussion of this issue, see Selody and Wilkins (2004).

Table 1

Current Inflation-Targeting Frameworks

	New Zealand	Canada	United Kingdom	Sweden	Australia
Date adopted	March 1990	February 1991	October 1992	January 1993	March 1993
Current target	1–3 per cent range (no specified midpoint)	2 per cent midpoint in 1–3 per cent range	2 per cent (±1 per cent, but not a target range)	2 per cent, ± 1 per cent	2–3 per cent on average over the business cycle
Target variable	CPI (with caveats for some deviations)	CPI (operationally use core CPI)	CPI (based on the European Union harmonized index)	CPI (but UND1X often emphasized)	CPI
Policy horizon[a]	Medium term	6–8 quarters	Medium term	2 years	Medium term
Target set by	PTA (most recently in 2002) between RBNZ Governor and Minister of Finance	Government and central bank (5-year agreement, last set in 2001)	Remit from Chancellor of the Exchequer (at least every 12 months)	Central bank	Joint statement (most recently in 2003) by the Governor of the Reserve Bank and the Treasurer

	Finland[b]	Spain[b]	Euro zone[c]	Switzerland[c]	Norway[d]
Date adopted	February 1993	November 1994	January 1999	January 2000	March 2001
Current target	2 per cent	Close to 2 per cent	Below, but close to, 2 per cent	Less than 2 per cent	Approximately 2 1/2 per cent (± 1 per cent, but not a target range)
Target variable	Adjusted CPI	CPI	HICP	CPI	CPI (emphasize a core measure of the CPI)
Policy horizon	Date-specific	Date-specific	Medium term	2–3 years	1–3 years
Target set by	Central bank	Central bank	Central bank	Central bank	Government

Note: CPI = consumer price index, PTA = Policy Targets Agreement, UND1X = measure of underlying inflation, HICP = harmonized index of consumer prices
RBNZ = Reserve Bank of New Zealand

a. The policy horizon may represent different things within an IT regime. Here it indicates the time period that is most commonly emphasized by the central bank.
b. In January 1999, both Finland and Spain became members of the euro zone.
c. The European Central Bank and Swiss National Bank do not consider inflation targeting the goal of their monetary policy regimes.
d. Iceland introduced inflation targeting at the same time as Norway, with the same numerical inflation target.

range to minimize divergences from the target in the face of shocks could lead to instability in policy instruments and induce undesired fluctuations in output.

Dealing with shocks in an IT regime is further complicated by uncertainty over the nature of the shock itself.

These concerns must be accommodated, however, in a way that does not seriously compromise the credibility of the regime by creating doubts over the willingness of the monetary authorities to achieve the target. In the following sections, we examine how policy-makers have designed the elements of their IT frameworks (some of which are summarized in Table 1, as they currently exist) and adjusted them as they gained experience to meet the dual criteria of credibility and flexibility.

The numerical target: points and ranges

The numerical target itself will influence the overall credibility of the IT regime. Set it too high, and the authorities may not be viewed as serious about achieving a low inflation environment. Too low, and the target may be viewed as unrealistic and have a reduced impact on expectations. In practice, views on what is realistic will vary over time as experience accumulates and expectations adjust.

To reflect the impossibility (and undesirability) of consistently maintaining inflation at a particular value, some central banks have specified a target range rather than a point target, or a range around the target. Yet the interpretation of ranges can be problematic. Is the objective to be within the band, or at its centre? Are the bands simply indicative, or does movement outside the range imply an aggressive monetary

Table 2

Selected Changes to IT Regimes (A)

	Numerical target	Target variable
New Zealand	• The initial band of 0–2 per cent was widened to 0–3 per cent in 1996 and changed to 1–3 per cent in 2002. • The 2002 PTA indicated that outcomes would be evaluated "on average over the medium term."	• Various consumer price indexes were used to avoid incorporating the immediate price impacts of interest rate changes; a new total CPI introduced in 1999 largely removed these effects. • The wording for specific caveats was broadened to reinforce the idea that those cited were only some of a possible range of shocks.
United Kingdom	• The initial 1–4 per cent target range effectively became "2.5 per cent or less" in 1995, and then 2 1/2 per cent "at all times" in 1997. • In 1997, deviations of greater than 1 per cent were given special significance, but not considered a "hard edge." • The target became 2 per cent in 2003 to reflect a new target price index.	• The CPI excluding mortgage costs (RPIX) was replaced by the European Union's HICP in 2003, which excludes both house prices and Council Tax (the new price series led to a change in the target, from 2 1/2 to 2 per cent).
Sweden	• The initial target and target range have not been changed, but beginning in 1999, a formal explanation was required if inflation moved outside of the range.	• At various times the central bank highlighted different price indexes (e.g., that excluding mortgage-interest costs and indirect taxes), and in 1999 clarified that other price indexes would be used as operational guides. • In 2003, the bank highlighted a series that excluded energy as an especially important guide.
Australia	• The authorities have clarified that the 2–3 per cent target average means that inflation, when calculated over the cycle, "would have a 2 in front of the decimal."	• The original target was defined as "underlying inflation," although a specific measure was not identified; after 1998, focused on a price measure that adjusted for housing costs.
Euro zone (European Central Bank)	• The initial definition of price stability as "below 2 per cent" was changed to "below, but close to, 2 per cent" in 2003.	• Targeted total CPI as defined by HICP—sometimes emphasizes that energy prices have caused large movements, but otherwise have made relatively little use of "core" indexes that exclude certain components.
Norway		• The intent to diminish the influence of temporary disturbances was formalized with the development of a new operational price index (published since 2001) that excludes energy and indirect taxes.

Note: CPI = consumer price index, PTA = Policy Targets Agreement, HICP = harmonized index of consumer prices

policy response, the so-called "hard edge"? In practice, IT central banks have tended to downplay any automatic response implied by the edges of the range (sometimes by giving them little emphasis).

The key changes that have been observed in the numerical targets of IT regimes are summarized in the first column of Table 2. Inflation targeters have demonstrated a clear preference for a target at or around 2 per cent. They have not lowered their inflation targets over time (aside from the use of indicative targets during disinflationary periods at the beginning of IT regimes), despite considerable success in controlling inflation and improved monetary policy credibility.[10] This may be disappointing to those who believe that additional gains can be had from further lowering inflation. Note that some observers emphasize the importance of maintaining a positive rate of inflation, given their concerns over measurement bias and the risk of deflation (in concert with the zero lower bound on nominal interest rates).

Ranges are intended as communication vehicles rather than as "tripwires" for policy action.

Most central banks also employ a range, sometimes without a midpoint. While generally intended to provide greater clarity as to the tolerance levels with respect to the variance of inflation, the edges of the ranges are not regarded as "hard." Transgressing them is not expected to induce a sudden break in policy behaviour, designed to quickly bring inflation back to the midpoint, but it is generally expected to bring about detailed public explanations.

A further signal that ranges are intended as communication vehicles rather than as "tripwires" for policy action is indicated by their nature. Rather than being based on explicitly defined confidence intervals with respect to inflation outcomes, ranges are generally given in round numbers, typically plus or minus 1 per cent, and are thus relatively easy to explain. Indeed, if viewed primarily as a communication tool, the precise size of the band may not be very important.

10. The reduction of the U.K. inflation target from 2 1/2 per cent to 2 per cent in 2003 was the result of a technical change associated with the targeted price index. See King (2004).

The target variable (and caveats)

Specifying a target begs the question of which prices are to be targeted. The communications aspect of inflation targeting argues in favour of highly visible price indexes that are readily understood by the public. Maintaining credibility also suggests that the choice of price index should not appear manipulative, attempting to hide inconvenient realities.

But inflation targeting also raises the issue of how to deal with transitory inflation shocks. Price movements that do not have medium-term implications for inflation should not typically affect monetary policy. Such deviations may nevertheless strain credibility. Aside from using ranges to explain their behaviour, authorities may choose to focus on price indexes that explicitly exclude transitory effects. For example, they may choose a measure of "domestic" inflation that excludes the direct effects on inflation of changes in exchange rates, or a measure of "core" inflation designed to exclude a range of shocks that are likely to have a transitory impact on inflation. In some cases, the authorities may retain a broad price index (usually the total consumer price index) as the overall objective, but set policy according to a narrower price index, i.e., an operational target that is felt to be more informative over the short term.

Central banks have, over time, developed a more nuanced picture of the different types of possible transitory shocks.

Over time, a number of IT central banks have refined their target variable in an effort to "remove" the impact of perceived temporary shocks (see the second column of Table 2 for a summary of the key changes that have been observed in the target variables). IT authorities have been relatively conservative, however, in the adjustments they make to price indexes, most likely because of the potential measurement problems that may be introduced as well as the implications for communication. In general, central banks have opted for broad series, generally excluding the direct effects of interest rate changes and indirect taxes (and preferably produced by a separate statistical agency rather than by the central bank itself, to minimize the potential for perceived manipulation).

Although central banks have, over time, developed a more nuanced picture of the different types of possible transitory shocks, they have tended to avoid highly specialized indexes, again, most likely in the interests of better communication. They have generally not, for example, emphasized indexes that exclude the direct effects of changes to exchange rates. It is also interesting that, despite the oft-repeated concerns regarding measurement bias, there has not been a shift towards indexes that might reduce this problem (e.g., chain-linked price indexes). Again, these series may be viewed as adding a degree of complexity (including the effects of revisions to past data) that could make communication more difficult.

The policy horizon

Transitory shocks can also be addressed by clarifying the period over which inflation is expected to return to its target. This period may be defined by the monetary policy lags, i.e., the horizon over which monetary policy can influence inflation (sometimes referred to as the control horizon). Alternatively, it may be defined as the period over which it is desirable to bring inflation back to the target (the policy, or targeting, horizon), with the difference influenced by the relative weight that the authorities place on other objectives (such as the stabilization of output).

An IT central bank may deliberately adopt a policy horizon longer than its control horizon. In general, a medium-term horizon for achieving the inflation objective suggests that other objectives are being accorded at least some weight. It may not be a simple task, however, for an outside observer to evaluate these relative weights.

Important changes that have occurred in the policy horizons of IT regimes are summarized in the first column of Table 3. The tendency has been to somewhat lengthen the policy horizon for the achievement of inflation targets, giving more attention in particular to the medium term, despite the degree of ambiguity such a choice may introduce. These revisions do not appear to have resulted from changing views regarding monetary policy lags, but may more accurately reflect the authorities' greater experience and increased appreciation of the shocks that can occur. An important motivating factor in some instances appears to be

Table 3

Selected Changes to IT Regimes (B)

	Policy horizon	Institutional structures
New Zealand	• The 2002 PTA placed considerable emphasis on the "medium term."	• Joint PTAs with the government were a key mechanism introduced at the beginning of inflation targeting, although the wording was altered over time to give increased clarity to the central objective of price stability. • The clause relating to the desire to avoid "unnecessary instability in output, interest rates and the exchange rate" added to the 1999 PTA was not viewed as compromising the price-stability objective.
United Kingdom	• The inflation objective was originally set in terms of the length of the current Parliament, but subsequent changes effectively emphasized a medium-term focus.	• The revisions to the Bank of England Act in 1998 included operational independence for the central bank, as well as the creation of a Monetary Policy Committee.
Sweden	• The policy horizon has changed from 1–2 years to 2 years. • There has been a steady clarification of circumstances that could lead to sustained deviations beyond the horizon. • A process providing for central bank warnings of the need to extend the policy horizon, if necessary, was introduced in 1999.	• Increased government support for the central bank's inflation-targeting approach appeared in budget statements beginning in 1996. • Formal institutional independence was introduced for the central bank in 1999.
Australia	• The horizon has always been put in the context of the medium term, but, beginning in 1996, it was further clarified that outcomes should be evaluated on the basis of "on average over the cycle."	• In 1996, the Governor and Treasurer released the *Statement on the Conduct of Monetary Policy*, which indicated the government's support for the inflation target and its recognition of the independence of the Reserve Bank of Australia (reiterated in the 2003 *Statement*).
Norway	• In 2004, the initial two-year policy horizon for achieving the target was subsequently changed to "a reasonable time horizon" of "normally 1–3 years."	
Finland		• The new Bank of Finland Act provided for independence of the central bank, beginning in 1998.

Note: PTA = Policy Targets Agreement

the desire to allow for the impact of possible asset-price bubbles.

Lengthening the explicit or implicit horizon does not appear to have compromised credibility. Indeed, such a shift may have been possible precisely because credibility has increased. The public statements of IT central banks may also shift among the control horizon (determined by the monetary policy lags); the inflation forecast horizon, in cases where the central bank publishes an economic projection; and the policy horizon over which deviations from the target are expected to be fully eliminated.[11] Although this might represent a challenge for clarity of communication, it does not appear to have harmed credibility.

Supporting institutional and policy structures

It is widely recognized that appropriate institutional and policy structures, particularly the clear support of the government, are important elements of a successful, credible IT regime. Such support has generally translated into increased independence for the central bank and has included policy and communication initiatives undertaken by the government. The evolution of institutional structures used to help establish the credibility of the IT regime in several representative instances is described in the second column of Table 3.

A concern may exist, however, when objectives other than inflation are raised. It is sometimes the case that the relevant government statements or legislation also make reference to apparently competing objectives, such as employment or output growth. It appears, however, that market participants have interpreted such competing statements as indicating that the monetary authorities will place some weight on output stabilization, but not at the expense of significantly undermining price stability.

Communication and the publication of forecasts

Ranges, measures of underlying inflation, explicit caveats, and policy horizons beyond the immediate future are all methods for providing flexibility in the face of uncertainty and transitory shocks. Yet the same flexibility may also threaten the credibility of the IT regime, particularly where the monetary authorities do not (and are perhaps unable to) reveal the weight they are giving to other intermediate objectives (e.g., output stabilization or instrument stability). In this situation, the supporting institutional structures discussed above are critical. At least as important are effective communications that publicly explain the authorities' decisions and behaviour.

Communications associated with policy frameworks and objectives have increased enormously over the past 15 years among IT and non-IT central banks alike.[12] As observed by Kuttner, "all inflation targeters talk a great deal" (2004, 94). There is now a significant commonality in the approaches currently taken (with, for example, detailed inflation reports almost universal). One area that continues to evolve significantly, however, is the publication of forward-looking economic information, including forecasts of inflation. Owing to monetary policy lags, the IT framework places heavy emphasis on inflation forecasts, so that policy-makers are able to act in a timely fashion. Svensson (1999, 2005) argues that, properly implemented, an inflation-targeting approach is essentially an application of inflation-forecast targeting. Central banks have steadily increased the amount of forward-looking information that they publish, including, to an increasing degree, their internal forecasts of inflation and other macroeconomic variables. Table 4 summarizes some of the key features of the published inflation forecasts of IT central banks.[13]

The central banks of both New Zealand and Norway have moved markedly far with respect to forecast disclosure. The publication of an interest rate path has been a singularly problematic issue, in part because of concerns that it may be interpreted as a commitment to a particular path by the authorities, and because it is difficult to convey the underlying uncertainty and conditionality of the outlook. Nevertheless, the RBNZ bases its forecast on an endogenous trajectory of interest rates (i.e., rates that are not completely independent but reflect what is happening in the other variables) consistent with attaining the inflation target at its chosen horizon. The Norwegian central bank had been using the market term structure of interest rates (adjusted when it has a significantly different view). In late 2005, however, it started publishing its own

11. The Sveriges Riksbank (Sweden's central bank), in a recent clarification (2006), noted that it had extended its forecast to three years, longer than the two-year policy horizon, in part so that the effects of shocks persisting beyond the policy horizon could be shown more easily.

12. See Issing (2005) and Berg (2005) for extensive tables comparing the communication activities of all the central banks discussed here. See Poole (2005) for a more detailed discussion of FOMC transparency.

13. See Berg (2005) for a similar comparison of central bank forecast reporting across a somewhat different grouping of central banks (especially Table 3). In Table 4, we focus on IT banks that report the interest rate assumption that was used. Australia and Canada also publish inflation forecasts.

Table 4

Selected Published Inflation Projections

	Interest rate assumption	Exchange rate assumption	Conveying uncertainty	Approximate horizon	Projection for output gap reported
New Zealand	Endogenous	Endogenous (with eventual return to long-run average)	Alternative scenarios are described (in boxes in the *Report*) as required.	3–4 years	Yes
United Kingdom	Market-implied (also alternative scenario with a constant interest rate)	An average between a constant level and the path implied by UIP	Fan charts	2–3 years	No
Sweden	Market-implied	Adjustment to long-run equilibrium	Risk assessment includes fan charts around the base scenario; also an alternative inflation scenario.	2–3 years	No (project some measures of resource utilization)
Euro zone[1]	Constant[2]	Constant	All figures reported in ranges	2 years	No
Switzerland	Constant	Constant	Also report inflation tendencies based on money indicators	3 years	No
Norway	Endogenous	Endogenous (but use a conservative view of future movements)	Fan charts; alternative scenarios; comparisons with monetary policy rules	3–4 years	Yes

Note: UIP = Uncovered interest parity
1. The projection reported is that of the European Central Bank staff. The Governing Council does not issue a separate projection.
2. Short-term interest rates are held constant, while long-term rates are based on market expectations.

forecast for the interest rate for the following three years.[14]

Central banks have steadily increased the amount of forward-looking information that they publish.

To summarize, communication is the glue that holds the IT framework together. Given the ever-present tension between the reality of a numerical target (or range), and the impossibility of constantly achieving it, communication tools such as inflation reports are crucial to explaining the impact of temporary shocks. The use of these tools has increased substantially in IT countries.

It can be argued that clarity about the central bank's objectives is maximized when the inflation forecast (and attendant uncertainty) is made public, so that private sector agents can assess central bank actions. In effect, the forecast is a summary statistic for all of the information variables upon which policy is set. While there are different ways to obtain information on the central bank's objectives, forecasts may be a particularly effective way of revealing underlying preferences. They may also have drawbacks, however, and an unresolved issue is the appropriate level of detail to be included in published forecasts.

Conclusion

In some respects, inflation targeting in the industrialized economies emerged in an ad hoc fashion. Economic theory in the early 1990s did not provide a definitive guide to the most suitable specification for an IT regime. Nor was it clear what were the optimal conditions under which to adopt an IT framework. Thus, the early specification of IT frameworks, and the timing of their introduction, included heavy doses of professional judgment, to some extent influenced by the exigencies of the day.

From this perspective, it may seem surprising that the original IT frameworks appear to have worked extremely well. With frameworks that have typically changed only modestly since their inception, all IT countries have achieved low inflation and have substantially lowered inflation expectations. This may suggest that, as long as a monetary authority can

14. The endogenous interest rate path is based on a set of six criteria that define an appropriate and reasonable path (see the most recent Norges Bank *Inflation Report*). The recent shift to an endogenous path for the policy rate has reportedly progressed smoothly, although the differences to date between the endogenous path and market-implied rates have been small (see Bergo 2006 and Qvigstad 2006).

establish a credible commitment to low inflation, the precise details of the IT framework are of comparatively little importance. However, the details form part of a broad communications package that is critical to the establishment and maintenance of credibility, given the flexible application of inflation targeting followed by all IT central banks.

It appears that central banks were able to arrive reasonably quickly at a framework that was broadly right for the existing environment. However, changes have occurred over time in several key areas, most significantly in the policy horizon. It had tended to lengthen somewhat, with greater emphasis on the medium term. Greater emphasis has also been given to the kinds of shocks and price movements to which the central bank would either not respond or that would cause it to allow sustained deviations from the target.

The design changes that have been adopted since IT regimes were first introduced were generally not the result of perceived errors with the original specification. Rather, it appears that, as credibility has been established, IT central banks have been able to move towards a more flexible IT regime that is viewed as more pragmatic, without concern about a loss of credibility. It has also allowed for a more nuanced approach to addressing large but transitory shocks within an IT framework. The remaining variations among the IT frameworks of the relevant central banks probably reflect different institutional realities and historical happenstance rather than strong differences in views of the underlying economic theory.

An important consideration underpinning the choice of many of the elements of the framework has been the ease with which they can be communicated to the public, making it easier to explain the IT central bank's objectives and policy actions. The considerable effort that central banks have put into public communication initiatives and the improved understanding of the IT framework that has emerged over time will likely facilitate future design changes that the authorities may wish to make. As discussed in Murray (2006), these could include increased attention to large asset-price movements, lower numerical targets, or price-level targeting as opposed to the inflation targeting that is now common.

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Evaluating Measures of Core Inflation

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- *The Bank of Canada's inflation-control target is expressed in terms of total consumer price index (CPI) inflation, but because movements in the CPI are frequently caused by transitory fluctuations in prices, the Bank uses a measure of core inflation as an operational guide to the underlying trend of inflation.*
- *When the inflation targets were renewed in 2001, the Bank adopted a new measure of core inflation, CPIX, to replace CPI excluding food and energy. This measure excludes eight of the most volatile components of the CPI and adjusts the remaining components for the effect of changes in indirect taxes.*
- *Recent research conducted at the Bank shows that CPIX still has advantages over the alternatives. However, it remains an imperfect measure of underlying inflation. Other measures of core inflation, in particular CPIW, which down-weights (rather than excluding) volatile components, provide valuable additional information about trend inflation.*
- *The Bank will therefore retain CPIX as its official measure of core inflation, but will continue to closely monitor the other measures.*

At the centre of the Bank of Canada's monetary policy is the inflation-control target, currently the 2 per cent midpoint of a 1 to 3 per cent range. The target is set in terms of the 12-month rate of increase in the total consumer price index (CPI), the most commonly used indicator of inflation in the Canadian economy. Since the CPI measures the prices of consumer goods and services, it is the most relevant estimate of the cost of living of Canadians. As well, the CPI is the price index that is most familiar to the general public, is available monthly, is published in a timely fashion, and is never revised.

Since inflation targeting was adopted in 1991, the Bank has chosen, for reasons discussed below, to focus on a measure of core inflation as a shorter-term operational guide for monetary policy. When the inflation-control targets were renewed in 2001, the Bank moved to a new measure of core inflation, CPIX, which it had been monitoring for some time. As Macklem (2001, 5) notes, "While no single measure outperformed the others across all dimensions in all periods, CPIX possessed some advantages over the alternatives."

In this article, we review the experience with the Bank's current measure of core inflation, specifically, whether the criteria used to select it in 2001 still favour the measure today. We begin by discussing the relevance of measures of core inflation to the conduct of monetary policy and then describe the measures the Bank is currently monitoring. This is followed by a re-evaluation of the various measures, using an updated sample period. Their performances are compared on the basis of empirical criteria, including volatility, absence of bias vis-à-vis total inflation, and the ability to predict future inflation. Practical criteria, such as timeliness and credibility, are also reported on. The article concludes that CPIX still satisfies all criteria. No other

measures significantly outperform it, and it has the advantage of being familiar to the public.

Some Background on the Use of a Core Inflation Measure

Core inflation has proved useful in the conduct of monetary policy in a number of ways. First, core inflation is a better indicator of current underlying inflationary pressures than total CPI. Total CPI can be misleading, since certain components of the index can be volatile as a result of temporary shocks. Short-run movements in inflation caused by these temporary shocks or the initial effect of changes in indirect taxes tend to reverse themselves fairly quickly. Given that the effect of monetary policy builds up gradually, it would be neither feasible nor desirable for monetary policy to counter such temporary movements. In fact, attempting to do so would increase economic volatility. The core inflation measure is useful because it excludes the components that are most subject to temporary supply shocks or relative price changes.

Second, to the extent that core inflation isolates the underlying trend to which total inflation will return, it provides a useful short-term operational guide for the conduct of monetary policy. Given the lags in the effects of interest rate changes on output and inflation, monetary policy must be forward looking. Thus, policy decisions today are based on what inflation is expected to be 18 to 24 months in the future. Projections of future total CPI inflation are based on a range of information, but core inflation is one relatively simple indicator that is straightforward to measure on a timely basis.

Over longer periods, the total CPI and core measures of the CPI that exclude components with short-run volatility have tended to move in a very similar fashion. As long as core and total inflation share a common long-term trend over a roughly two-year horizon, focusing on core inflation is consistent with targeting total inflation. The Bank targets total inflation in order to meet its objective of providing an environment with low, stable, and predictable inflation, one that helps households make the best consumption decisions. It therefore sets the inflation target in terms of the year-over-year rate of change in total CPI (i.e., total inflation), which is the best available estimate of the cost of living for Canadian households. Focusing on core inflation does not mean that the Bank is not concerned about inflation in the components excluded from this measure (e.g. fruit, vegetables, or gasoline), which represent a significant proportion of the consumer basket. Core inflation is simply a convenient guide to help the Bank achieve its objective of controlling total inflation.

Finally, core inflation has also proven useful for communicating monetary policy to the public. Analyzing and comparing the evolution of both core and total inflation in the *Monetary Policy Report* help the general public to better understand and assess the monetary policy decisions of the Bank.

Core inflation is simply a convenient guide to help the Bank achieve its objective of controlling total inflation.

The first measure of core inflation, which the Bank adopted in 1991, was the 12-month rate of change in CPIXFET, defined as the CPI excluding food, energy, and the effect of changes in indirect taxes. When the inflation targets were renewed for the third time, in May 2001, the Bank chose CPIX as its operational guide for policy because it demonstrated both theoretical and statistical advantages over CPIXFET (see Box 1). Specifically, CPIX excludes eight of the most volatile components of the CPI and the effect of changes in indirect taxes on the remaining components.[1] It is worth noting that these eight components represent a smaller proportion of the consumer basket than the 12 food and energy components excluded from CPIXFET.

There is no unique definition of core inflation and no way to measure it directly. Although CPIX was chosen over other possible measures, it remains an imperfect estimate of underlying trend inflation. For this reason, the Bank regularly conducts research on core inflation measures and closely monitors several measures that have proven useful.

Alternative Measures of Core Inflation Monitored by the Bank

In addition to its official measure of core inflation, the Bank carefully follows the development of other measures of underlying inflation, including CPIW, a "double-weighted" measure. Instead of excluding the

1. The eight components are fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs.

Box 1:
Theoretical Foundations for Excluding the Eight Components from CPIX

The Bank's measure of core inflation, CPIX, excludes only two food components,[1] fruit and vegetables, which are frequently affected by weather-related disturbances to crops. CPIXFET excludes all the food components, including meat, fish, dairy products, bakery products, other food products, and food purchased from restaurants, which are not as often exposed to temporary shocks and, hence, are not very volatile.

Among the energy components, which are all excluded from CPIXFET, three are excluded from CPIX: gasoline, natural gas, and fuel oil. Prices of these components are clearly influenced by the world price of oil, which is very volatile and is determined on foreign markets. Electricity prices were not excluded from CPIX, because they were not particularly affected by supply shocks and, hence, were not very volatile over the sample period (January 1986 to July 2001).

1. This discussion is taken from Macklem (2001, 8-9).

Three volatile components included in CPIXFET were excluded from CPIX: intercity transportation, tobacco products, and mortgage-interest costs. Intercity transportation includes airfares, which are significantly influenced by oil prices. Prices of tobacco products vary substantially with changes in excise taxes, which are clearly temporary shocks.[2]

Mortgage-interest costs are a unique case. They are excluded from core inflation because a rise in interest rates from monetary policy actions aimed at reducing inflation would raise mortgage-interest costs, adding temporarily to inflation. This would send the wrong signal about the underlying short-run trend of inflation. Many other central banks exclude this component from their core measure for the same reason.

2. The core measure is adjusted to take into account the effect of changes in indirect taxes. However, the tax adjustment is only an approximation. Excluding tobacco products avoids the need to frequently adjust tobacco prices for the effect of changes in indirect taxes and, hence, avoids the approximation.

most volatile components from the total price index, as CPIX does, CPIW reduces their influence by assigning to each of the 54 components a weight inversely proportional to its variability.[2] This weight is defined as the reciprocal of the standard deviation of the change in relative prices.[3] In other words, the more volatile the relative price of a component, the lower its weight. The second weight, by which the first is multiplied, is the original weight in the CPI basket, which represents the importance of the component in consumer spending. Some empirical tests have shown that CPIW is among the most informative measures of core inflation (Laflèche 1997; Hogan, Johnson, and Laflèche 2001). This is the principal reason why the Bank monitors CPIW closely and mentions it regularly in its *Monetary Policy Report*.

2. At the most detailed level, the CPI consists of 264 components. We combined some components, however, in order to obtain historical series that all start on the same date and do not change over time. The statistical core inflation measures are therefore constructed using historical series for 54 components of the CPI, which all begin in 1986. For more detail, see Hogan, Johnson, and Laflèche (2001).

3. The change in relative prices is measured by the difference between the change in the price of a component and the inflation rate as measured by the total CPI.

Two other measures are also regularly monitored by the Bank: MEANSTD and WMEDIAN. These measures are "order statistics," calculated using the cross-sectional distribution of the year-over-year changes in the prices of the 54 components of the CPI.[4] To understand these measures, the annual inflation rate—the year-over-year change in total CPI—must be seen as the weighted average of the year-over-year change in each of its components.

WMEDIAN is the weighted median of the monthly distribution of the year-over-year changes in the prices of the 54 components of the CPI. This weighted median is the value that separates the ordered distribution into two parts, with the sum of the weights of each part being equal to 50 per cent. No component is excluded from this measure. WMEDIAN may vary considerably with the change in the shape of the distribution: If the distribution is very asymmetrical, WMEDIAN will diverge considerably from the mean, that is, from total inflation.

4. The measures are called order statistics because they are calculated using an ordered distribution. For simple numerical examples of these statistical measures, see Laflèche (1997, 34).

MEANSTD excludes price components whose rate of increase or decrease exceeds 1.5 standard deviations from the average. Once these components are eliminated, the weighted average of the year-over-year changes in the prices of the remaining components is calculated to obtain the core measure. Components whose year-over-year change is among the lowest or the highest, and hence, at the extremities of the distribution, are thereby eliminated. An important characteristic of this measure is that the components excluded differ from one month to the next.

The main difference between CPIX and the other measures of core inflation described above is that no component is systematically excluded from the other measures. This difference has both advantages and disadvantages. In systematically excluding specific components, there is a risk of either losing pertinent information about inflationary pressures and the underlying trend of inflation or inappropriately continuing to include a price following a change in its behaviour. There is no such problem with order-statistics measures, which have the additional advantage of being able to capture the effect of unusual one-time changes in components that are typically not volatile. It is harder, however, to explain changes over time in order statistics than in exclusion-based measures such as CPIX. Doing so requires keeping track of the components that are excluded every month (with MEANSTD) and determining which components are responsible for the variation of the weighted median (with WMEDIAN).

When all the measures convey the same message, it is reasonable to assume that the Bank has a relatively good estimation of underlying inflationary pressures.

As noted above, although CPIX was chosen as the official core inflation measure because it had some advantages over the other measures, it remains an imperfect estimate of the underlying trend of inflation. To evaluate this trend, the Bank therefore relies on several measures of underlying inflation in the conduct of monetary policy. When all the measures convey the same message, it is reasonable to assume that the Bank has a relatively good estimation of underlying inflationary pressures. When the measures diverge, however, there is more uncertainty about the trend, requiring a close examination of the reasons for the disparity.

The following example is a good illustration. From May 2001 to October 2002, CPIX remained well inside the target bands, close to the 2 per cent inflation-control target. Between November 2002 and March 2003, however, it fluctuated around the upper band of the target. While CPIX and CPIW both increased substantially during this period, MEANSTD and WMEDIAN did not. The volatility evident in CPIX and CPIW, and the rise in both measures, was driven mainly by the behaviour of electricity prices and auto insurance premiums. Because these two components had suddenly become more volatile, they were excluded from MEANSTD during that period (remember that the components excluded from this order statistic change from one month to the next, depending on their volatility). The other order statistic, WMEDIAN, also remained well inside the target band during this period. After this upward trend between November 2002 and March 2003, core inflation dropped rapidly, to 2.1 per cent, in April 2003. It is clear that CPIX and CPIW overestimated the underlying trend of inflation during this period, since the rise in inflation was not reflecting demand pressures, but large relative price movements in electricity and auto insurance premiums. The order statistics, however, because of their ability to remove the effects of temporary movements in components that are not usually volatile, were better indicators of the underlying trend of inflation over this period.

Following this period of volatility in the prices of electricity and auto insurance premiums, two new exclusion-based measures, CPIX9 and CPIX10, were added on an experimental basis to the set of measures of underlying inflation monitored by the Bank. CPIX9 excludes the same components as CPIX, as well as electricity prices, while CPIX10 further excludes auto insurance premiums.

Evaluating the Measures of Core Inflation

Despite the widespread use of core inflation by central banks, there is no unique concept or measure of core inflation. However, all the measures described above are based on the concept that total inflation can be separated into two components: the core part, representing the underlying trend of inflation as shaped by the pressure of aggregate demand against capacity,

and the non-core part, which reflects price movements caused by temporary shocks or relative price changes. The empirical criteria used to evaluate our core measures are derived from this concept.

The first criterion is the volatility of a component, reflecting the underlying notion that a component subject to temporary shocks is more volatile than one that is not. To meet this criterion, it is necessary to determine which CPI components are the most volatile and whether the source of their volatility reflects temporary shocks or relative price changes.

The second criterion for evaluating potential core measures is the volatility of the measures themselves. If core inflation actually represents the underlying trend in inflation, one would expect it to be more stable than total inflation. By definition, the measures that exclude or reduce the influence of the most volatile CPI components will be less volatile than total inflation. Comparing the volatility of the various core measures, however, helps to determine which ones exclude the right components (i.e., those most often influenced by temporary shocks or large relative price changes) and, hence, which measure is the best estimate of the underlying trend of inflation.

The third empirical criterion is the absence of bias between the core measures and total inflation. This criterion is backward looking: We verify whether, over time, the measures and total inflation followed the same trend or diverged. A significant divergence between the two measures indicates that they do not share the same long-term trend and contradicts the basic notion that core inflation represents the underlying trend of inflation.

The fourth criterion—the ability of a core measure to predict total inflation—is also derived from the fact that core inflation represents the underlying trend of inflation. In the short run, total inflation can diverge temporarily from its trend, but it should, by definition, return to it in the long term. The empirical tests assess the hypothesis that divergences between total inflation and the core measures are temporary. It is expected that core measures contain more information about the future trend of inflation than the latest 12-month increase in total CPI. If this was not the case, core measures would not be useful guides in the conduct of monetary policy.

These empirical criteria are time sensitive. The volatility of the CPI components and of the core measures is calculated over a specific time period and may therefore change over time. A component that was excluded because it was highly volatile over a specific time period may have recently become less volatile, while a component that was not very volatile over the same period may have since become more volatile and be excluded. As well, assessments of the bias and the predictive power of the core measures may yield different results over different time periods. When the inflation-control target was renewed in 2001, these criteria favoured CPIX. Recent research conducted at the Bank shows that CPIX continues to have some advantages over the other measures of core inflation. Empirical results drawn from Armour (2006) and supporting these conclusions are described below.

The central bank must take into account some practical criteria related to the timeliness of the core measures and their understanding and acceptance by the general public.

In addition to the empirical criteria, the central bank must take into account some practical criteria related to the timeliness of the core measures and their understanding and acceptance by the general public. These criteria are discussed at the end of this section.

Component volatility

Component volatility figured prominently in the 2001 move from CPIXFET to CPIX as the Bank's measure of core inflation. CPIX not only had stronger statistical support than CPIXFET (the eight components excluded from it were all very volatile, which was not the case for all of the 12 components excluded from CPIXFET), but also had better theoretical foundations, as explained in detail in Box 1.

Because volatility is time sensitive, it is necessary to periodically re-evaluate whether the eight components excluded from core inflation remain among the most volatile and whether the volatility of other components has increased enough to justify their exclusion. The statistical criteria used to determine the components to be excluded from CPIX are the standard deviation and the frequency of exclusion from MEANSTD (i.e., components whose rate of change, in absolute value, exceeded 1.5 standard deviations from the mean). For this study, we revisited the 2001 computa-

Table 1

Standard Deviation of the 12-Month Change in Selected Components of the CPI

Sample: February 1991 to December 2005

Rank	Component	Standard deviation
1	Fuel oil and other fuel	16.9
2	Natural gas	16.0
3	Tobacco products and supplies	12.0
4	Gasoline	11.1
5	Vegetables and vegetable preparations	8.1
6	**Other auto operating expenses**[1]	5.6
7	Intercity transportation	5.3
8	Fruit, fruit preparations, and nuts	4.9
12	**Electricity**	4.2
13	Homeowners' insurance premiums	4.0
14	Mortgage-interest costs	3.9
15	Meat	3.2
22	Fish and other seafood	2.5
23	Other food products	2.5
36	Bakery and other cereal products	1.7
39	Dairy products and eggs	1.6
53	Food purchased from restaurants	0.8

Note: The components Electricity, Meat, Fish and other seafood, Other food products, Bakery and other cereal products, Dairy products and eggs, and Food purchased from restaurants are excluded from CPIXFET, but not from CPIX.

1. Includes automobile insurance premiums

Table 2

Frequency of Exclusion from MEANSTD of Selected Components of the CPI

Sample: February 1991 to December 2005

Rank	Component	Exclusion from MEANSTD (%)
1	Fuel oil and other fuel	56
2	Natural gas	55
3	Gasoline	49
4	Vegetables and vegetable preparations	40
5	Education	40
6	Tobacco products and supplies	37
7	Intercity transportation	34
8	Recreational equipment and services	33
9	Mortgage-interest costs	26
10	**Other auto operating expenses**[1]	22
11	Lease and rental of autos	20
12	Fruit, fruit preparations, and nuts	19
18	Fish and other seafood	7
19	**Electricity**	7
23	Other food products	5
33	Meat	2
40	Dairy products and eggs	0
41	Bakery and other cereal products	0
42	Food purchased from restaurants	0

Note: The components Electricity, Meat, Fish and other seafood, Other food products, Bakery and other cereal products, Dairy products and eggs, and Food purchased from restaurants are excluded from CPIXFET, but not from CPIX.

1. Includes auto insurance premiums

tions, including data only from the inflation-targeting period ending in December 2005, and found few changes in the results.[5] The eight components excluded from CPIX remain among the most volatile, based on their standard deviations and their frequency of exclusion from MEANSTD (see Tables 1 and 2).

The volatility of some components has nonetheless changed. Of the seven components excluded from CPIXFET but not from CPIX, only electricity has become more volatile. Of the three components excluded from CPIX but not from CPIXFET, mortgage-interest costs have become less volatile, likely owing to the conduct of monetary policy under a credible, constant inflation target. In fact, longer-term interest rates have been quite stable over the past several years. In addition to components excluded from either core inflation or CPIXFET, auto insurance premiums (the largest part of the "Other auto operating expenses" component) have exhibited more volatility.[6]

Based on their volatility, electricity prices and auto insurance premiums have become potential candidates for exclusion.

Based on their volatility, electricity prices and auto insurance premiums have become potential candidates

5. In Macklem (2001), the volatility was calculated over the period January 1986 to July 2001. An important shift is observable, however, in the mean of the inflation rate between the pre-inflation-targeting period (January 1986 to January 1991) and the inflation-targeting period (February 1991 to December 2005). To avoid the bias that this shift could create, the statistics cited in this article are calculated over the inflation-targeting period only.

6. It is worth noting that some components, such as Education and Recreational equipment and services, are among the most volatile in terms of their frequency of exclusion from MEANSTD. These components are not, however, considered very volatile on the basis of their standard deviation over the sample period.

for exclusion. It is important, however, to carefully examine the source of their volatility before deciding to remove them from the measure of core inflation. Box 2, below, reviews the advantages and disadvantages of excluding electricity prices and auto insurance premiums.

Volatility in core measures

In addition to the volatility of the components of the CPI, we considered the volatility of the overall measures. If core inflation measures properly capture trend

Box 2: Electricity Prices and Auto Insurance Premiums

When constructing exclusion-based measures of core inflation, volatility alone is insufficient to justify the exclusion of a component; there must also be some support from economic theory. The two recent shocks to electricity prices and auto insurance premiums illustrate this point.

When CPIX was created, the price of electricity had been quite stable for many years. Since then, however, changes in the Alberta and Ontario electricity markets have made the price of electricity more volatile. In Ontario, temporary deregulation followed by an electricity shortage and an exceptionally warm summer pushed the price up in 2002, and the provincial government's refund pushed it down in 2003. Electricity prices have since returned to a more stable path. Tables 1 and 2 provide evidence of this volatility: Electricity ranks relatively high both in terms of its standard deviation and its frequency of exclusion from MEANSTD. As well, Table 3 shows that CPIX9 has lower volatility than CPIX.

For now, electricity prices are still regulated in Ontario and Alberta, and we do not know what will happen in the other provinces. Deregulating electricity prices may well result in increased volatility, so that excluding electricity prices would be justified. The timing of the exclusion is problematic, however, given the difficulty in differentiating between volatility and trend movements that could occur during the transition to a deregulated market. CPIX9 could become biased relative to total CPI over the transition period.

Between January 2002 and January 2003, automotive vehicle insurance premiums rose by 30 per cent. The most plausible explanation for this trend is a combination of rising claim costs and the bursting of the technological bubble in 2001, which meant that rising claims were no longer offset by solid investment returns for insurance companies. Subsequently, many provinces imposed price reductions on insurance companies, and auto insurance premiums reverted to a more stable path. Again, Tables 1 and 2 show the effects of these unusual price movements. The category "Other auto operating expenses" (of which auto insurance premiums are the main component) ranks high in terms of both its standard deviation and its exclusion from MEANSTD. Furthermore, as shown in Table 3, CPIX10 has lower volatility than CPIX or CPIX9 and is biased relative to total CPI over this period. This suggests that instead of characterizing auto insurance price movements, which are seldom reversed, as volatile they could be characterized as subject to infrequent persistent shifts in their trend.

While the specific combination of events that caused the dramatic premium increases may be a one-time or rare event, this component may nevertheless be subject to similar price movements because of the way insurers adjust their premiums.[1] Given that the regulatory process is not expected to change, the kind of surges in auto insurance premiums sometimes observed in the past may recur. Since trend movements in these prices would not be related to current demand pressures, excluding auto insurance premiums has some theoretical justification.[2] However, the issue of bias relative to total CPI would likely remain.

Overall, it does not seem appropriate at this time to exclude the price of electricity and auto insurance premiums from the official core measure. However, since a recurrence of the types of events that led to large changes in these prices is likely, it is important for the Bank to continue to monitor CPIX9 and CPIX10 closely.

1. Insurers must convince the government that their costs have increased significantly. The process is long, and a substantial cumulative cost increase is required before the government will allow insurers to raise their premiums.

2. A similar argument can be made for regulated prices more generally.

Table 3

Summary Statistics for Core Inflation Measures

Sample: February 1991 to December 2005

	Mean	Standard deviation	Coefficient of variation	Mean absolute change
CPIXT	1.90	0.86	0.45	0.29
CPIX	1.87	0.48	0.26	0.16
CPIXFET	1.77	0.66	0.37	0.17
CPIW	1.86	0.59	0.32	0.14
WMEDIAN	1.71	0.59	0.34	0.22
MEANSTD	1.76	0.60	0.34	0.23
CPIX9	1.84	0.46	0.25	0.15
CPIX10	1.71	0.39	0.22	0.14

inflation, they should be less volatile than total CPI inflation.

One way to examine the volatility of a series is the dispersion around its sample mean. Table 3 reports the standard deviation and coefficient of variation for each measure.[7] For the inflation-targeting period, all traditional measures have coefficients of variation substantially lower than that of total inflation excluding the effects of changes in indirect taxes (CPIXT), with CPIX having the lowest value.[8] Both CPIX9 and CPIX10 have even lower volatility than CPIX, pointing to the importance of the recent movements in electricity prices and auto insurance premiums.

To examine the robustness of the above results, Table 3 also reports the mean of the absolute monthly change in year-over-year inflation. This alternative measure of volatility depends less directly on the persistence of inflation. Based on this measure, CPIX, CPIXFET, and CPIW are much less volatile than total inflation, with variability about half that of CPIXT. CPIW has the lowest value of these three core measures. CPIX9 and CPIX10 are also less volatile than CPIX, with CPIX10 matching CPIW. WMEDIAN and MEANSTD are the most volatile measures. Actually, the order-statistics measures exhibit the largest volatility, no matter how it is measured.

7. The coefficient of variation is the standard deviation divided by the mean. If the means of these series are similar, the ranking of the coefficient of variation should not be much different from that of the standard deviation. However, given some evidence in the literature that the variance of inflation increases with the mean, the coefficient of variation may be a more appropriate measure than the standard deviation.

8. All of the inflation rates of the components used to build up the cross-sectional measures have been adjusted only for the effects of the 1991 Goods and Services Tax and the 1994 tobacco tax, the two largest indirect tax effects. However, other changes in indirect taxes that generate large swings in relative prices are eliminated or down-weighted, depending on the construction of each measure. Therefore, CPIXT is a better benchmark than CPI.

Absence of bias

Core inflation and total inflation must share the same long-term trend to ensure consistency between the short-term operational measure and the inflation target. Core inflation should be unbiased relative to total inflation. An absence of bias supports the claim that only short-term shocks are excluded from the core inflation measure.

A simple way to identify bias is to compare the unconditional means of the various core measures with that of CPIXT. Table 3 shows that the means of CPIXT, CPIX, CPIW, and CPIX9 all fall within the same range. The means of CPIXFET and MEANSTD are slightly lower than the others, but the differences are not statistically significant. CPIX10 and WMEDIAN have the lowest means, and they are statistically significantly different from the mean of CPIXT, indicating a bias relative to total CPI inflation. This is not surprising for CPIX10, given the surge in auto insurance premiums in 2002–03. In the case of WMEDIAN, this result indicates that the distribution of the year-over-year changes in the 54 CPI components is often asymmetrical. All the other measures, including CPIX, have followed the same trend as total inflation over the past 14 years.

Predictive power

If core inflation represents the underlying trend of inflation, it should contain more information about the future trend of inflation than total inflation itself. Moreover, it is expected that divergences between total inflation and core inflation will be temporary, i.e. total inflation may diverge from core inflation in the short run, but comes back to it in the long run.

A common way to test the hypothesis that divergences between total inflation and core inflation are only temporary is to estimate the following equations:

$$(\pi_{t+h} - \pi_t) = \alpha + \beta(\pi_t^{Core} - \pi_t) + u_t, \qquad (1)$$

$$(\pi_{t+h}^{Core} - \pi_t^{Core}) = a + B(\pi_t - \pi_t^{Core}) + v_t, \qquad (2)$$

where $\pi_{t+h} - \pi_t$ is the change in total inflation, $\pi_{t+h}^{Core} - \pi_t^{Core}$ is the change in core inflation, u_t and v_t are random error terms, and h is the time horizon.[9] The idea behind these equations is that if core inflation is above total inflation, total CPI must have been hit by a specific shock that will be reversed.

9. These are Cogley's (2002) equations, which were estimated in Macklem (2001).

Table 4

Regressions: $(\pi_{t+12} - \pi_t) = \alpha + \beta(\pi_t^{Core} - \pi_t) + u_t$

Estimation period: January 1992 to December 2005

CPIXT	$\bar{R}^2$	α (s.e.)	β (s.e.)	p-value H_0: (β = 1, α = 0)
CPIX	0.30	0.05	0.96*	0.97
		(0.22)	*(0.39)*	
CPIXFET	0.31	0.21	1.09*	0.48
		(0.19)	*(0.34)*	
CPIW	0.44	0.14	1.32*	0.46
		(0.20)	*(0.39)*	
WMEDIAN	0.37	0.31	1.03*	0.22
		(0.18)	*(0.32)*	
MEANSTD	0.32	0.23	1.03*	0.45
		(0.19)	*(0.31)*	
CPIX9	0.27	0.06	0.95*	0.96
		(0.22)	*(0.41)*	
CPIX10	0.38	0.22	1.08*	0.56
		(0.21)	*(0.31)*	

Note: Standard errors (s.e.) are corrected for serial correlation.
* Indicates significance at 95 per cent level

Table 5

Regressions: $(\pi_{t+12}^{Core} - \pi_t^{Core}) = a + B(\pi_t - \pi_t^{Core}) + v_t$

Estimation period: January 1992 to December 2005

CPIXT	$\bar{R}^2$	a (s.e.)	B (s.e.)
CPIX	–0.01	–0.01	0.00
		(0.10)	*(0.22)*
CPIXFET	0.01	–0.01	0.13
		(0.12)	*(0.18)*
CPIW	0.04	0.00	0.19
		(0.08)	*(0.21)*
WMEDIAN	0.02	0.00	–0.13
		(0.07)	*(0.19)*
MEANSTD	0.00	0.02	–0.07
		(0.06)	*(0.17)*
CPIX9	0.00	–0.01	0.05
		(0.10)	*(0.25)*
CPIX10	0.00	0.01	0.01
		(0.05)	*(0.17)*

Note: Standard errors (s.e.) are corrected for serial correlation.

Total CPI inflation should therefore be expected to increase in the future ($\beta > 0$), but core inflation should be unaffected ($B = 0$). If the restriction $\alpha = 0$ and $\beta = 1$ holds, equation (1) collapses to: $\pi_{t+h} = \pi_t^{Core} + u_t$. In that case, core inflation is an unbiased predictor of total inflation.

Tables 4 and 5 show the results for the 12-month horizon. It is not possible to reject the joint hypothesis $\beta = 1$ and $\alpha = 0$ with 95 per cent confidence for any of the core measures considered; nor is it possible to reject the hypothesis that ($B = 0$), suggesting that all the core measures are unbiased predictors of total inflation. This also means that deviations between core and total inflation are not persistent and that total inflation moves towards core rather than vice versa. This confirms the hypothesis that the core inflation measures are better than total inflation itself in forecasting future total inflation.

Desirable measures of core inflation should be relatively smooth and down-weight or exclude components with transitory, highly volatile fluctuations. Moreover, if the measure is a good estimate of core inflation, the coefficient β should be positive and close to one. Both of these features tend to raise the $\bar{R}^2$.[10] According to this criterion, CPIW, the regression that obtains the highest $\bar{R}^2$, has the best overall performance among the alternative measures of core inflation (see Table 4).

In summary, these results show that all of the measures of core inflation are unbiased predictors of total inflation and contain more information about the future trend of inflation than total inflation itself. Moreover, CPIW has the best overall performance of all the core measures.

Practical criteria

Central banks must consider certain practical criteria when choosing their core measures. First, core measures must be timely: It is important for policy-makers to have data readily available. The core inflation measures monitored by the Bank can all be calculated the day inflation data are released by Statistics Canada.

Second, core measures should ideally not be revised. Most economic variables are periodically revised, causing some problems for monetary policy decisions or communication, but these variables are not closely tied to an explicit policy target. Revisions of the core measures would reduce their usefulness both as decision-making and communication tools. Among the set of core measures monitored by the Bank, only CPIW is subject to revision. One of the weights of this double-weighted measure is defined as the reciprocal of the standard deviation of the change in relative prices. Since the standard deviation being calculated over a specific time period would change with the time period selected, so would the weight. However, as reported

10. In equation (1), the $\bar{R}^2$ provides a measure of the predictive ability of the *difference* between core and total inflation to predict the *change* in total inflation. The $\bar{R}^2$ is positively related to β and to the ratio of the variance of the component of total inflation *not explained by the core measure* to the variance of the change in total inflation.

in Armour (2006), the extension of the period on which the CPIW weights are calculated did not lead to significant historical revisions of the CPIW time series. Moreover, this problem is not insurmountable: the weights could be updated every few years (e.g., every four years) and the new series linked to the old one in order not to change the history.

Credibility is the third practical criterion. To be credible, a core measure must be understood and accepted by the public. A very sophisticated measure would be more difficult to explain and, hence, probably less acceptable. Exclusion-based measures such as CPIX and CPIXFET are the most easy to understand. The order-statistics measures, WMEDIAN and MEANSTD, require some statistical knowledge to be understood, since they are more technically sophisticated than the exclusion-based measures. Moreover, because their movements are not as easy to explain as those of CPIX and CPIXFET, they are only used internally. The double-weighted measure, CPIW, is also more difficult to understand than CPIX. However, although it seems at first to be very complicated, its concept is actually quite simple. The difficulty lies in the calculation of the special weight, which is based on the volatility of the component. Despite its sophistication, the double-weighted measure has been published on a regular basis in the *Monetary Policy Report*.

Summary of Results and Conclusion

Although there has been some reshuffling among components in the volatility rankings, the eight components excluded from CPIX remain among the most volatile over the inflation-targeting period. Two other components, electricity prices and auto insurance premiums, had periods of increased volatility over the past five years. These prices have recently returned to a more stable path, but the events that caused their volatility could recur. For now, their exclusion would be premature, but the Bank will continue to monitor the core measures that exclude them, CPIX9 and CPIX10.

All our measures of core inflation continue to satisfy the empirical criteria. They are unbiased, have lower volatility than total CPI inflation, and contain information about the future trend of total inflation.

Because of their simplicity, exclusion-based measures are well understood and accepted by the public. Their evolution compared with that of total CPI is easy to explain, which helps the Bank to communicate its monetary policy decisions. Order-statistics measures and their movements are less accessible to the general public. The double-weighted measure, CPIW, is also more sophisticated than CPIX and, in addition, is subject to revisions.

The general conclusion is that CPIX still satisfies all of the empirical and practical criteria. No core measure significantly outperforms it. Moreover, CPIX is familiar to the public and well accepted.

Although there has been some reshuffling among components in the volatility rankings, the eight components excluded from CPIX remain among the most volatile over the inflation-targeting period.

Although the double-weighted measure, CPIW, is more sophisticated than the official core measure, it does slightly better than the other core inflation measures on purely statistical grounds. Therefore, it seems to us that among the alternative measures, CPIW merits closer study.

All the core measures contain information on the underlying trend in inflation and are particularly useful for identifying the source and nature of persistent but temporary shocks that affect inflation and push it away from the target. Although the Bank will retain CPIX as its official measure of core inflation, it will continue to monitor the other measures closely. It will also continue to report CPIW in the *Monetary Policy Report*. Research will also be conducted regularly to ensure that the Bank has the most reliable estimate of the underlying trend in inflation.

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Another Look at the Inflation-Target Horizon

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- *The inflation-target horizon is the period during which monetary policy actions are expected to return inflation to target. Policy-makers have an interest in communicating this horizon, since it is likely to help anchor inflation expectations.*
- *Bank researchers have recently conducted two studies of the appropriate horizon for returning inflation to target. The choice of the inflation-target horizon balances the costs of volatility associated with the output gap and interest rates against the benefits of keeping inflation close to its target.*
- *Research results indicate that the duration of the optimal inflation-target horizon varies widely, depending on the combination of shocks to the economy. On average, however, it is marginally shorter than eight quarters. Bearing in mind the inherent uncertainty in this type of analysis, the current target horizon of six to eight quarters appears to remain an appropriate guide to the speed with which inflation should return to target in response to economic shocks.*
- *In rare cases when the financial accelerator is triggered by a persistent shock such as an asset-price bubble, it may be appropriate to take a longer view of the inflation-target horizon.*

The inflation-target horizon is the time it takes inflation to return to target in response to monetary policy actions designed to offset the effects of a shock on the economy. Inflation does not immediately return to target because frictions (for example, wage contracts) in the economy cause movements in inflation to persist, and because there are lags in the effect of a monetary policy action on inflation.

The inflation-target horizon is the time it takes inflation to return to target.

A short horizon would be consistent with a vigorous change in interest rates in order to return inflation to target quickly, but could result in excessive volatility in interest rates and the real economy, since the lagged effects of vigorous interest rate changes need to be cancelled by subsequent actions in the other direction. A long horizon would be consistent with a more sluggish change in interest rates that could result in less real volatility, but would cause deviations of inflation from target to be more persistent. Thus, there is an optimal inflation-target horizon that balances these two opposing considerations. Moreover, each type of shock to the economy will have its own optimal inflation-target horizon because each shock leads to a different trade-off between output and inflation volatility. The target horizon as discussed by the Bank of Canada refers to the typical length of time required to return inflation to target in response to various combinations of shocks.

This article draws on two Bank of Canada studies that subject a pair of state-of-the-art dynamic stochastic general-equilibrium models of the Canadian economy to an array of shocks that mimic the typical shocks experienced over the past 25 years. Both models contain well-articulated explanations of the monetary policy transmission mechanism. In one study, the model focuses on nominal and real frictions (e.g., nominal wage contracts, costs of adjusting capital) to explain the lag between a monetary policy action and the subsequent movement of inflation. The model in the other study additionally incorporates financial frictions (often referred to as financial accelerators) that, when triggered, can change the relationship between a monetary policy action and the subsequent movement of inflation.

Inflation does not immediately return to target because of frictions in the economy.

To determine the optimal inflation-target horizon, a quantitative measure of the loss the economy suffers from volatility in output, inflation, or interest rates from following a monetary policy rule that returns inflation to target either too quickly or too slowly is included in the models. The parameters of the monetary policy rules in the models—which relate changes in the policy interest rate to predicted future deviations of inflation from target and the current state of the output gap—are then varied to determine the inflation-target horizon that minimizes the loss to the economy.[1] This exercise is repeated for a wide array of potential shocks in order to obtain the range of optimal inflation-target horizons.

The results from these studies support the thesis that different shocks are associated with different horizons, indicating that the optimal inflation-target horizon varies over time, just as shocks hitting the economy vary. Nevertheless, in most instances, the studies support the conclusion that the Bank's policy since 1991, which has aimed to return inflation to target within a six-to-eight-quarter target horizon, remains appropriate. In rare cases when the financial accelerator is triggered by a large and persistent shock, it may be appropriate to take a longer view of the inflation-target horizon.

Methodology

Because of the complexity of the frictions present in the economy, the two studies examined the issue of the inflation-target horizon through the lens of two different models of the Canadian economy.

The first study, by Cayen, Corbett, and Perrier (2006, henceforth CCP), uses a preliminary version of the Terms-of-Trade Economic Model (TOTEM), a new multi-sector, open-economy dynamic general-equilibrium model of the Canadian economy designed to analyze monetary policy issues and to conduct economic projections (Murchison and Rennison, forthcoming). Nominal-wage rigidity is the most important friction used in TOTEM to generate persistent real short-run effects of monetary policy actions. Significant, but less important, are price rigidities. Also important are habit formation,[2] costly adjustment of physical capital, and variable capital utilization. In addition, TOTEM features a separate commodity-production sector that permits rich terms-of-trade dynamics and uses a wide range of exogenous shocks to provide the initial impulses for the model's dynamics.

The second study, by Basant-Roi and Mendes (2006, henceforth BRM), uses an experimental model that features a financial accelerator in the housing market.[3] This model shares many of the features of TOTEM, including nominal-wage rigidities in both the labour and product markets and real rigidities, such as habit formation, that slow the speed of the real economy's adjustment to shocks. Although the model used in BRM is not as well developed in certain areas as TOTEM, it features financial frictions not incorporated in TOTEM and can therefore provide insight into how the interaction between the real economy and the financial sector might affect economic outcomes.[4] The financial frictions in the model result from variations in the value

1. See Armour and Côté (1999–2000) and Black, Macklem, and Rose (1997) for a review of feedback rules for inflation control.

2. Habit formation refers to the assumption that consumers care not only about their level of consumption but about the change in consumption from one period to the next.

3. The current version of this model does not account for a financial accelerator that may also exist in the business sector and affect business investment through, say, large swings in equity prices. However, given the structure of the Canadian economy, large swings in housing prices are likely to be of more concern to policy-makers (Selody and Wilkins 2004).

4. For example, BRM does not allow for commodity-price shocks or shocks to the inflation target.

of collateral used to secure mortgage financing. For example, in the face of a positive shock to housing prices, the initial increase in the price of houses raises the value of mortgage collateral, which reduces the cost of borrowing. This stimulates borrowing and aggregate demand, including housing demand, and sets off a financial accelerator by causing a further increase in housing prices. The financial accelerator is set off by shocks that are quite similar to those in TOTEM; in addition, the inclusion of housing prices in the model provides an opportunity to study the effect of asset-price bubbles on the optimal inflation-target horizon.

Both models were assigned parameters to replicate key characteristics of the Canadian macroeconomic data over the period 1980 to 2004. Matching the key relationships found in the data is essential to correctly characterizing the inherent trade-offs between inflation, the output gap, and interest rate stabilization that are a feature of the economy.

Well-anchored expectations create a strong tendency for actual inflation to revert to the inflation target.

One of the key determinants of the persistence of inflation in the economy is the credibility of monetary policy. If policy is highly credible, inflation expectations will remain well anchored to the inflation target over the medium term. For the purpose of this article, both models assume that monetary policy is highly credible, which is consistent with recent evidence (see box).

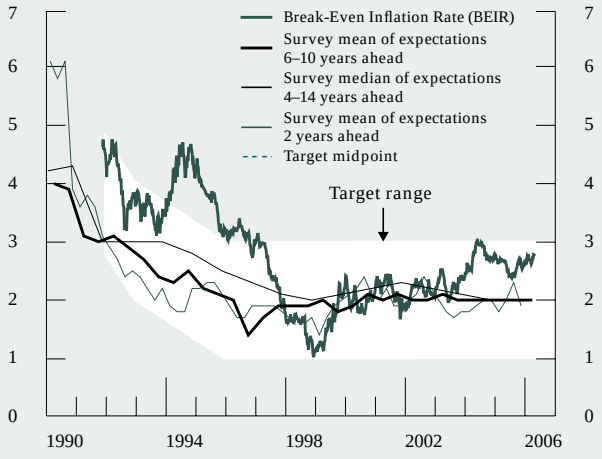
Monetary Policy Credibility

There is considerable evidence that the credibility of monetary policy has increased significantly with the introduction of the inflation-targeting regime in Canada. Chart B1 shows several measures of inflation expectations at various horizons. For example, the difference between the yield on Government of Canada long-term Real Return Bonds and nominal bonds of comparable maturity (labelled the Break-Even Inflation Rate, BEIR), may be considered a very crude proxy for long-term inflation expectations. (For a thorough discussion of the usefulness of the BEIR as an indicator of inflation expectations, see Christensen, Dion, and Reid 2004). The evolution of bond-yield differentials suggests that there has been a decline in the premium for inflation expectations. Longer-term inflation forecasts reported by Consensus Economics surveys of private sector forecasters show a similar convergent trend. These forecasts suggest that longer-term inflation expectations (two, five, and 10 years ahead) converged on the 2 per cent inflation target after its introduction and have remained in line with the target since then. Johnson (1998), Perrier (1998), and Amano and Perrier (2000) use statistical analysis based on the survey data to conclude that the credibility of monetary policy in Canada has increased over the inflation-targeting period.

Drawing inferences about monetary policy credibility from surveys of expected inflation is hindered by the possibility that expectations of inflation may be low simply because of recent business-cycle developments, including past inflation itself. A more compelling analysis can be found in Levin, Natalucci, and Piger (2004), who find that, for the period 1994 to 2003, private sector long-run inflation forecasts fail to exhibit significant correlation with lagged inflation for the five countries (including Canada) that maintained explicit inflation objectives over this period, indicating that the monetary policy followed by these central banks has been reasonably credible.

Chart B1

Four Measures of Long-Term Inflation Expectations



Well-anchored expectations create a strong tendency for actual inflation to revert to the inflation target and, all else being equal, indicate that monetary policy needs to be less active (Svensson 2002) and that interest rates and output need to move less to counter movements in inflation away from target.

The CCP and BRM studies apply the same general methodology to determine the optimal target horizon (see Batini and Nelson 2000). In both studies, the central bank is assumed to adjust policy interest rates to minimize the overall costs arising from three sources: inflation volatility around the target inflation rate, output volatility around potential output (the output gap), and the volatility of interest rates. Stabilizing inflation is desirable in part because variable inflation makes it harder for the market to achieve efficient resource allocation, and the ensuing uncertainty makes it more difficult for firms, consumers, and savers to make the right decisions (Svensson 2002). Minimizing output variability around potential is an objective because households generally prefer a smooth future consumption stream. The volatility of interest rates is included because policy-makers are assumed to care about financial stability, which might be impacted by excessive volatility in interest rates (Cukierman 1990), or about the risk of hitting the zero bound on nominal interest rates (Rotemberg and Woodford 1997; Woodford 1999).

More formally, the models used in the two studies incorporate the assumption that the central bank sets the optimal inflation-target horizon to minimize the quadratic loss function:

$$\bar{L} = \sigma_{\pi}^2 + \sigma_{ygap}^2 + 0.5 \cdot \sigma_{\Delta R}^2 , \qquad (1)$$

where σ_{π}^2, σ_{ygap}^2, and $\sigma_{\Delta R}^2$ are the unconditional variances of the gap between inflation (π) and the target inflation rate (π^T), the output gap (*ygap*), and the change in the policy interest rate (ΔR).[5]

The function captures the notion that all future deviations of these variables from target are costly to the economy.[6] The weights on the various elements in the function imply that the central bank cares equally about inflation and the output gap but less about smoothing interest rate movements.[7]

Both studies also characterize the behaviour of the central bank through the use of a simple monetary policy rule:

$$R_t = \rho R_{t-1} + (1-\rho)R^* + \varphi_{\pi}(E_t\pi_{t+k} - \pi^T) + \varphi_y(ygap_t) , \qquad (2)$$

where R^* is where interest rates eventually settle and E_t denotes expectations made in period t.[8] A simple rule was used because it is more likely to be robust across models than a more complex rule optimized for a particular model (Levin, Wieland, and Williams 1999; Armour and Côté 1999–2000; and Côté et al. 2002). The specific rule used here is an inflation-forecast-based (IFB) rule in that the inflation term uses the difference between the expected future inflation rate and the target. In general, IFB rules are simple, intuitive, and parsimonious, and have reasonable properties over a wide range of disturbances (see Amano, Coletti, and Macklem 1999; and Black, Macklem, and Rose 1997).

The variables in this hypothetical monetary policy reaction function are the same as those in the objective function. The central bank chooses the weight on interest rate smoothing (ρ), the degree to which it reacts to expected deviations of inflation from target (φ_{π}), the degree to which it reacts to the output gap (φ_y), and the degree to which policy is forward looking (k). These parameters are chosen separately for each of the models in the CPP and BRM studies to minimize the objective function (1) when the economy is subject to an array of random shocks similar to those seen over history. The resulting inflation-target horizon is deemed to be an optimal horizon, at least within the confines of a simple feedback rule.

Results from Shocks Occurring in Normal Times

Table 1 quantifies the inflation-target horizon associated with the optimal rule if we again faced the typical macroeconomic shocks observed over the 1980 to 2004

5. The intertemporal loss function is: $\bar{L}_t = E_t\left((1-\beta)\sum_{i=0}^{\infty}\beta^i L_{t+i}\right)$, where E_t denotes expectations based on information that is available in time t, and β is the rate at which central banks discount the future. As the discount rate approaches one $\text{Lim}_{\beta \to 1}\bar{L}_t = \bar{L}$. Tables 1 and 2 provide estimates of the variances of inflation, the output gap, and the change in interest rates under the optimized monetary policy rules.

6. Note that the deviations are represented quadratically, indicating that substantial deviations from the targets are thus assessed as considerably more costly than slight variations.

7. Some recent research focuses on choosing monetary policy rules that maximize the welfare of the representative consumer. One advantage of this strategy is that it avoids specifying arbitrary central bank loss functions, as is done in the work discussed here. Since this new approach is computationally quite demanding, it remains challenging in more realistic larger-scale models.

8. The complexity of monetary policy decision making means that these simple reaction functions should not be thought of as precise characterizations of the behaviour of policy-makers.

Table 1

Optimal Target Horizons in the Absence of Housing-Price Bubbles

	CCP	BRM
Feedback horizon (k)	2.0	2.0
Smoothing parameter (ρ)	0.8	0.6
Inflation variance (σ^2_{π})	0.9	0.7
Output gap variance (σ^2_{ygap})	5.1	4.3
Variance of the change in interest rate ($\sigma^2_{\Delta R}$)	1.7	1.6
Mean target horizon	7.0	6.0
Range of target horizons*	4–11	2–9

Note: Horizons are expressed as the number of quarters required to return inflation to within 0.1 percentage point of the target.
* Based on a 90 per cent confidence band

period.[9] For these calculations it is deemed that inflation has returned to target if it is within 0.1 percentage point of the target. The average target horizon is the mean of the distribution built from making repeated draws from the distribution of shocks that were estimated to have hit the economy over that period.

There are three main points to be drawn from the table. First, the CCP and BRM studies find a similar mean inflation-target horizon of 6 to 7 quarters. Second, the range of target horizons is also quite similar in the two studies. The CCP study estimates that, in the event of a shock that pushes inflation away from the target, it should be returned to within 0.1 percentage point of the target within 4 to 11 quarters 90 per cent of the time. The BRM study finds a similar range of 2 to 9 quarters. Third, these results suggest that the optimal inflation-target horizon is, on average, at the lower end of the 6-to-8-quarter range. This may reflect, in part, increased credibility since the targeting regime was introduced, which has acted to reduce the lag between monetary policy actions and inflation outcomes and has thereby reduced the cost of returning inflation to target.

Results Including Housing-Price Bubbles

BRM also simulated an exogenous asset-price bubble in the housing market to see what effect it might have on the optimal inflation-target horizon. The bubble, which is defined as a sustained and growing gap between the market price of a house and its fundamental economic value, is modelled along the lines of Bernanke and Gertler (2000). In this exercise, it is assumed that the probabilities of the bubble arising and bursting are fixed and are known to all of the agents in the model.[10] Bubbles are assumed to arise, on average, every 10 years. The probabilities are calculated such that, on average, the bubble grows to a maximum of 30 per cent of fundamental value, and the bubble-boom period spans a maximum of three years.[11] These simulations are conducted using the same policy rule as in the no-bubble case considered above (Rule 1), along with another rule that is optimized given the possibility of bubbles (Rule 2).

Table 2

Optimal Target Horizons in the Case of Housing-Price Bubbles

	Rule 1: ignoring bubbles	Rule 2: optimized with bubbles
Feedback horizon (k)	2.0	2.0
Smoothing parameter (ρ)	0.6	0.6
Inflation variance (σ^2_{π})	0.8	0.8
Output gap variance (σ^2_{ygap})	4.3	4.4
Variance of the change in interest rate ($\sigma^2_{\Delta R}$)	1.6	1.6
Mean target horizon	14.0	13.0
Range of target horizons*	3–51	4–48

Note: Horizons are expressed as the number of quarters required to return inflation to within 0.1 percentage point of the target.
* Based on a 90 per cent confidence band

Introducing the possibility of bubbles has little effect on the parameters of the optimized simple feedback rule from the BRM study reported in Table 1, since asset-price bubbles are assumed to be low-probability events. In the event that a housing-price bubble actually hits the economy, the average time it takes for inflation to return to target lengthens significantly (Table 2). The horizon is substantially longer because such a shock triggers large financial-accelerator effects, which are very costly for monetary policy to counteract. In particular, a housing-price bubble has a direct effect on asset prices and the financial accelerator, whereas all of the other shocks have only an indirect effect.

9. The horizon is somewhat sensitive to different sample periods, with the horizon varying as much as two quarters in the samples considered in the CCP study. While a variation of two quarters is enough to push the average inflation horizon outside the six-to-eight-quarter range in some circumstances, the deviation is not large enough to significantly affect expectations. In the CCP study, there are five demand shocks (e.g., consumption shock), six price or mark-up shocks (e.g., wage shock), a domestic technology shock, a shock to the country risk premium, and four foreign shocks (world commodity prices, foreign output, foreign prices, and the foreign interest rate).

10. This assumption is made for simplicity, since, in reality, agents do not have this much information.

11. This is roughly consistent with stylized facts for housing-price bubbles found in the International Monetary Fund's World Economic Outlook for April 2003.

This result occurs whether or not housing prices are specifically added to the monetary policy rule. Sensitivity analysis shows that there is little to be gained by including housing prices directly in the rule, likely because it already considers their effects on inflation and output volatility. This result is consistent with Bernanke and Gertler's (2000) finding that monetary policy can deal appropriately with bubbles by reacting to expected inflation. Policy does not have to respond directly to housing prices to be effective.[12]

The results are therefore no more than an indication of what might happen if the Canadian economy were to experience an asset-price bubble.

The simulations in BRM are highly stylized, and the results are therefore no more than an indication of what might happen if the Canadian economy were to experience an asset-price bubble. It is difficult to be precise about the real impact of large housing-price shocks, the effect of monetary policy actions on a housing-price bubble, and the degree to which the target horizon may need to be extended, given how rarely these situations have occurred in Canada in the past.[13] Moreover, the model does not account for the full extent of financial disruption that may accompany such events. For example, while the cost of mortgage financing increases in response to falling asset prices, quantity restrictions that may occur in the event of a "credit crunch" are not modelled. Tkacz and Wilkins (2006) find evidence in the Canadian data of important threshold effects in the relationship between housing prices and real activity, suggesting that the bias from ignoring such quantity restrictions may be important.

A target horizon of six to eight quarters remains appropriate.

Conclusions

The choice of the inflation-target horizon is a balancing act. A shorter horizon keeps inflation closer to the target but at the cost of more volatility in output and interest rates; a longer horizon allows the central bank to miss its inflation target for a longer period in the interest of greater stability in output and interest rates. Our studies show that the optimal inflation-target horizon varies with each shock and suggest that, on average, the optimal horizon is marginally shorter than previously thought. However, because of several important sources of uncertainty inherent in the analysis, the point estimates of the optimal inflation-target horizon should be interpreted as merely indicative. In particular, the structure and calibration of the models studied are imperfect approximations of the actual economy. As well, the pattern of future shocks could be quite different from historical experience. Finally, these studies rely on concepts that are not easy to put into practice with great precision. For example, it is difficult to accurately specify the preferences of policy-makers using a simple objective function. In light of this uncertainty, we conclude that a target horizon of six to eight quarters remains appropriate in most instances. In the context of the models examined, a few rare shocks, such as an asset-price bubble, have unusually long inflation-target horizons. In these rare circumstances, the results suggest that it may therefore be appropriate for monetary policy to take a longer view of the inflation-target horizon.

12. For a more recent example, see Tetlow (2005).

13. In the BRM experiments, monetary policy actions affect the fundamental component of housing prices, but not the bubble process.

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Speeches

Introduction

In a 21 June speech to la Chambre de commerce du Montréal métropolitain and the Fédération des chambres de commerce du Québec, Governor David Dodge said that powerful developments and trends in the global economy, including the rise of Asian economic powers, strong world economic growth, and low global interest rates, mean that Canadian businesses need to make adjustments. Noting that there is clear evidence that they are doing just that, Governor Dodge also described the Bank of Canada's contribution to the adjustment process: to keep inflation on target and the economy operating at full capacity.

Deputy Governor Tiff Macklem, in a speech to the Lunenburg Board of Trade on 8 June, described the two key components of the Bank of Canada's monetary policy framework as the inflation target (the anchor), and the float (the flexible exchange rate) and explained how they work together to promote the economic well-being of Canada.

Both speeches are reproduced in this issue of the *Review*. The full text of these and other speeches can be found on the Bank's website (www.bankofcanada.ca), including:

20 July 2006	Remarks by David Dodge to the Brazil-Canada Chamber of Commerce, São Paulo, Brazil
19 July 2006	Remarks by David Dodge to the Chile-Canada Chamber of Commerce, Santiago, Chile
13 July 2006	Opening statement at a press conference following the release of the *Monetary Policy Report Update*
30 May 2006	Opening statement to the House of Commons Standing Committee on Industry, Science and Technology
3 May 2006	Opening statement to the Senate Committee on Banking, Trade and Commerce
27 April 2006	Opening statement following the release of the *Monetary Policy Report*
30 March 2006	Remarks to the Woodrow Wilson School of Public and International Affairs, Princeton, New Jersey
29 March 2006	Remarks to the New York Association for Business Economics, New York, New York
6 February 2006	Remarks to the Barbados International Business Association, Bridgetown, Barbados
26 January 2006	Opening statement following the release of the *Monetary Policy Report Update*

Global Economic Forces and the Need for Adjustment

Remarks by David Dodge
Governor of the Bank of Canada
to the Chambre de commerce du Montréal métropolitain and the Fédération des chambres de commerce du Québec
Montréal, Quebec
21 June 2006

Since the start of the millennium, developments in the global economy have led to important changes throughout the Canadian economy and to serious challenges for many sectors and regions. Because nobody can anticipate precisely how the world will unfold, the best we can do is to ensure that our economy is as flexible as possible. What I want to do today is look briefly at how the Canadian economy has adjusted so far and talk about what public policies—including monetary policy—can do to promote economic flexibility.

Let me start by listing the main global developments since 2000. First, China and India have emerged as economic powerhouses. Second, global economic growth has been extraordinarily strong. Third, we have gone through a period marked by an unusually high amount of monetary stimulus, which central banks are now in the process of reducing. At the same time, we have seen a persistent and growing current account deficit in the United States, mirrored by large and growing current account surpluses elsewhere, especially in Asia and among many oil-exporting countries.

These developments have had significant consequences for the Canadian economy. The strong global growth, especially in China, India, and the United States, has led to sharply higher prices for many of the primary commodities that Canada produces. The emergence of China and India has also led to intense competition for many manufacturers, as well as lower prices for various consumer durable and semi-durable goods. The higher prices for many of our exports, coupled with lower prices for imported goods, have led to an improvement in our terms of trade and rising incomes for Canadians—particularly for producers of commodities, including metals and energy products. In this environment, we have seen a rapid increase in the external value of the Canadian dollar.

It is clear that we must all adjust to these developments and be ready to take advantage of the opportunities presented by the strong global economy.

It is clear that we must all adjust to these developments and be ready to take advantage of the opportunities presented by the strong global economy.

Of course, adjustment is easier said than done. And it is important to acknowledge that adjustment is often very difficult on a personal level. The adjustments over the past three years have been particularly difficult because of the speed and size of the movements in relative prices. This has been a double-edged sword. On the one hand, some firms are facing booming demand and have been unable to expand quickly enough, hindered by shortages of skilled labour, outdated machinery, and inadequate infrastructure. On the other hand, some firms have struggled to increase the value-added of the goods they produce in Canada in the face of falling prices and global competition. They have had to find ways to shift some activities offshore. This second type of difficulty has been more prevalent in traditional goods-producing industries such as clothing, textiles, and newsprint. In some cases, business owners and employees—who have invested

decades of their lives in a particular firm or industry—are coming to terms with plant closures and the loss of jobs. None of this is easy. These difficulties have been plain to see in media reports and in official economic data. However, these same data also show increases in output in sectors such as wholesale trade and financial and business services, as well as manufacturing sectors such as pharmaceuticals and transportation equipment.

Despite all the challenges, we are seeing businesses across the country being inventive in responding to the necessity of adjustment.

Despite all the challenges, we are seeing businesses across the country being inventive in responding to the necessity of adjustment. We have been tracking this adjustment through our regular communications with business groups, manufacturers, and exporters, as well as through the Bank's *Business Outlook Surveys*. These surveys, conducted by staff in the Bank's regional offices, are available on our website, and I encourage you to look at them. Since 2003, when the Canadian dollar began to appreciate, they have told an encouraging story of how businesses have found ways to innovate and adjust to changing circumstances.

The Role of Public Policies

But what role is there for public policies in this adjustment process? Above all, governments should not try to shield business from global forces, nor should they interfere with market signals. Which policies then can support market-based adjustment? At the macroeconomic level, monetary and fiscal policies can facilitate adjustment by promoting stable and sustainable long-term economic growth. I'll have more to say about the role of monetary policy in a moment. On the microeconomic side, let me mention a few areas where governments can act.

The first has to do with infrastructure, and there are really two sides to that—human and physical. In terms of human infrastructure, there is a crucial role for government in promoting education and training. Ultimately, the strength of our economy depends on the skills of its workforce. Obviously, governments should make sure that everyone has the opportunity to receive a sound, basic education. And in the face of shortages of skilled labour, public policies should encourage the training and retraining of employees, so that they can move more easily into sectors that are expanding. But I would not stop there. There is much that we as employers can do to give our employees the opportunity to improve and develop their skills.

In terms of physical infrastructure, public policies can support both public and private investment so that firms can become more productive. By infrastructure, I am referring not only to traditional projects such as roads, bridges, and pipelines, but also to assets such as the so-called "information superhighway." Having modern, reliable infrastructure in place allows businesses to invest with greater certainty, thus furthering the adjustment process. This may mean the use of private funds to develop public infrastructure projects, as I have mentioned in past speeches. And now is the time to encourage this type of investment, given our climate of low nominal interest rates, and the presence of large pension funds that are searching for these kinds of investment opportunities.

We need to recognize that supporting workers does not mean propping up factories or industries that cannot compete in the global economy.

The second area where governments can act has to do with policies to promote economic flexibility. Governments must see to it that rules and regulations are not hindering that flexibility. In terms of labour markets, we need to recognize that supporting workers does not mean propping up factories or industries that cannot compete in the global economy. Rather, it means removing barriers so that workers can make adjustments as easily and painlessly as possible. Rules and regulations should not prevent workers from shifting from sector to sector, province to province, or even region to region within a province. Too often, labour mobility is hindered because credentials are not recognized from one province to another. All of these barriers to labour mobility are unhelpful, not just to the economy, but to the workers themselves. The focus for policy must

be how to encourage and support the mobility of our workforce.

Third, we need policies that allow Canadian capital markets to work at peak efficiency. This will also provide businesses with flexibility to help them invest and expand, and so support the adjustment process. As I have said before, we need policies that do not impede efficiency in our financial institutions and markets, and at the same time encourage competition. This is crucial, not only because it allows firms to have appropriate access to capital, but also because financial services is a high value-added industry that makes a large contribution to employment and income, particularly here in Montréal.

Those are three of the most important microeconomic policy considerations for the public sector in terms of supporting economic adjustment. On the macroeconomic side, governments should continue to aim for sustainable fiscal policies, with budgets in rough balance or in small surplus. But I want to spend a few minutes speaking about monetary policy and the role of the Bank of Canada.

The Bank of Canada's monetary policy aims to preserve a climate of low, stable, and predictable inflation. This can help with the adjustment process in several ways. Such a climate minimizes the distortion of price signals that can lead to inappropriate investment choices. Low and stable inflation allows firms to undertake long-term investments with greater certainty. But crucially, low inflation also reduces the risk premium demanded by investors. This means that nominal long-term interest rates are kept low, which supports the investment that helps with the adjustment process.

We help the adjustment process because resources that are released by sectors under pressure can be more readily absorbed by sectors that are expanding.

In addition, the Bank's monetary policy has a stabilizing function, which also facilitates adjustment. Let me explain. We keep inflation in check by trying to have the economy operate at full capacity, with aggregate supply and demand in balance. In doing so, we help the adjustment process because resources that are released by sectors under pressure can be more readily absorbed by sectors that are expanding. We see clear evidence of this process happening right now in Canada.

Low inflation is the best contribution that monetary policy can make to economic health. We do not have a target for the Canadian dollar.

Let me now say a few words about how our flexible exchange rate fits into our monetary policy framework. There are some who have called on the Bank to smooth out fluctuations in the Canadian dollar, or to slow its ascent. But we have one monetary policy instrument—our influence over interest rates—so we can have only one target. Canada has chosen low inflation as the target, because experience clearly shows that low inflation is the best contribution that monetary policy can make to economic health. We do *not* have a target for the Canadian dollar.

However, this does not mean that the Bank does not care about the impact of movements in the exchange rate on the Canadian economy. The truth is quite the opposite—the exchange rate plays an important role in our monetary policy deliberations. Exchange rate movements tell us something about economic developments that may be having a direct impact on the demand for Canadian goods and services. And the movements themselves have their own effect on aggregate demand, by changing relative prices and by shifting demand between domestic- and foreign-produced products. The challenge for the Bank is to evaluate these movements, together with other data, and to set a course for monetary policy that works to keep demand and supply in balance and inflation low and stable.

In making this evaluation, we try to determine how much of a particular movement in the Canadian dollar is due to changes in world demand for our goods and services, and how much is due to other factors unrelated to the demand for Canadian goods and services. It is important that we understand the causes of exchange rate movements, because the implications for the economy, and the appropriate monetary policy response, depend on the cause of the change. Generally speaking, movements related to changes in demand for our goods and services would require little, if any, monetary policy

response. This is because their impact on Canadian aggregate demand would serve to offset the initial direct changes in global demand for our goods and services. And this would help to keep overall supply and demand in balance.

So what can we say about the appreciation of the Canadian dollar? Since 2003, most of the appreciation—but not all—appears to have been related to our improved terms of trade and the increased demand for Canadian goods and services. Some of the appreciation has also reflected the broad-based weakness of the U.S. dollar associated with global current account imbalances. My colleague, Tiff Macklem, spoke on this topic at some length a couple of weeks ago, and you can find his remarks on our website. Determining how much of each of these forces is behind the movement in the currency is an important, but very difficult, judgment that the Bank must make. This judgment is even more difficult during times of market volatility, such as we have seen since the Bank's last fixed announcement date on 24 May. During that time, a number of Canadian economic indicators have also been published. Some of these indicators have been stronger than expected, others have been weaker. But on balance, the projection we set out in our April *Monetary Policy Report* appears to be reasonable. That is to say, we continue to expect economic growth roughly in line with the growth of potential output, and inflation to average close to the 2 per cent target in 2007 and 2008, excluding any temporary effects on inflation that will follow the forthcoming reduction in the Goods and Services Tax.

As we said at our last fixed announcement date, we will continue to monitor all economic and financial developments in the global and domestic economies relative to the projection in the April *Report*. But it is important to remember that when it comes to setting monetary policy, the Bank always tries to develop a complete picture of the economy. We do not react unduly to any individual piece of information. Rather, we put all the pieces together to get to the underlying trends in the economy. And, as always, we will look at the complete economic picture as we lead up to our next decision date on 11 July, and we will present that complete picture in our *Monetary Policy Report Update* two days later.

Conclusion

Let me conclude. Powerful global economic forces have been affecting the Canadian economy and will continue to have an impact for the foreseeable future.

Adjustment won't be easy in the months and years ahead. But I'm encouraged to see that most firms are getting on with the job.

Adjustment must take place. It hasn't been easy, and it hasn't been without pain. And adjustment won't be easy in the months and years ahead. But I'm encouraged to see that most firms are getting on with the job. I encourage you to persevere with these adjustments.

For our part, we remain committed to keeping inflation low, stable, and predictable. That is the best contribution we can make to helping output and employment remain strong.

Floating Dollar, Anchored Inflation: The Role of the Exchange Rate in Canada's Monetary Policy Framework

Remarks by Tiff Macklem
Deputy Governor of the Bank of Canada
to the Lunenburg Board of Trade
Lunenburg, Nova Scotia
8 June 2006

The first thing I'd like to say is . . . Happy Birthday! And many, many more. Two hundred and fifty-three years of hard work and civic pride have made Lunenburg the beautiful and historically rich place it is today. I'm very pleased to be here with you on this occasion.

I'm happy to have been invited by the Board of Trade to speak about the role of the exchange rate in Canada's monetary policy framework. The Canadian dollar is very much in the news these days. And so I want to put exchange rate movements into context, and Nova Scotia is a good place to do that. With a commercial history that goes back centuries, Nova Scotians have a long experience with trade and currencies. From the early 1700s, when they were alleged to possess, and I quote, "a canniness in trade that staggered even the Scotch,"[1] to the energy and agri-food exports of today, Nova Scotians have always been outward looking, engaged in trade, and thus interested in the value of currencies.

Over the next 20 minutes, I'd like to explain the role of the flexible exchange rate in our economy. I'll start by providing a useful backdrop—the Bank of Canada's monetary policy framework. Next, I'll take a close look at the flexible exchange rate, and discuss how the Bank considers currency movements in its monetary policy decisions. I'll then comment on the recent appreciation of the Canadian dollar, and conclude by discussing the challenges that the rapid appreciation of our currency is posing. At the end of my remarks, there will be time for comments and questions.

The Monetary Policy Framework

The ultimate goal of the Bank of Canada is to promote the economic and financial welfare of Canadians. To achieve this goal, we need a clear, effective policy framework.

The two key components of the Bank's monetary policy framework are an "anchor," the inflation target, and a "float," the flexible exchange rate. Living by the ocean, you know better than I that a good mooring is one that keeps a boat in place, yet allows some give and take for the wind and the tide. And so it is for our framework. We need an inflation target to anchor our policy with a clear objective. We also need the flexible exchange rate to pass on valuable price signals and to absorb some of the ups and downs of the global economy. The two components work hand in hand and reinforce each other to promote the economic well-being of the nation. Let me elaborate first on the "anchor," the inflation target.

Out of the bitter experience of the 1970s and early 1980s, we learned that the best contribution that monetary policy can make to the welfare of Canadians is to keep inflation low and stable. In 1991, the Bank and the

1. John C. Miller, *Origins of the American Revolution* (Stanford University Press 1959, 12)

Government of Canada formalized this commitment to low inflation by announcing an explicit inflation target. Since 1995, the target has been the 2 per cent midpoint of a 1 to 3 per cent inflation-control range. The inflation target has proven to be very effective—indeed, it has been the most successful regime in Canadian monetary policy history. Inflation has been low and stable, and we've experienced solid growth and less volatility in output and employment.

A good mooring is one that keeps a boat in place, yet allows some give and take for the wind and the tide. And so it is for our framework. We need an inflation target to anchor our policy with a clear objective. We also need the flexible exchange rate to pass on valuable price signals and to absorb some of the ups and downs of the global economy.

To keep inflation at 2 per cent, the Bank tries to maintain a balance between the overall (or aggregate) demand for, and supply of, goods and services. When aggregate demand and supply are in balance, the economy can operate at its full production capacity, and inflation is stable. To achieve this balance, the Bank raises interest rates when aggregate demand pushes the economy above its sustainable production capacity, causing price pressures to build and inflation to rise above the target. And, in a symmetric fashion, the Bank lowers interest rates when unused capacity puts downward pressure on inflation, pushing it below the target.

Inflation control contributes to better economic performance in several ways, but let me highlight two of them. First, low and stable inflation enables firms and individuals to have confidence in the value of money and to read price signals clearly, helping them to make sound long-term economic decisions. Second, when inflation is contained, and the economy is running close to capacity, we can deal more effectively with economic shocks. Resources can more easily be reallocated from sectors where demand is relatively weak to sectors where demand is relatively strong. This is especially important at times, like now, when there are large movements in relative prices—that is, in the prices of some goods, such as energy products, relative to other prices.

Meeting the inflation target helps to anchor expectations of inflation, and that in itself helps to keep inflation low and the economy relatively stable. Also, and importantly, the explicit goal of the inflation target acts as an anchor in our decision-making process at the Bank of Canada.

Let me now turn to the other key component of Canada's monetary policy framework—the "float"—the flexible exchange rate.

Let's start with a basic question: Why allow the dollar to float? The fundamental reason is that a flexible currency allows us to follow an independent monetary policy, a policy suited to our own economic circumstances. We wouldn't be able to address the particulars of the Canadian economy if we set monetary policy with the goal of maintaining a fixed exchange rate. With just one instrument to carry out monetary policy, we can have only one target—and we target inflation.

But there's another important reason for having a flexible exchange rate. Just as a properly moored ship has some play in the mooring lines to absorb changes in the wind and the tide, the floating dollar helps the economy to absorb shocks—especially external shocks that affect our economy differently than the economies of our major trading partners. That is, it helps us adjust to shifting currents in the global economy. It's useful to think of the exchange rate as a *relative price*, a price that provides a good deal of useful information. Movements in the exchange rate send signals to businesses and consumers, signals that help the economy adjust to changing circumstances.

But just because the Bank of Canada does not have a target for the Canadian dollar does *not* mean that we ignore the exchange rate. Far from it. For any significant currency movement, we try to assess the implications for aggregate demand in Canada, and thus the implications for monetary policy. And, as part of this analysis, we try to determine the factors driving a given movement. Let me expand on this.

Interpreting Currency Movements

The Canadian dollar can rise or fall for a number of reasons. But, in principle, we can divide exchange rate movements into two categories—Type One and Type Two. Type One exchange rate movements reflect

changes in the aggregate demand for Canadian goods and services. Type Two movements reflect other factors. The key point is that these two types of currency movement have different implications for monetary policy. In general, there's less of a need for monetary policy to respond to a Type One movement than to a Type Two movement. But just to make life interesting for central bankers, *both* types of movement may occur at the same time. Interpreting currency movements is not a science; it requires judgment.

In Canada, Type One currency movements often relate to the health of the global economy, which in turn is reflected in the foreign demand for, and world prices of, the commodities we produce in this country. When global demand is strong, and world commodity prices rise, the value of the goods that Canada exports increases, and this tends to cause the Canadian dollar to appreciate. This appreciation provides an offsetting force, dampening foreign and domestic demand for Canadian-produced goods and services. To the extent that this dampening effect offsets the initial direct increase in demand, there's no need for a policy response. Aggregate demand and supply remain in balance, and inflation stays on target.

Just to make life interesting for central bankers, both *types of movement may occur at the same time. Interpreting currency movements is not a science; it requires judgment.*

A Type Two exchange rate movement is one that is *not* triggered by a change in aggregate demand for Canadian goods and services. But, as you might expect, the currency movement *itself* affects the demand for Canadian goods and services, by making them more, or less, competitive relative to goods and services produced elsewhere. Other things being equal, this is a situation to which monetary policy needs to respond to keep aggregate demand and supply in balance, and inflation on target.

Type Two exchange rate movements are more difficult to describe, both because they are best defined as anything that is not Type One, and because the distinction is not always as clear in practice as it is in theory.

One example of a Type Two exchange rate movement is the "portfolio shock" that can arise when there is a sudden reassessment of risk by global investors, often in response to an economic crisis somewhere in the world. When this happens, there is a so-called "flight to quality." That is, investors move out of assets denominated in riskier currencies—typically those of highly indebted countries—and this can lead to a sharp depreciation of these currencies. To the extent that the depreciation reflects the pure portfolio effect that is due to "financial contagion," and not the result of a fall in demand for the goods and services produced by the country, it is a Type Two depreciation. In the first half of the 1990s, when inflation targeting was still very new in Canada, and our government debt was rising unsustainably, Canada was more susceptible to this kind of exchange rate movement.

Another example of a Type Two force, this time in the opposite direction for the Canadian dollar, is the adjustment of the U.S. dollar against most major currencies, reflecting concerns about the U.S. current account deficit. I'd like to elaborate on this as I discuss the recent appreciation of the Canadian dollar.

The Recent Appreciation of the Canadian Dollar

Since the beginning of 2003, the Canadian dollar has appreciated by about 40 per cent relative to the U.S. dollar, and by a lesser amount against a trade-weighted basket of the currencies of our major trading partners. This sharp appreciation appears to be largely the result of two factors: strong foreign demand for Canadian products, especially commodities, and broad-based weakness in the U.S. dollar. That is to say, both Type One and Type Two forces have been at play.

Global economic growth has been strong over this period. Sustained strength in the U.S. economy, combined with tremendous growth in China and other parts of Asia, has led to a surge in world demand and prices for oil and gas, metals, and other commodities that Canada exports. In many respects, what we have been seeing since 2003 is the reverse of what happened as a result of the fallout of the Asian Crisis in the second half of the 1990s, when world growth weakened, commodity prices plunged, and the Canadian dollar dropped to a low of about 64 cents U.S. Indeed, our own research has long found a relationship, in the same

direction, between non-energy commodity prices and the value of the Canadian dollar. And our more recent research suggests that, with the substantial growth in our net trade surplus in energy since the early 1990s, energy prices now appear to have an influence (also in the same direction) on the value of the Canadian dollar. So, with the boom in the prices of energy and non-energy commodities since 2003, we have seen a marked Type One appreciation of our currency.

But this is not the whole story. Another factor driving the Canadian dollar higher since 2003 has been a broad-based weakening of the U.S. dollar. The American dollar has fallen against many currencies as a result of concerns about the large and growing U.S. current account deficit. This situation cannot be sustained indefinitely, and investors appear to believe that a depreciation of the U.S. dollar is needed to help resolve this aspect of the "global imbalances." This multilateral currency realignment also appears to be playing a role in the appreciation of the Canadian dollar.

To the extent that the Type One appreciation is working to offset the underlying positive shock to the Canadian economy, there is less need for monetary policy to respond. But the Type Two appreciation is something that monetary policy would want to respond to in the form of a lower policy interest rate *than would otherwise be the case*. Our assessment is that *most* of the exchange rate appreciation since 2003 reflects strong global demand and higher commodity prices. At the same time, part of the Canadian dollar appreciation has been related to the multilateral depreciation of the U.S. dollar, and we have had to factor this Type Two force into our monetary policy decision making.

While the Canadian and the U.S. economies both appear to be operating close to their full production capacity, interest rates in Canada are below those in the United States right across the yield curve. And, at longer maturities, the negative spreads with U.S. rates are historically large.

Weighing all factors, the Bank of Canada has raised the policy interest rate from 2 1/2 per cent to 4 1/4 per cent, as unused capacity in the Canadian economy has been absorbed by strong foreign and domestic demand for Canadian goods and services. Our objective with these rate moves has been to keep the Canadian economy operating at its potential and inflation close to the 2 per cent target over the medium term. Policy interest rates in the United States, by comparison, have increased from 1 per cent to 5 per cent. As a result, while the Canadian and the U.S. economies both appear to be operating close to their full production capacity, interest rates in Canada are below those in the United States right across the yield curve. And, at longer maturities, the negative spreads with U.S. rates are historically large.

As I said earlier, interpreting currency movements is difficult and requires judgment. The challenge is even more acute during periods of market volatility, such as we've seen in recent weeks.

The Challenges of a Rapid Currency Appreciation

At this point, I'd like to make one thing very clear: for many individuals and firms, adjusting to exchange rate changes can be difficult—particularly when the currency moves as far and as quickly as it has in the past three years. While higher commodity prices benefit some firms, others are facing higher energy and non-energy input costs, and new competition from low-cost producers in China and elsewhere. For these firms, the higher value of the Canadian dollar is an added pressure. Some sectors, particularly manufacturing, tourism, and fishery and forestry, are facing some very real challenges. And some firms, especially in the manufacturing sector, are struggling, and individuals have lost jobs. We are well aware of this, and recognize the stresses that come with such dislocation.

It's important to point out that there's a good deal of diversity *within* each sector of the economy. Not all commodity producers are benefiting from high commodity prices—firms in the paper products and agriculture sectors face difficulties. And some manufacturers, notably in machinery and equipment, and resource processing, are doing well.

What we have been struck by, both in industry visits and in our analysis of the data, is how actively businesses have been responding to the challenges posed by a rapidly appreciating dollar. The Bank of Canada's most recent survey of Canadian businesses shows that about half of the firms surveyed have been adversely affected by the rising dollar, while about a quarter have been favourably affected. Those adversely affected

have responded to the strengthening dollar by outsourcing labour-intensive production, specializing in higher value-added products, developing new products and entering new markets, and by improving productivity.

We have been struck by how actively businesses have been responding to the challenges posed by a rapidly appreciating dollar . . . attesting to the strength and resiliency of Canadian business, and to the skills and resourcefulness of our workers.

Firms in Nova Scotia and across Canada are looking for ways to adapt to, and thrive in, these challenging times. The fact that they *are* adjusting attests to the strength and resiliency of Canadian business, and to the skills and resourcefulness of our workers. For its part, the Bank of Canada will continue to support the adjustment process by keeping inflation low and stable and the economy operating close to capacity. This contribution is critical to the adjustment process because it enables sectors that are expanding to more readily absorb resources that are released by sectors under pressure. And our focus on inflation control ensures that Canadians can continue to have confidence in the value of their money.

Conclusion

I'd like to conclude by emphasizing that the flexible exchange rate is an essential part of Canada's monetary policy framework. A floating currency absorbs shocks, passes on price signals, and—against a backdrop of low and stable inflation—facilitates adjustment to economic developments.

This framework of anchored inflation and a floating exchange rate helps Canada to weather the sometimes stormy seas of the global economy. Whatever the economic circumstances, the Bank of Canada will continue to do its part by keeping inflation under control and the economy expanding in a sustainable fashion.

For business, a floating currency brings both challenges and opportunities. I'm sure that Nova Scotians will continue to seize the opportunities, and, through investment, innovation, and marketing, rise to the challenges.

I'd now be happy to respond to your comments and questions.

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Summary Tables

A1 Summary of Key Monetary Policy Variables

Monthly		Inflation-control target (12-month rate)			Policy instrument			Monetary conditions			Monetary aggregates (12-month growth rate)			Inflation indicators					
		Target range	CPI	Core CPI*	Operating band for overnight rate (end of month)		Overnight money market rate	Monetary conditions index (January 1987=0)	90-day commercial paper rate	C-6 trade-weighted exchange rate (1992=100)	Gross M1	M1++	M2++	Yield spread between conventional and Real Return Bonds	Total CPI excluding food, energy, and the effect of changes in indirect taxes	CPIW	Unit labour costs	IPPI (finished products)	Average hourly earnings of permanent workers
					Low	High													
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
2002	J	1-3	2.1	2.1	2.50	3.00	2.7418	-10.40	2.88	77.71	13.3	14.7	6.7	2.28	2.1	2.0	0.2	0.5	2.5
	A	1-3	2.6	2.5	2.50	3.00	2.7448	-9.68	3.09	78.90	13.9	15.2	6.7	2.18	2.2	2.4	1.2	1.3	2.7
	S	1-3	2.3	2.5	2.50	3.00	2.7447	-10.27	2.90	77.97	10.9	12.7	6.1	2.18	2.3	2.3	0.6	0.9	2.6
	O	1-3	3.2	2.5	2.50	3.00	2.7449	-10.06	2.83	78.63	11.5	12.6	5.6	2.18	2.5	2.4	1.1	2.1	2.4
	N	1-3	4.3	3.1	2.50	3.00	2.7431	-10.21	2.85	78.24	9.6	10.3	4.8	2.15	3.1	3.0	2.0	1.8	2.2
	D	1-3	3.9	2.7	2.50	3.00	2.7439	-9.80	2.83	79.24	7.0	8.2	3.9	2.09	3.3	2.4	1.4	2.1	1.7
2003	J	1-3	4.5	3.3	2.50	3.00	2.7439	-9.34	2.91	80.15	7.4	7.3	3.7	2.27	3.3	2.9	1.9	1.1	1.7
	F	1-3	4.6	3.1	2.50	3.00	2.7469	-8.61	2.97	81.78	6.8	6.4	3.3	2.40	3.3	2.9	2.2	1.1	1.7
	M	1-3	4.3	2.9	2.75	3.25	2.9920	-7.72	3.28	83.22	6.2	5.6	3.4	2.50	3.1	2.7	2.2	0.1	1.4
	A	1-3	3.0	2.1	3.00	3.50	3.2373	-6.92	3.35	85.07	6.6	5.2	3.0	2.28	2.8	2.1	3.2	-1.5	1.0
	M	1-3	2.9	2.3	3.00	3.50	3.2416	-6.02	3.27	87.60	7.0	5.3	3.5	2.12	2.5	2.2	2.4	-2.7	1.8
	J	1-3	2.6	2.1	3.00	3.50	3.2449	-5.11	3.11	90.45	7.7	5.2	3.3	2.04	2.1	2.0	2.3	-3.7	1.1
	J	1-3	2.2	1.8	2.75	3.25	2.9947	-6.60	2.89	87.07	10.0	6.6	3.5	2.25	1.7	1.9	4.5	-2.1	2.0
	A	1-3	2.0	1.5	2.75	3.25	2.9972	-6.68	2.80	87.11	9.5	6.6	3.5	2.29	1.7	1.7	2.7	-2.6	2.2
	S	1-3	2.2	1.7	2.50	3.00	2.7490	-5.93	2.64	89.52	8.6	6.5	3.4	2.15	1.8	1.9	1.9	-3.8	2.7
	O	1-3	1.6	1.8	2.50	3.00	2.7492	-4.85	2.71	92.25	6.9	6.1	3.1	2.38	1.8	1.8	2.0	-5.5	2.7
	N	1-3	1.6	1.8	2.50	3.00	2.7481	-4.73	2.73	92.54	8.5	6.8	3.1	2.38	1.8	1.7	1.2	-6.0	2.2
	D	1-3	2.0	2.2	2.50	3.00	2.7481	-4.68	2.66	92.87	9.6	7.6	3.9	2.41	1.5	2.1	1.3	-5.4	2.7
2004	J	1-3	1.2	1.5	2.25	2.75	2.4951	-5.77	2.37	90.68	10.4	8.3	3.8	2.66	1.5	1.5	1.9	-5.3	2.9
	F	1-3	0.7	1.1	2.25	2.75	2.4953	-6.21	2.25	89.82	12.9	9.7	4.4	2.53	1.0	1.2	2.3	-4.3	2.6
	M	1-3	0.7	1.3	2.00	2.50	2.2482	-5.72	2.10	91.55	14.0	10.5	4.7	2.65	1.1	1.2	1.5	-3.5	2.8
	A	1-3	1.6	1.8	1.75	2.25	1.9959	-6.98	2.05	88.28	15.2	12.0	5.1	2.85	1.2	1.7	1.9	-1.3	3.0
	M	1-3	2.5	1.5	1.75	2.25	1.9985	-7.08	2.07	87.98	15.8	13.1	5.1	3.00	1.2	1.8	2.0	2.8	2.8
	J	1-3	2.5	1.7	1.75	2.25	2.0005	-6.36	2.10	89.81	14.1	13.0	5.7	2.96	1.4	1.8	2.2	3.1	3.3
	J	1-3	2.3	1.9	1.75	2.25	1.9973	-6.03	2.12	90.65	10.9	11.6	5.4	2.98	1.4	1.9	0.1	0.6	2.4
	A	1-3	1.9	1.5	1.75	2.25	1.9979	-5.28	2.22	92.43	10.4	10.6	5.2	2.93	1.0	1.7	0.9	0.3	2.1
	S	1-3	1.8	1.5	2.00	2.50	2.2496	-4.22	2.50	94.63	10.1	10.4	5.2	2.72	1.0	1.6	2.3	-	1.9
	O	1-3	2.3	1.4	2.25	2.75	2.4960	-3.03	2.60	97.77	11.5	10.5	5.7	2.72	0.8	1.7	1.7	0.7	2.2
	N	1-3	2.4	1.6	2.25	2.75	2.4977	-1.82	2.74	100.95	10.6	9.8	5.3	2.73	1.1	1.8	1.8	-0.6	3.1
	D	1-3	2.1	1.7	2.25	2.75	2.4999	-3.02	2.57	97.89	11.6	10.7	5.6	2.81	1.3	1.7	2.5	-0.7	2.7
2005	J	1-3	2.0	1.6	2.25	2.75	2.4980	-3.35	2.56	96.96	11.1	10.2	5.7	2.71	1.2	1.6	1.2	-	3.0
	F	1-3	2.1	1.8	2.25	2.75	2.4971	-3.54	2.57	96.37	10.1	9.6	5.8	2.69	1.4	1.7	1.4	-0.5	2.5
	M	1-3	2.3	1.9	2.25	2.75	2.4794	-2.74	2.68	98.39	9.9	9.1	5.5	2.69	1.4	1.9	3.0	-0.7	3.2
	A	1-3	2.4	1.7	2.25	2.75	2.4954	-3.69	2.58	95.92	9.8	8.3	5.7	2.67	1.2	1.8	2.2	-0.5	3.2
	M	1-3	1.6	1.6	2.25	2.75	2.4866	-4.02	2.59	94.93	8.8	7.2	5.4	2.60	1.2	1.6	1.6	-2.2	2.4
	J	1-3	1.7	1.5	2.25	2.75	2.4936	-2.88	2.58	98.28	9.5	6.6	5.0	2.42	1.3	1.7	2.2	-1.5	2.9
	J	1-3	2.0	1.4	2.25	2.75	2.4922	-2.95	2.64	97.88	9.6	6.2	4.7	2.38	1.1	1.7	3.2	-0.7	3.1
	A	1-3	2.6	1.7	2.25	2.75	2.4882	-1.63	2.83	101.27	9.3	6.0	4.9	2.39	1.5	1.9	2.5	-0.3	3.4
	S	1-3	3.4	1.7	2.50	3.00	2.7421	-1.07	2.98	102.51	11.3	7.1	5.6	2.57	1.6	2.1	2.8	0.8	3.6
	O	1-3	2.6	1.7	2.75	3.25	2.9873	-0.66	3.14	103.30	11.3	7.8	5.6	2.67	1.5	1.8	2.9	0.6	3.7
	N	1-3	2.0	1.6	2.75	3.25	2.9883	-0.21	3.37	103.96	11.4	7.9	5.9	2.53	1.4	1.7	3.4	1.5	3.6
	D	1-3	2.2	1.6	3.00	3.50	3.2437	-	3.52	104.14	10.7	7.4	6.3	2.58	1.3	1.7	2.6	0.9	3.6
2006	J	1-3	2.8	1.7	3.25	3.75	3.2961	0.47	3.67	105.15	10.6	6.6	5.9	2.66	1.4	2.0	3.2	0.7	3.2
	F	1-3	2.2	1.7	3.25	3.75	3.4765	0.73	3.80	105.56	12.3	7.2	6.0	2.71	1.4	1.7	2.7	-0.8	3.2
	M	1-3	2.2	1.7	3.50	4.00	3.7269	0.20	4.00	103.29	12.1	7.1	6.5	2.64	1.5	1.8	2.0	0.2	3.1
	A	1-3	2.4	1.6	3.75	4.25	3.8182	1.56	4.19	106.97	11.2	7.0	6.3	2.78	1.6	1.7		-	3.1
	M	1-3	2.8	2.0	4.00	4.50	4.2126	2.29	4.33	108.87	11.2	6.4		2.67	1.8	2.0		-1.3	4.0
	J				4.00	4.50	4.2577	1.96	4.51	107.21				2.77					3.7

* New definition for core CPI as announced on 18 May 2001: CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the remaining CPI components

A2 Major Financial and Economic Indicators

Rates of change based on seasonally adjusted data, percentage rates unless otherwise indicated

	Year, quarter, and month	Money and credit									Output and employment				
		Monetary aggregates					Business credit		Household credit		GDP in current prices	GDP volume (millions of chained 1997 dollars, quarterly)	GDP by industry (millions of 1997 dollars, monthly)	Employment (*Labour Force Information*)	Un-employment rate
		Gross M1	M1+	M1++	M2+	M2++	Short-term business credit	Total business credit	Consumer credit	Residential mortgages					
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	1993	9.4	5.1	-0.7	4.2	6.6	-6.3	0.7	2.3	7.6	3.8	2.3		0.5	11.4
	1994	13.2	8.4	1.4	1.9	6.8	1.6	4.7	7.9	6.4	6.0	4.8		2.1	10.4
	1995	6.6	0.8	-2.6	3.8	4.1	5.5	5.1	7.5	3.7	5.1	2.8		1.8	9.5
	1996	12.2	8.2	3.3	4.4	6.8	1.5	5.5	6.5	4.2	3.3	1.6		0.9	9.6
	1997	16.9	11.2	7.2	0.9	7.2	7.7	10.0	10.0	5.6	5.5	4.2		2.1	9.1
	1998	10.3	7.0	3.1	-1.1	5.5	11.5	11.5	10.1	4.9	3.7	4.1	3.8	2.5	8.3
	1999	7.6	6.0	4.3	3.6	5.3	2.4	6.3	7.1	4.3	7.4	5.5	5.6	2.6	7.6
	2000	14.7	10.6	8.8	5.9	7.0	6.5	7.3	12.6	4.8	9.6	5.2	5.5	2.5	6.8
	2001	12.1	10.3	9.6	6.6	7.6	-1.5	5.7	6.8	4.0	2.9	1.8	1.6	1.2	7.2
	2002	11.7	10.9	13.7	7.4	6.4	-6.0	3.9	6.5	7.4	4.0	2.9	3.2	2.4	7.7
	2003	7.9	5.0	6.3	4.7	3.4	-2.9	1.5	8.7	8.2	5.2	1.8	2.1	2.4	7.6
	2004	12.2	9.0	10.8	4.7	5.1	-0.6	4.0	9.9	9.8	6.4	3.3	3.1	1.8	7.2
	2005	10.2	7.2	7.8	4.7	5.5	7.4	6.3	12.2	10.1	6.2	2.9	3.1	1.4	6.8
Annual rates	2002 II	4.8	5.2	8.3	3.7	4.4	-6.8	2.2	9.1	8.9	10.2	2.5	4.8	4.3	7.7
	III	11.6	8.4	8.2	6.4	4.8	-3.6	2.3	9.4	8.1	5.4	3.9	3.0	4.3	7.5
	IV	9.9	6.8	6.9	4.8	3.4	0.8	2.4	10.0	7.3	7.7	2.7	1.9	2.7	7.5
	2003 I	1.3	0.4	2.3	4.1	1.4	-1.1	0.7	6.4	8.0	9.1	2.1	2.2	2.8	7.4
	II	5.9	2.3	3.7	5.0	3.5	-3.3	0.2	8.9	8.1	-3.8	-1.3	-0.1	0.2	7.7
	III	21.3	13.2	13.8	5.8	5.7	-6.3	1.6	10.4	9.0	6.5	1.7	2.0	1.2	7.8
	IV	5.8	5.1	8.0	1.3	3.0	-7.9	2.7	7.9	9.5	4.0	3.6	4.8	3.1	7.5
	2004 I	17.6	11.1	12.8	4.6	5.0	-3.9	3.6	10.0	9.2	8.4	4.1	2.5	1.5	7.3
	II	16.0	13.9	16.4	7.5	7.5	9.6	6.6	10.8	10.9	10.1	4.4	4.0	2.6	7.2
	III	3.1	4.4	6.6	5.5	5.5	7.5	6.5	10.5	10.6	6.6	4.1	4.0	0.6	7.1
	IV	8.6	6.3	6.0	3.0	4.1	4.6	5.3	11.6	10.6	4.5	2.1	1.8	1.4	7.1
	2005 I	14.1	10.2	9.9	5.7	5.6	7.5	7.2	13.2	9.3	4.0	2.2	2.9	0.9	7.0
	II	12.0	7.6	7.0	5.0	6.1	5.7	5.1	13.0	9.5	6.1	3.4	3.4	1.7	6.8
	III	5.7	0.5	3.1	1.7	4.5	10.7	6.9	12.3	10.6	10.4	3.2	3.8	1.5	6.8
	IV	12.8	10.3	11.0	5.9	7.5	11.3	7.0	11.9	11.2	8.3	2.6	2.5	2.4	6.5
	2006 I	16.5	9.0	6.9	5.0	6.6	21.2	6.8	10.5	10.7	0.9	3.8	3.5	1.6	6.4
	II													3.1	6.2
Last three months		13.1	10.7	6.7	6.8	7.5	8.9	4.8	8.5	10.8			3.1	3.1	6.1
Monthly rates	2005 J	0.9	0.5	0.2	0.4	0.5	0.8	0.5	0.9	0.9			0.3	0.1	6.8
	J	0.2	-0.5	-	-0.4	-	1.3	0.6	1.0	0.8			0.3	0.2	6.8
	A	-0.1	-0.3	-	0.3	0.5	0.5	0.5	1.0	0.8			0.6	0.1	6.8
	S	1.6	1.4	1.3	0.9	0.9	1.1	0.7	1.2	0.9			-0.1	-	6.7
	O	1.1	1.1	1.2	0.5	0.6	0.8	0.5	0.7	0.9			0.2	0.4	6.6
	N	0.7	0.3	0.4	-	0.3	0.4	0.4	0.9	0.8			0.2	0.2	6.4
	D	1.4	1.0	1.0	0.9	1.0	2.2	0.8	1.0	0.9			0.4	-0.1	6.5
	2006 J	0.7	0.1	-0.1	-0.2	0.1	2.2	0.6	1.0	0.8			0.2	0.2	6.6
	F	2.7	1.6	1.2	0.8	0.8	1.7	0.5	0.5	0.8			0.4	0.2	6.4
	M	0.6	0.8	0.5	0.7	0.7	-0.1	0.2	0.6	0.9			0.1	0.3	6.3
	A	0.6	0.8	0.7	0.4	0.5	-0.3	0.4	0.5	1.0			0.1	0.1	6.4
	M	0.3	0.5	-0.2			1.7	0.8						0.6	6.1
	J													-	6.1

A2 (Continued)

Capacity utilization rate		Prices and costs				Wage settlements		Bank of Canada commodity price index (unadjusted)		Securities mid-market yield			Year, quarter, and month
Total industrial	Manufacturing industries	CPI	Core CPI*	GDP chain price index	Unit labour costs	Public sector	Private sector	Total	Non-energy	Treasury bills 3-month	Canada 10-year benchmark bonds	Canada 30-year Real Return Bonds	
(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	
80.6	79.9	1.8	2.1	1.4		0.6	0.8	0.5	3.0	3.87	6.57	3.78	1993
83.0	83.5	0.2	1.8	1.1		-	1.2	3.3	7.5	7.14	9.07	4.92	1994
82.1	83.9	2.2	2.3	2.3		0.7	1.4	8.3	11.1	5.54	7.11	4.42	1995
82.0	82.8	1.6	1.7	1.6		0.5	1.8	3.8	-1.2	2.85	6.37	4.09	1996
83.6	83.6	1.6	1.9	1.2		1.1	1.9	-3.7	-4.3	3.99	5.61	4.14	1997
84.6	84.3	0.9	1.3	-0.5	1.0	1.6	1.7	-15.3	-12.6	4.66	4.89	4.11	1998
86.0	85.8	1.7	1.4	1.7	0.1	1.9	2.7	6.7	1.5	4.85	6.18	4.01	1999
87.1	86.1	2.7	1.3	4.2	3.0	2.5	2.4	18.4	3.5	5.49	5.35	3.42	2000
84.4	81.7	2.6	2.1	1.1	3.1	3.3	3.0	-5.2	-6.9	1.95	5.44	3.76	2001
84.8	82.5	2.2	2.3	1.1	1.0	2.9	2.6	-5.9	-6.6	2.63	4.88	3.33	2002
84.4	81.3	2.8	2.2	3.4	2.3	2.9	1.2	20.1	8.8	2.57	4.66	2.79	2003
85.8	83.4	1.9	1.5	3.0	1.8	1.4	2.2	20.5	21.4	2.47	4.39	2.11	2004
86.1	84.4	2.2	1.6	3.2	2.4	2.2	2.4	23.0	3.8	3.37	3.93	1.44	2005
85.2	83.1	4.3	3.5	7.8	-0.7	2.7	2.2	40.0	-1.8	2.70	5.37	3.42	2002 II
85.4	83.3	4.6	3.0	1.5	2.4	3.2	2.5	2.8	-1.5	2.83	4.92	3.25	III
84.8	82.4	3.5	2.0	4.9	4.8	3.3	3.6	20.4	-4.0	2.63	4.88	3.33	IV
85.5	82.8	5.2	3.6	6.7	1.9	2.9	2.4	82.0	14.1	3.14	5.13	3.08	2003 I
83.7	80.6	-1.9	-	-2.5	1.3	3.0	0.3	-17.4	14.8	3.07	4.37	2.99	II
83.5	79.8	2.0	1.5	4.8	4.2	3.2	2.3	0.6	20.8	2.58	4.64	3.08	III
84.9	81.9	1.8	2.5	0.4	-1.3	2.3	1.6	17.6	19.5	2.57	4.66	2.79	IV
84.7	81.5	1.7	1.1	4.0	3.5	2.8	2.7	45.3	38.9	1.98	4.33	2.39	2004 I
85.6	83.0	3.4	1.7	5.4	2.0	-0.3	2.5	36.7	34.4	2.01	4.83	2.37	II
86.6	84.8	1.0	1.5	2.5	0.2	1.8	1.0	5.4	1.5	2.45	4.58	2.32	III
86.3	84.4	3.0	2.0	2.5	2.3	2.1	2.7	13.7	-15.7	2.47	4.39	2.11	IV
86.3	85.0	1.0	1.6	1.7	3.0	2.6	2.3	16.3	25.6	2.56	4.39	2.08	2005 I
85.9	84.1	2.8	1.4	2.4	2.6	2.6	2.6	23.7	-1.2	2.48	3.81	1.87	II
86.2	84.2	3.9	1.4	7.0	3.4	2.9	2.7	62.5	-10.2	2.86	3.94	1.64	III
86.1	84.3	1.4	2.0	5.5	2.8	1.6	2.1	27.7	14.0	3.37	3.93	1.44	IV
85.9	84.1	2.0	2.0	-2.6	1.6	2.2	2.5	-26.9	28.7	3.86	4.23	1.59	2006 I
								19.6	47.5	4.32	4.63	1.90	II
		2.8	2.1		1.6			19.6	47.5	4.32	4.63	1.90	
		0.2	0.2		0.5			5.5	0.1	2.48	3.81	1.87	2005 J
		0.3	-		0.9			1.5	-2.1	2.59	3.91	1.93	J
		0.4	0.2		-0.8			8.6	-0.1	2.72	3.78	1.73	A
		0.8	0.2		0.8			9.7	1.3	2.86	3.94	1.64	S
		-0.3	0.2		-			1.1	0.2	3.06	4.16	1.70	O
		-0.1	0.2		0.5			-9.3	1.7	3.31	4.06	1.65	N
		0.2	0.2		0.1			8.8	3.3	3.37	3.93	1.44	D
		0.5	0.2		-			-6.7	2.8	3.47	4.11	1.54	2006 J
		-0.2	0.2		0.1			-4.2	1.2	3.72	4.10	1.44	F
		0.3	0.2		0.2			-1.1	-	3.86	4.23	1.59	M
		0.5	-					6.7	6.5	4.03	4.52	1.79	A
		0.2	0.4					1.2	6.4	4.18	4.45	1.83	M
								-1.8	-3.3	4.32	4.63	1.90	J

* New definition for core CPI as announced on 18 May 2001: CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the remaining CPI components

A2 (Continued)

	Year, quarter, and month	Government surplus or deficit (-) on a national accounts basis (as a percentage of GDP)		Balance of payments (as a percentage of GDP)		U.S. dollar, in Canadian dollars, average noon spot rate
		Government of Canada	Total, all levels of government	Merchandise trade	Current account	
		(28)	(29)	(30)	(31)	(32)
	1993	-5.5	-8.7	1.8	-3.9	1.2898
	1994	-4.6	-6.7	2.6	-2.3	1.3659
	1995	-3.9	-5.3	4.4	-0.8	1.3726
	1996	-2.0	-2.8	5.1	0.5	1.3636
	1997	0.7	0.2	2.9	-1.3	1.3844
	1998	0.8	0.1	2.6	-1.2	1.4831
	1999	0.9	1.6	4.3	0.3	1.4858
	2000	1.9	2.9	6.2	2.7	1.4852
	2001	1.1	0.7	6.4	2.3	1.5484
	2002	0.8	-0.1	5.0	1.7	1.5704
	2003	-	-0.4	4.6	1.2	1.4015
	2004	0.4	0.5	5.1	2.1	1.3015
	2005	0.1	1.4	4.7	2.3	1.2116
Annual rates	2002 II	0.8	-0.1	4.8	1.8	1.5549
	III	0.8	-0.2	4.8	1.4	1.5628
	IV	1.1	0.4	4.7	1.1	1.5698
	2003 I	0.3	-0.1	5.2	1.1	1.5102
	II	-1.0	-0.8	3.8	0.3	1.3984
	III	0.2	-0.5	4.9	1.5	1.3799
	IV	0.4	-	4.7	1.7	1.3160
	2004 I	0.1	-	5.3	2.3	1.3179
	II	-	0.3	5.9	2.6	1.3592
	III	0.8	0.8	5.0	2.2	1.3072
	IV	0.9	1.0	4.1	1.5	1.2203
	2005 I	-1.4	0.9	3.9	1.4	1.2267
	II	0.5	1.2	4.1	1.7	1.2439
	III	0.2	1.4	5.1	2.3	1.2012
	IV	1.2	2.0	5.8	3.7	1.1733
	2006 I	1.2	1.4	4.9	3.0	1.1547
	II					1.1213
Last three months						1.1213
Monthly rates	2005 J					1.2402
	J					1.2227
	A					1.2040
	S					1.1776
	O					1.1776
	N					1.1811
	D					1.1610
	2006 J					1.1573
	F					1.1489
	M					1.1574
	A					1.1438
	M					1.1095
	J					1.1138

Notes to the Tables

Symbols used in the tables

R Revised

– Value is zero or rounded to zero.

Note:

Blank spaces in columns indicate that data are either not available or not applicable.

A horizontal rule in the body of the table indicates either a break in the series or that the earlier figures are available only at a more aggregated level.

A1

(1) In February 1991, the federal government and the Bank of Canada jointly announced a series of targets for reducing inflation to the midpoint of a range of 1 to 3 per cent by the end of 1995. In December 1993, this target range was extended to the end of 1998. In February 1998, it was extended again to the end of 2001. In May 2001, it was extended to the end of 2006.

(2-3) Year-to-year percentage change in consumer price index (Table H8). The core CPI is the CPI excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the other CPI components

(4–5) The *operating band* is the Bank of Canada's 50-basis-point target range for the average overnight rate paid by investment dealers to finance their money market inventory.

(6) The *overnight money market financing rate* is an estimate compiled by the Bank of Canada. This measure includes overnight funding of the major money market dealers through general collateral buyback arrangements (repo) including special purchase and resale agreements with the Bank of Canada. Prior to 1996, data exclude all repo activity with the exception of those arranged directly with the Bank of Canada. These latter have been included in the calculation since 1995.

(7) The *monetary conditions index* is a weighted sum of the changes in the 90-day commercial paper rate and the C–6 trade-weighted exchange rate (see technical note in the Winter 1998–1999 issue of the *Bank of Canada Review*, pages 125 and 126). The index is calculated as the change in the interest rate plus one-third of the percentage change in the exchange rate. The Bank does not try to maintain a precise MCI level in the short run. See *Monetary Policy Report*, May 1995, p.14.

(8) *90-day commercial paper rate*. The rate shown is the Bank of Canada's estimate of operative market trading levels on the date indicated for major borrowers' paper.

(9) The C–6 exchange rate is an index of the weighted-average foreign exchange value of the Canadian dollar against major foreign currencies. (See technical note in the Winter 1998–1999 issue of the *Bank of Canada Review*, pages 125 and 126.) Weights for each country are derived from Canadian merchandise trade flows with other countries over the three years from 1994 through 1996. The index has been based to 1992 (i.e., C–6 = 100 in 1992). The C–6 index broadens the coverage of the old G–10 index to include all the countries in the EMU.

(10) Gross M1: Currency outside banks plus personal chequing accounts plus current accounts plus adjustments to M1 described in the notes to Table E1 *(Bank of Canada Banking and Financial Statistics)*.

(11) M1++: M1+ plus non-chequable notice deposits held at chartered banks plus all non-chequable deposits at trust and mortgage loan companies, credit unions, and caisses populaires less interbank non-chequable notice deposits plus continuity adjustments.

(12) M2++: M2+ plus Canada Savings Bonds and other retail instruments plus cumulative net contributions to mutual funds other than Canadian-dollar money market mutual funds (which are already included in M2+).

(13) Yield spreads between *conventional* and *Real Return Bonds* are based on actual mid-market closing yields of the selected long-term bond issue. At times, some of the change in the yield that occurs over a reporting period may reflect switching to a more current issue. Yields for *Real Return Bonds* are mid-market closing yields for the last Wednesday of the month and are for the 4.00% bond maturing 1 December 2031. Prior to 24 September 2001, the benchmark bond was 4.25% maturing 1 December 2026. Prior to 7 December 1995, the benchmark bond was 4.25% maturing 1 December 2021.

(14–15) CPI excluding food, energy, and the effect of changes in indirect taxes. CPIW adjusts each of the CPI basket weights by a factor that is inversely proportional to the component's variability. For more details, see "Statistical measures of the trend rate of inflation." *Bank of Canada Review,* Autumn 1997, 29–47

(16) *Unit labour costs* are defined as aggregate labour income per unit of output (real GDP at basic prices).

(17) IPPI: Industrial product price index for finished products comprises the prices of finished goods that are most commonly used for immediate consumption or for capital investment.

(18) Data for average hourly earnings of permanent workers are from Statistics Canada's *Labour Force Information* (Catalogue 71-001).

A2

The majority of data in this table are based on, or derived from, series published in statistical tables in the *Bank of Canada Banking and Financial Statistics.* For each column in Table A2, a more detailed description is given below, as well as the source table in the *Banking and Financial Statistics,* where relevant.

(1) Gross M1: Currency outside banks plus personal chequing accounts plus current accounts plus adjustments to M1 described in the notes to Table E1.

(2) M1+: Gross M1 plus chequable notice deposits held at chartered banks plus all chequable deposits at trust and mortgage loan companies, credit unions, and caisses populaires (excluding deposits of these institutions) plus continuity adjustments.

(3) M1++: M1+ plus non-chequable notice deposits held at chartered banks plus all non-chequable despoits at trust and mortgage loan companies, credit unions, and caisses populaires less interbank non-chequable notice deposits plus continuity adjustments.

(4) M2+: M2 plus deposits at trust and mortgage loan companies and government savings institutions, deposits and shares at credit unions and caisses populaires, and life insurance company individual annuities and money market mutual funds plus adjustments to M2+ described in notes to Table E1.

(5) M2++: M2+ plus Canada Savings Bonds and other retail instruments plus cumulative net contributions to mutual funds other than Canadian-dollar money market mutual funds (which are already included in M2+).

(6) Short-term business credit (Table E2)

(7) Total business credit (Table E2)

(8) Consumer credit (Table E2)

(9) Residential mortgage credit (Table E2)

(10) Gross domestic product in current prices (Table H1)

(11) Gross domestic product in chained 1997 dollars (Table H2)

(12) Gross domestic product by industry (Table H4)

(13) Civilian employment as per labour force survey (Table H5)

(14) Unemployment as a percentage of the labour force (Table H5)

(15-16) Data for capacity utilization rates are obtained from the Statistics Canada quarterly publication *Industrial Capacity Utilization Rates in Canada* (Catalogue 31-003), which provides an overview of the methodology. *Non-farm goods-producing industries* include logging and forestry; mines, quarries and oil wells; manufacturing; electric power and gas utilities; and construction.

(17) Consumer price index (Table H8)

(18) Consumer price index excluding the eight most volatile components: fruit, vegetables, gasoline, fuel oil, natural gas, intercity transportation, tobacco, and mortgage-interest costs, as well as the effect of changes in indirect taxes on the other CPI components. (Table H8)

(19) Gross domestic product chain price index (Table H3)

(20) Unit labour costs are defined as aggregate labour income per unit of output (real GDP at basic prices).

(21–22) The data on wage settlements are published by Human Resources and Skills Development Canada and represent the effective annual increase in base wage rates for newly negotiated settlements. These data cover bargaining units with 500 or more employees. Contracts both with and without cost-of-living-allowance clauses are included.

(23–24) Bank of Canada commodity price indexes: Total and total excluding energy (Table H9)

(25) *Treasury bills* are mid-market rates for typical quotes on the Wednesday shown.

(26–27) *Selected Government of Canada benchmark bond yields* are based on actual mid-market closing yields of selected Canada bond issues that mature approximately in the indicated term areas. At times, some of the change in the yield occurring over a reporting period may reflect a switch to a more current issue. Yields for *Real Return Bonds* are mid-market closing yields for the last Wednesday of the month and are for the 4.00% bond maturing 1 December 2031. Prior to 24 September 2001, the benchmark bond was 4.25% maturing 1 December 2026. Prior to 7 December 1995, the benchmark bond was 4.25% maturing 1 December 2021.

(28-29) The data on the government surplus or deficit on a national accounts basis are taken from Statistics Canada's *National Income and Expenditure Accounts* (Catalogue 13-001), where the government surplus or deficit is referred to as "net lending."

(30) Merchandise trade balance, balance of payments basis (Table J1)

(31) Current account balance, balance of payments basis (Table J1)

(32) U.S. dollar in Canadian dollars, average noon spot rate (Table I1)