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**The Bank of Canada's Monetary Policy Framework:  
Have Recent Changes Enhanced Central Bank Credibility?**

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**Abstract**

In recent years the Bank of Canada has made important changes in the way it conducts monetary policy. In particular, the bank has adopted explicit inflation targets and introduced significant changes to its operational framework designed to increase transparency and reduce market uncertainty. This paper examines the key issues associated with the recent changes in the Bank of Canada's monetary policy framework and analyzes various indicators of central bank credibility.

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## SUMMARY

Recently, the Bank of Canada has made some important changes in the way it implements monetary policy. In February 1991 the government and the Bank of Canada introduced explicit targets for CPI inflation, specifically, a range of 1 percent to 3 percent by the end of 1995. In December 1993 it was announced that this target range would be extended through the end of 1998. The Bank of Canada has also aimed at increasing transparency and reducing market uncertainty in its day-to-day operations. Since June 1994, the operational objective of monetary policy has been to keep the overnight interest rate within a 50-basis point range. This change shifted the focus away from the three-month treasury bill rate toward the overnight interest rate as the bank's short-term operational objective. In February 1996, the bank announced that the Bank Rate would be set at the upper limit of the operating band for the overnight rate.

This paper examines the way in which the Bank of Canada conducts monetary policy, discusses the main issues associated with setting inflation targets, and looks at the transmission of monetary policy through intermediate targets and indicators. Because of the importance of credibility in the conduct of monetary policy, several indicators of central bank credibility are explored. They suggest that the credibility of low inflation in the near future has now been established.

## I. Introduction

In recent years, there have been important changes in the way in which the Bank of Canada conducts monetary policy. In particular, the Bank adopted explicit inflation targets and introduced important changes to its operational framework. This paper reviews some of the key issues associated with the recent changes in the Bank of Canada's monetary policy framework and analyzes various indicators of central bank credibility.

The Government and the Bank of Canada in February 1991 announced targets for inflation, aiming at reducing CPI inflation to a range of 1 to 3 percent by the end of 1995, and since then the Bank has conducted monetary policy so as to achieve this target. Inflation was brought within the target range earlier than expected, and it was announced in December 1993 that the 1 to 3 percent target range would be extended through the end of 1998.

Recently, the Bank of Canada also has made some important changes to the way in which it implements monetary policy. Since June 1994, the operational objective of monetary policy is to keep the overnight interest rate within a 50-basis point range. This change shifted the focus away from the three-month treasury bill rate toward the overnight interest rate as the Bank's short-term operational objective. In February 1996, the Bank of Canada announced that the Bank Rate would be set at the upper limit of the operating band for the overnight rate.<sup>1</sup> Previously, the Bank Rate was set 25 basis points above the tender average for the three-month treasury bill rate. The main objective of these changes was to reduce the degree of uncertainty regarding policy objectives and to increase the transparency with which the Bank of Canada conducts monetary policy (see Noël (1995)).

This paper is organized as follows. Section II discusses the main issues associated with setting inflation targets. Particularly important in this regard is the monetary authorities' forecast of inflation and the policy reaction to inflationary "surprises" or shocks. Section III discusses the transmission mechanism of monetary policy and the role of the Monetary Conditions Index as an operational target. Section IV discusses the Bank of Canada's day-to-day implementation of monetary policy and the operational changes that have been recently introduced. Section V examines several indicators of central bank credibility. The various indicators suggest that the credibility of low inflation in the near future has now been established, while longer-term credibility appears to have not yet been firmly established. Section VI concludes.

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<sup>1</sup>The Bank Rate is the interest rate used by the Bank of Canada for advances to direct clearers (the major financial institutions that maintain accounts at the Bank for clearing and settlement purposes), and for purchase and resale transactions with a designated group of investment dealers and banks (known as "jobbers").

## II. Inflation Targets

Similarly to other central banks that have announced explicit inflation targets, the Bank of Canada's decision-making process involves several basic steps: (1) a forecast of the rate of inflation one to two years into the future; (2) a view on the transmission mechanism between changes in policy instruments and the rate of inflation; and (3) an operational framework through which to implement monetary policy, and a mechanism to communicate the rationale for the policy actions.

The inflation forecast is the crucial starting point for the analysis of what is required to keep inflation within its target band over the policy horizon. Several models have been used at the Bank of Canada to forecast major macroeconomic variables (including inflation).<sup>2</sup> The framework currently used in the preparation of the Bank staff's quarterly economic projection is the new Quarterly Projection Model (QPM).<sup>3</sup> In contrast with most of the past models used at the Bank of Canada, QPM is *calibrated* to reflect the empirical evidence, rather than being directly estimated through econometric methods.<sup>4</sup>

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<sup>2</sup>The various alternative models used at the Bank of Canada are reviewed in Coletti, Hunt, Rose, and Tetlow (1996). Some of the published research at the Bank of Canada includes Duguay (1994) where a simple Phillips curve, based on the assumption that expectations are formed adaptively, is estimated for Canada for the period 1968Q4-1990Q4.

<sup>3</sup>QPM can be viewed as a "system" formed by two formal models: one of the steady state or long-run equilibrium and a set of dynamic relationships that provide paths linking starting conditions to the solutions implied by the steady state. The steady state QPM model is reviewed in Black, Laxton, Rose, and Tetlow (1994), while the dynamic properties of QPM are discussed in Coletti, Hunt, Rose, and Tetlow (1996). Some of the structural relationships in QPM are supported by satellite models which have more detailed analysis than the highly aggregated level in QPM.

<sup>4</sup>The traditional methods of estimating a model's parameters through econometric techniques (e.g., ordinary least squares, instrumental variables, etc.) rely on standard measures of statistical inference (including, for example, the parameters' signal-to-noise ratio or t-statistics). When a model is calibrated, certain parameter values are imposed while "fitting" the data. Many of the parameters used in QPM are derived from other empirical studies which are based on traditional econometric techniques. One of the main advantages of calibration is that some of the major difficulties in estimating a large macroeconomic model through traditional econometric methods (including, for example, high simultaneity of the system and the fact that some relevant data may not be directly observable) can be avoided. The principal disadvantage of calibration, however, is that there is no formal metric for rejecting null hypotheses embedded in the model and there is no standard metric to measure "goodness of fit." (For a review of the key issues in calibration, see, for example, Kydland and Prescott

(continued...)

In QPM, current inflation is determined by inflation expectations (modeled as a mixture of backward- and forward-looking components), the relative deviation of output from its potential level, and a term which captures an asymmetry in price movements related to whether there is excess demand or excess supply in the economy. In particular, excess demand is assumed to be more inflationary than excess supply is assumed to be deflationary.<sup>5</sup> In contrast to more standard linear specifications of the Phillips curve, the asymmetry in the output gap has important implications in that the effects of a shock will depend in part on whether there is excess demand or excess supply in the economy when the shock occurs.

QPM also includes a monetary policy reaction function which roughly mimics the Bank of Canada's policy practice.<sup>6</sup> In particular, the central bank reacts today to predicted deviations of inflation from the target six to eight quarters ahead.<sup>7</sup> Any forces that create an expected inflation gap will be countered by an increase in short-term interest rates. The central bank acts to influence nominal short-term interest rates, aiming to set a path for the slope of the yield curve that will eventually achieve its objective for inflation. Formally, the link between the yield curve and real economic activity in the model arises because consumption and investment spending are specified as being influenced by the yield spread. Long-term interest rates reflect world interest rates and a specified risk premium.

Simulations based on QPM have been found useful in analyzing the effects of a variety of shocks and the impact of various assumptions regarding central bank credibility.<sup>8</sup> The

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<sup>4</sup>(...continued)  
(1996); and Hansen and Heckman (1996)).

<sup>5</sup> Laxton, Rose, and Tetlow (1993) find evidence of such asymmetry in Canada.

<sup>6</sup>Specifically, the monetary reaction function in QPM takes the form:

$$R_t^S - R_t^L = \delta(R_{t-1}^S - R_{t-1}^L) + \theta \left[ \sum_{i=6}^7 (\pi_{t+i}^e - \pi_{t+i}^T) \right]$$

where  $R^S$  is the three-month commercial paper rate,  $R^L$  is the ten-year Government of Canada bond rate,  $\pi^e$  is the rate of inflation expected by the monetary authorities, and  $\pi^T$  is the target rate of inflation. The role of the lagged value of the (inverted) yield spread,  $R^S - R^L$ , is to smooth the reaction of short-term interest rates to shocks. Coletti, Hunt, Rose, and Tetlow (1996) note that this term can be viewed as reflecting constraints facing the central bank in how fast it can move in responding to shocks and the uncertainty that it faces in interpreting what is happening to the economy.

<sup>7</sup>In QPM, the actual achievement of the inflation target would take longer (8 to 12 quarters, for most shocks).

<sup>8</sup>Coletti, Hunt, Rose, and Tetlow (1996) provide examples of quantitative results (relative to control) of various types of shocks in the model's simulations.

effects of various shocks, as discussed below, will largely depend on whether, and to what extent, monetary policy is credible.

A simple Phillips-curve framework can be used to examine the role of central bank credibility:<sup>9</sup>

$$\pi = \pi^e + b (y - y^*)$$

where $\pi^e = \pi^T$	if full credibility
$\pi^e = a(L) \pi$	if no credibility
$\pi^e = \lambda \pi^T + (1-\lambda) \{a(L) \pi\}$	if less than full credibility

Actual, expected, and target inflation are denoted by  $\pi$ ,  $\pi^e$  and  $\pi^T$ , respectively, while  $a(L)$  is a polynomial lag function indicating that expected inflation is tied to current and past rates of inflation. The logarithms of output and capacity output are denoted by  $y$  and  $y^*$ , respectively. Partial credibility would be characterized by expected inflation being linked to a combination of target inflation and past rates of inflation.

Because of the lags between the policy action and the rate of inflation, the response of the monetary authorities to shocks to the economy depends on the assessment of the effects of such shocks on the projected rate of inflation. Specifically, the assessment of whether a policy response is necessary requires a judgement on whether the shock comes from the demand side or the supply side, and whether it is likely to be persistent or temporary. It is the effect of shocks on the forecast of inflation relative to the target for inflation that is the crucial determinant of the need for policy action. The policy response to a shock would also depend in part on the degree of credibility of the monetary authorities. This is particularly the case when there is some uncertainty about the nature or the duration of the shock, since the credibility of the central bank will determine the authorities' ability to delay reaction to the shock until more information becomes available.

If a *demand shock* is expected to be temporary, its effect on forecast inflation will depend on how the expected rate of inflation would react to the change in the current rate of inflation that occurs in response to the shock. If the central bank is credible, expected inflation is anchored to the target inflation rate, rather than past rates of inflation or new information on shocks affecting the economy. If the monetary authorities lack credibility, expected inflation will respond to movements in actual inflation and, consequently, even a *temporary* change in aggregate demand pressures would lead to a change in forecast inflation. To bring the forecast rate of inflation back to the target in such circumstances would require a change

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<sup>9</sup>The response of the Bank of Canada to various types of shocks, highlighting the role of central bank credibility, is discussed in Freedman (1996). The remainder of this section roughly follows Freedman's arguments.

in monetary policy. If a demand shock is viewed by the central bank as *persistent*, it will lead to a change in forecast inflation and will require a change in monetary policy.

In the case of *supply* shocks, the greater the credibility of the authorities, the more likely it would be that a one-time price level effect derived from a supply shock would not feed into inflation expectations. The Bank of Canada has made it clear that, while it will not act to reverse the first round of price level effects of a supply shock (for example, an indirect tax change), it will react to any effect on the ongoing rate of inflation (see, for example, Freedman (1996)).

### III. The MCI as an Operational Target

The transmission mechanism can be understood as the channel through which monetary policy influences the economy; that is, the connection between the instrument(s) that the central bank controls directly and the ultimate policy objective. Because of the long lags and indirect connections between the instrument(s) and the ultimate goal of monetary policy, central banks have found it helpful to make use of intermediate targets or indicators. In recent years, the Bank of Canada moved away from the use of monetary aggregates as intermediate targets because financial market liberalization, deregulation, and innovations had led to changes in the financial structure that weakened the link between monetary aggregates and the ultimate target variable. In addition, the Bank of Canada viewed monetary targeting as impractical because large changes in interest rates were required to effect changes to the monetary aggregates. After using the narrow monetary aggregate M1 as its intermediate target variable during the period 1975-1982, the Bank of Canada has conducted policy without an intermediate target since then. It also has shifted its operational target for monetary policy actions from the short-term interest rate to a monetary condition's index (MCI), which includes short-term interest rates and the exchange rate.<sup>10</sup> The Bank of Canada also makes considerable use of a broad range of economic and financial indicators (including monetary and credit aggregates and collective wage settlements) to aid in its analysis of current and anticipated economic developments. In particular, real M1 has proven to be a

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<sup>10</sup>Eika, Ericsson, and Nymoen (1996) provide a critical assessment of the use of monetary conditions indices by several central banks. They argue that the value of a monetary conditions index for conducting economic policy is doubtful because it relies on strong assumptions, which have not been thoroughly investigated, about parameter consistency, omitted variables, cointegration, dynamics, and exogeneity. While some of those technical arguments may be valid if the MCI were to be viewed as a long-run fundamental economic relationship, the usefulness of a MCI as a "short-hand," short-term indicator of the stance of monetary policy (as it is used by the Bank of Canada) is not necessarily diminished even if it incorporates certain strong assumptions. In addition, in order to account for these potential problems, the desired path of the MCI is recalibrated with every quarterly update of the Bank of Canada staff's projection.



useful indicator of output growth one to two quarters ahead, while broader monetary aggregates (such as M2 and M2+) are good leading indicators of the near-term rate of inflation.

The Bank of Canada sets a target for the rate of inflation, and given the anticipated inflationary pressures, policy actions are taken to achieve this target. Correspondingly, the Bank sets a provisional path for the monetary condition's index (MCI) that would be consistent with the achievement of the targeted outcome for inflation. The rationale for adopting the MCI as the operational target is that, given the openness of the Canadian economy, aggregate demand and inflation are influenced by changes in both interest rates and the exchange rate.

The role of the MCI as a way of capturing the effects of both short-term interest rates and the exchange rate in the transmission mechanism of monetary policy can be illustrated by the following example. Consider an expansionary demand shock resulting in a deviation of forecast inflation from the inflation target, which may lead to the authorities' decision to tighten monetary conditions. Typically, a tightening of monetary conditions would lead to both a rise in short-term interest rates and an appreciation of the domestic currency. The extent to which interest rates and the exchange rate would change depends on the sensitivity of the exchange rate to movements in relative interest rates. Although both a rise in interest rates and an appreciation of the exchange rate would have similar overall effects on *aggregate* demand, the former would affect predominantly the interest sensitive components of domestic demand, while the latter would affect mainly tradables.

The MCI is constructed as a combination of the short-term interest rate and the exchange rate relative to the values of these variables in a base period. It measures the degree of ease or tightening in monetary conditions from this arbitrary date, and no meaning is attached to the *level* of the MCI. The MCI can be calculated in real terms or nominal terms. While the real MCI has the most direct connection with macroeconomic variables, in practice the Bank of Canada focuses more on the nominal MCI because of the lags in the availability of the price data from Canada's main trading partners that are used in calculating real effective exchange rates. The nominal MCI tends to behave similarly to the real MCI for the relatively short horizon over which the MCI is considered to be most useful, in large part at the moment because of the relatively low level of inflation in Canada and its major trading partners.

The real MCI is measured as a weighted sum of the change (in percentage points) in the short-term real interest rate (based on the three-month commercial paper rate less a measure of the expected rate of inflation over the three months) and the percentage change in the real effective exchange rate against G-10 countries relative to the base period.<sup>11</sup> The relative weights on the components of the MCI are based on a number of empirical studies

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<sup>11</sup>The weight of the U.S. dollar in the effective exchange rate is about 0.82.

that estimate the effect on real aggregate demand over six to eight quarters of changes in real interest rates and the real effective exchange rate. Current estimates place the ratio of those effects at around 1:3 (i.e., over time, a 1 percentage point change in the real interest rate has about the same effect on aggregate demand as a 3 percent change in the real effective exchange rate).

#### **IV. The Operational Implementation of Monetary Policy**

Since June 1994, the Bank of Canada's operational tactics focus on achieving an average level for the overnight interest rate within a 50-basis point target range. The Bank changes its operating range for the overnight rate when it wishes to (or signals a desire to) increase or decrease the level of the MCI, or to rebalance monetary conditions following a significant movement in the exchange rate. Also, the Bank may increase its operating range to stabilize financial markets following unanticipated events, or it may simply ratify movements that have already occurred in the market.<sup>12</sup>

Through its influence on the overnight rate, the Bank aims to affect other money market rates and, through expectations, longer term rates and the exchange rate. In addition, movements in the overnight rate affect other money market rates because financial institutions typically carry large inventories of money market securities financed by overnight loans. Changes in the cost-of-carry (the spread between the overnight rate and other short-term interest rates) lead to changes in the profitability of these money market positions and, hence, affect the willingness of market participants to carry these inventories. This would lead in turn to changes in the money market rates.

The relationship between movements in the overnight interest rate and movements in the MCI is examined empirically in Barker (1996). He finds that, following the introduction of the Bank of Canada's new operational framework in mid-1994, the major impact of the Bank's operations seems to come from periodic movements in the operating band for the overnight rate rather than from daily fluctuations in the overnight rate. Moreover, the effects on the MCI mostly correspond to changes in the three-month commercial paper rate rather than on the exchange rate.

While the Bank of Canada can influence the overnight rate in a number of ways, the management of settlement balances is the principal mechanism used by the Bank to achieve

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<sup>12</sup>The time of the day when a change in the overnight rate occurs can reflect the motivation for the shift. Noël (1995) notes that, generally, changes in the band to reflect economic fundamentals or to rebalance monetary conditions occur at around 9 a.m. Changes in the overnight rate to help stabilize markets can take place at any time during the day.

the desired level of the overnight rate.<sup>13</sup> The Bank is able to exert control over the supply of cash balances by virtue of the fact that the final settlement of all transactions occurs in the direct clearers' accounts on the books of the Bank of Canada, and that the Bank can alter the level of balances by the transfer of deposits between the Government's accounts at the Bank of Canada and those at the directly clearing financial institutions.<sup>14</sup> This transfer is used to neutralize the effect of public sector flows (e.g. government receipts and disbursements) on the financial system as well as to alter the overall supply of settlement balances in order to influence overnight interest rates. The Bank of Canada's operating framework is designed to influence direct clearers to adjust their level of settlement balances on the basis of relative costs. Advances in the form of overdraft loans are charged interest at the Bank Rate and deposits at the Bank of Canada earn no interest. In addition, direct clearers must maintain an average settlement balance of at least zero at the Bank of Canada over a calculation period, or otherwise pay a penalty of Bank Rate on any cumulative deficit. Setting the level of balances above or below the demanded level would exert downward or upward pressure on overnight rates.

The Bank of Canada can also influence the overnight rate in several other ways. In particular, when the management of settlement balances alone is insufficient to achieve the desired effect on overnight interest rates, the Bank may supplement its actions through buy-back open market techniques. Open market buyback transactions are typically used to indicate and enforce the upper and lower limits of the Bank of Canada trading range for the overnight rate. Through buyback operations, the Bank can keep most overnight market trading during the day within the target band. Thus, when the overnight rate moves above the ceiling of the band in a persistent manner, the Bank may intervene to add temporary liquidity to the system through Special Purchase and Resale Agreements (SPRAs). Through SPRAs, the Bank of Canada offers to purchase short-term government securities from "jobbers", with an agreement to resell them at a specified price determined by the Bank on the next business day.<sup>15</sup> Conversely, when it appears that the overnight rate will fall below the floor of the

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<sup>13</sup>The operational framework at the Bank of Canada has been addressed, inter alia, in Noël (1995), Montador (1995), Clinton (1991), Clinton and Fetting (1989), Howard (1996), Stenger (1994), Farahmand (1995), and Zelmer (1995). Specific procedural details are provided in these sources.

<sup>14</sup>The directly clearing members of the Canadian Payments Association (CPA) maintain accounts with the Bank of Canada in order to settle transactions among themselves.

<sup>15</sup> These transactions are also called "specials" to differentiate them from regular Purchase and Repurchase Agreements (PRAs) which are a form of financing available up to a predetermined limit to dealer jobbers at the Bank Rate, on the initiative of the dealer. PRAs assist dealer jobbers in their overnight financing positions in government securities. However, this facility does not constitute an open market operation since the use of this facility is at the discretion

(continued...)

Bank's target band, the Bank may engage in Sale and Repurchase Agreements (SRAs), which constitute the opposite transaction to SPRAs and, hence, temporarily absorb liquidity from the overnight market.<sup>16</sup>

On occasion, the Bank also may make outright purchases or sales of treasury bills to pace the movements in money market rates. Because the interest rate used in the monetary condition's index is a three-month interest rate, the Bank of Canada remains sensitive to movements in money market rates, and hence, it may have a view about the pace of the movement in the three-month interest rates, even if it does not feel it is necessary to move its overnight range.

## **V. Central Bank Credibility**

A first look at Canada's inflation record since the announcement of inflation targets in 1991 seems to indicate that the Bank of Canada has gained credibility quite rapidly, as the inflation rate came down relatively fast (Chart 1). The CPI inflation rate, which was close to 7 percent at the beginning of the 1990s, came down to 1 percent by mid-1992. However, a careful examination of the data suggests that it took a relatively long time for inflation expectations to decline and that considerable costs, in terms of foregone output and employment, were incurred to bring down inflation.

The sharp decline in the inflation rate since 1991 and the relatively stable, low inflation rate since then reflects several factors. First, the inflation rate appears to have come down as a delayed reaction to the economic recession in 1990-91. Second, fiscal policy in Canada has been tightened markedly in recent years, reducing the likelihood of future inflation. However, it might have taken time for the markets to become convinced of the Government's commitment to reducing the fiscal deficit. Third, the substantial improvements in the current account balance that has also taken place in recent years probably made market participants believe that a further depreciation of the currency was unlikely, contributing to lower inflation expectations. Lastly, the achievement of the inflation target and maintenance of the inflation rate within the target range also is likely to have contributed to a lowering of inflation expectations.

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<sup>15</sup>(...continued)  
of the dealer.

<sup>16</sup> Given that the Bank targets a daily average of the overnight rate, some trades in the overnight market may occur outside of the trading band without prompting central bank intervention. Factors such as the size and concentration of liquidity needs in the market, the length of time since the last intervention on that day, and prospects for the overnight rate to return within the band also play a role in the decision of whether or not to intervene.

In order to investigate whether and how quickly central bank credibility has been achieved, different measures have been proposed in the literature.<sup>17</sup> Two of the most recent tests of central bank credibility applied to the Bank of Canada are Amano, Fenton, Tesier, and van Norden (1996) and Johnson (1995). The former groups of researchers at the Bank of Canada find evidence of central bank credibility in Canada based on the market reaction to inflationary surprises. In particular, they find that, for the inflation targeting period beginning in 1991, the reaction of the foreign exchange market to inflation surprises (defined as the release of actual data relative to the expected inflation rate, as per the survey data compiled by Money Market Services International) was consistent with the expectation that the Bank of Canada would raise interest rates (and hence lead to an appreciation of the domestic currency) if inflation turned out to be worse than expected; hence, supporting the view that the Bank of Canada has credibility. Johnson (1995) undertook a formal econometric analysis of the behavior of inflation expectations in Canada based on the Conference Board's survey data and concluded that the announcement of the inflation targets in February 1991, controlling for other factors, had little effect on increasing central bank credibility. He also finds that the announcement of the extended targets in December 1993 and the appointment of a new Governor did not have a significant effect on inflation expectations.

In the remainder of this section, several descriptive indicators of central bank credibility in Canada are examined. In particular, direct surveys on inflation expectations show a gradual decline in the expected inflation rate in Canada. For example, based on the Consensus Forecast, both the six- to ten-year ahead expected inflation rate and the average of the three- and five-year ahead expected inflation rates declined from around 4 percent in mid-1990 to 2 percent by 1995 (Chart 2). In recent years, long-term inflation expectations have been quite stable around 2 percent, while the one-year ahead expectations of inflation have fluctuated between 1 and 3 percent--suggesting that the credibility of the inflation target band is now firmly established.

The yield curve can also provide an indication of central bank credibility. As the inflation target becomes credibly established, the yield curve should be "flattened" (if the starting point is a high inflation period such as in 1990). However, one of the problems in looking at long-term interest rates is that they reflect not only inflation expectations but also a risk premium for certain political events (e.g., a potential Constitutional crisis) or other economic circumstances (e.g., changes in the outlook for public debt). However, as a first approximation the yield curve, and especially Canada's yield curve relative to that in the United States, can be informative. The U.S. yield curve can be used to control for the uncertainty from a possible common global shock. Chart 3 shows that the slope of the yield curve (defined as the ten-year government bond yield minus the three-month treasury bill rate) has been steeper in Canada than the United States since the second half of 1995, reversing the relationship that had prevailed during much of 1994. Although it is difficult to exactly

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<sup>17</sup>A comprehensive survey of these approaches can be found in Amano, Fenton, Tesier, and van Norden (1996).

identify the factors determining the fact that long-term interest rates have been relatively high in Canada, one possible interpretation is that the credibility of low inflation over the long-term has not yet been firmly established. However, other factors may also be at work, including a risk premium for political developments.

Another measure often used to proxy for expected inflation is the trend in the difference between nominal and indexed bonds. In the case of Canada, this approach is limited by the fact that the market for Canadian indexed bonds is relatively thin. With this proviso in mind, an examination of these data suggests a fairly consistent decline in the market's long-term inflation expectations (Chart 4). The differential between the nominal and real bonds declined from above 4 percent at the beginning 1994 to just over 3 percent by mid-1996. However, the decline is modest in magnitude, and the current differential is indeed higher than the ceiling of the inflation target band.

Based on the various descriptive indicators examined, it would seem that the credibility of low inflation in the near future has now been established, as evidenced, for example, by survey data. However, longer-term credibility, although difficult to assess precisely, appears to have not yet been firmly established according to the slope of the yield curve and the real-nominal bond yield spread.

## List of References

- Amano, Robert, Paul Fenton, David Tesier, and Simon van Norden, 1996, "The Credibility of Monetary Policy: A Survey of the Literature with some Simple Applications to Canada," (unpublished; Ottawa: Bank of Canada).
- Bank of Canada, 1995, *Monetary Policy Report* (May).
- , 1996, *Monetary Policy Report* (May).
- Barker, William, 1996, "Daily Bank of Canada Operations and the Monetary Conditions Index," in *Money Markets and Central Bank Operations* (Ottawa: Bank of Canada).
- Black, Richard, Douglas Laxton, David Rose, and Robert Tetlow, 1994, *The Bank of Canada's New Quarterly Projection Model, Part 1, The Steady-State Model: SSQPM*, Technical Report No. 72 (Ottawa: Bank of Canada).
- Clinton, Kevin, 1991, "Bank of Canada Cash Management: The Main Technique for Implementing Monetary Policy," *Bank of Canada Review* (January).
- , and Kevin Fetting, 1989, "Buy-back Techniques in the Conduct of Monetary Policy," *Bank of Canada Review* (July).
- Coletti, Donald, Benjamin Hunt, David Rose and Robert Tetlow, 1996, *The Bank of Canada's New Quarterly Projection Model, Part 3, The Dynamic Model: QPM*, Technical Report No. 75 (Ottawa: Bank of Canada).
- Duguay, Pierre, 1994, "Empirical Evidence on the Strength of the Monetary Transmission Mechanism in Canada: An Aggregate Approach," *Journal of Monetary Economics* (February).
- , and Steve Poloz, 1994, "The Role of Economic Projections in Canadian Monetary Policy Formulation," *Canadian Public Policy-Analyse de Politiques* (June).
- Eika, Kari, Neil Ericsson, and Rgnar Nymoen, 1996, "Hazards in Implementing a Monetary Conditions Index," *International Finance Discussion Papers*, Board of Governors of the Federal Reserve System, No. 568 (October).
- Farahmand, Pascal, 1995, "Bank of Canada Operations and Their Influence on the Overnight Rate," paper presented at the Bank of Canada conference, "Money Markets and Central Bank Operations," November.

- Freedman, Charles, 1994, "The Use of Indicators and of the Monetary Conditions Index in Canada," in *Frameworks for Monetary Stability*, edited by Tomás Baliño and Carlo Cottarelli (Washington: International Monetary Fund).
- , 1995, "The Role of Monetary Conditions and the Monetary Conditions Index in the Conduct of Policy," *Bank of Canada Review* (Autumn).
- , 1996, "What Operating Procedures should be Adopted to Maintain Price Stability?-- Practical Issues," paper presented at the Federal Reserve Bank of Kansas City Symposium, "Achieving Price Stability," Jackson Hole, Wyoming, August 29-31.
- Hansen, Lars Peter and James Heckman, "The Empirical Foundations of Calibration," *Journal of Economic Perspectives*, Volume 10, Number 1 (Winter).
- Howard, Donna, 1996, "A Primer on the Implementation of Monetary Policy" (unpublished; Ottawa: Bank of Canada).
- Johnson, David, 1995, "Expected Inflation in Canada 1988-1995: an Evaluation of Bank of Canada Credibility and the Effect of Inflation Targets" (unpublished; Waterloo: Wilfrid Laurier University).
- Kydland, Finn and Edward Prescott, 1996, "The Computational Experiment: An Econometric Tool," *Journal of Economic Perspectives*, Volume 10, Number 1 (Winter).
- Laxton, Douglas, David Rose, and Robert Tetlow, 1993, "Is the Canadian Phillips Curve Non-linear?" Working Paper 93-7 (Ottawa: Bank of Canada).
- Montador, Bruce, 1995, "The Implementation of Monetary Policy in Canada," *Canadian Public Policy-Analyse de Politiques* (March).
- Noël, Tim, 1995, "Bank of Canada Operations in Financial Markets," in *Bank of Canada Review*, Bank of Canada (Winter).
- Stenger, Kumar, 1994, "Bank of Canada Open Market Operations," (unpublished; Ottawa: Bank of Canada).
- Zelmer, Mark, 1995, "Strategies versus Tactics for Monetary Policy Operations," paper presented at the conference of the Bank of Canada, "Money Markets and Central Bank Operations," November.

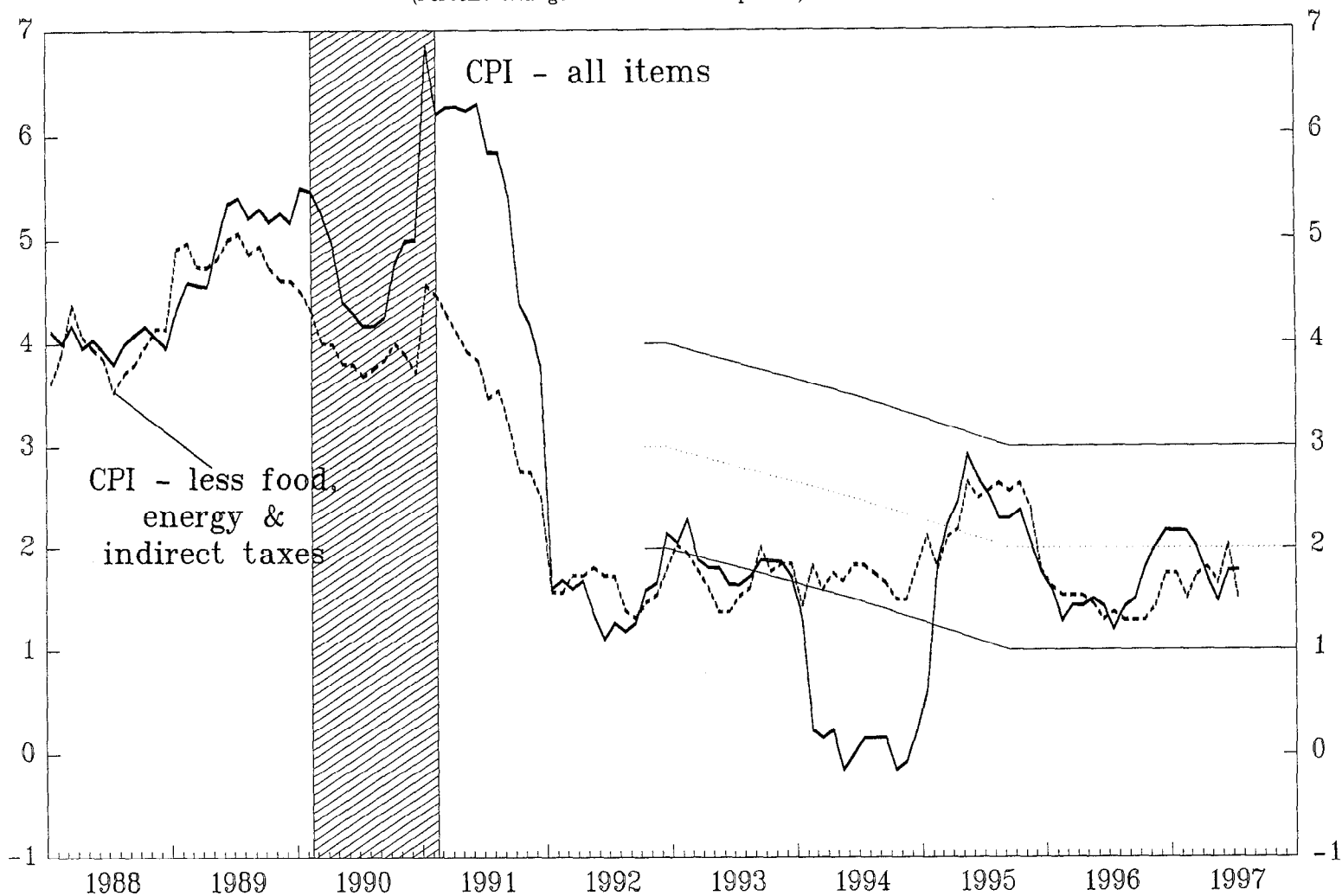


CHART 1

CANADA

# INFLATION TARGETS 1/

(Percent change over 12 month period)



Source: Statistics Canada.

1/ Shaded area indicates recession.

CHART 2

CANADA

# INFLATION EXPECTATIONS AT VARIOUS HORIZONS 1/

(Percent)

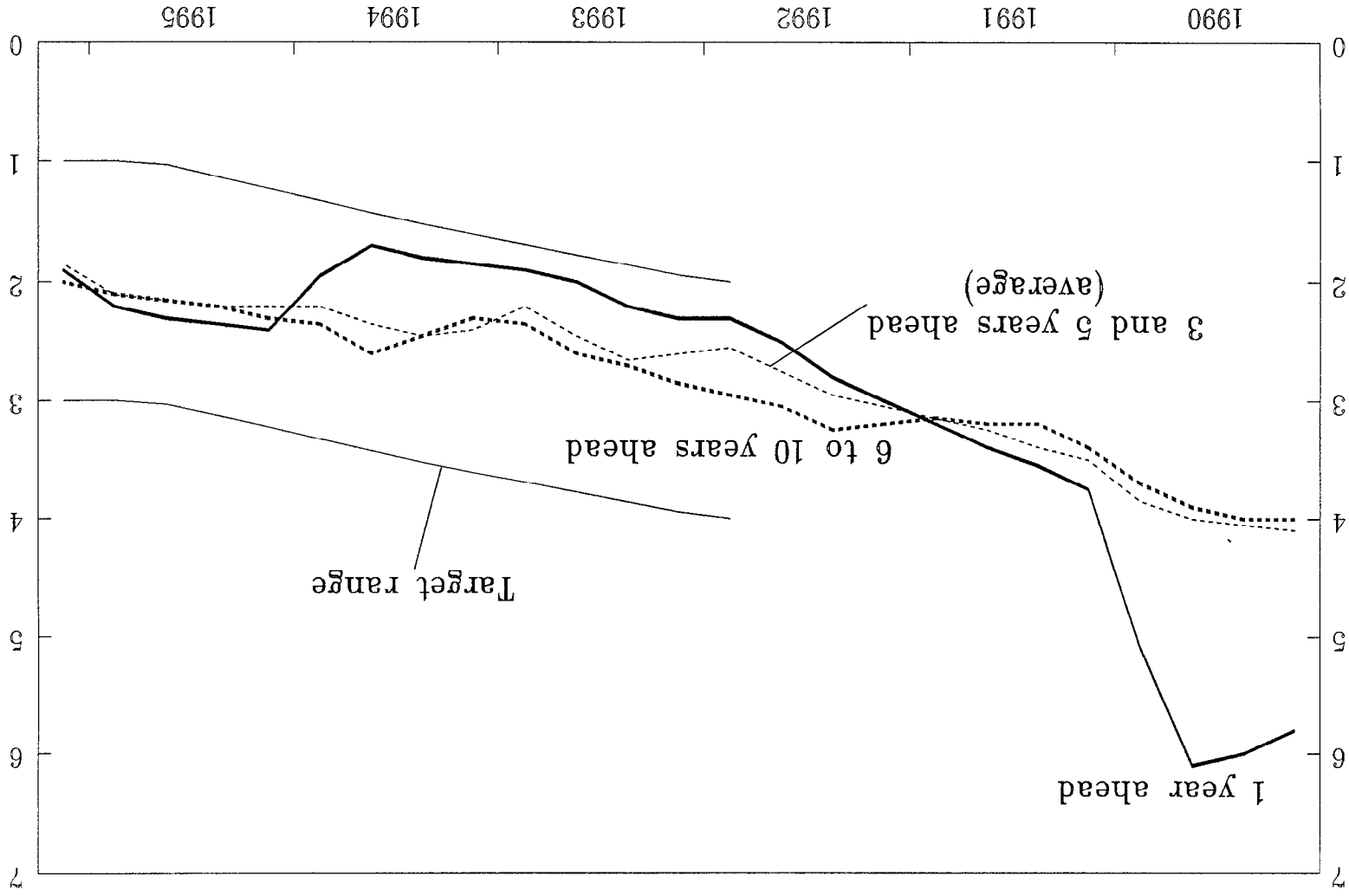
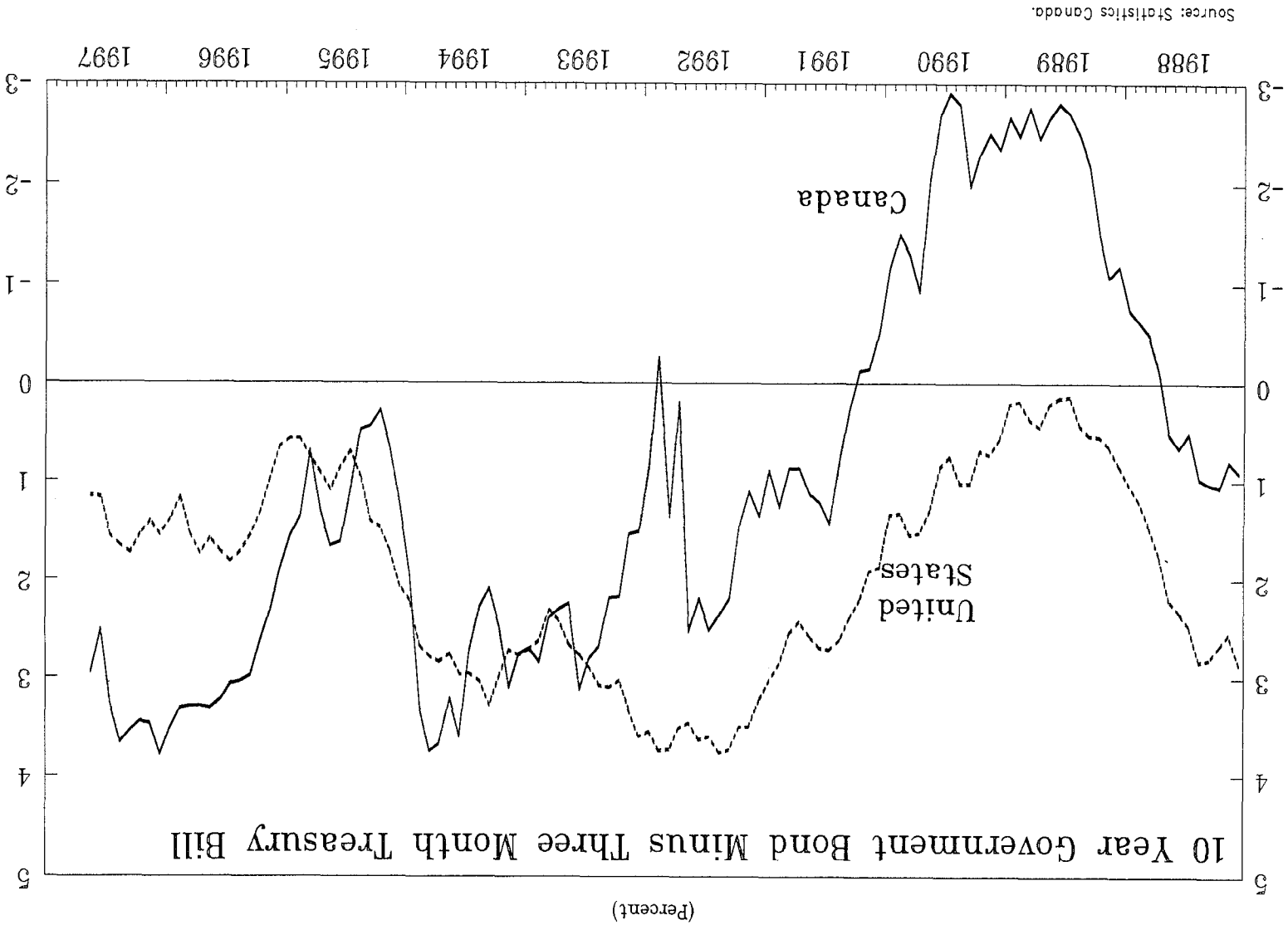


CHART 3

CANADA  
CANADIAN YIELD CURVE VERSUS UNITED STATES YIELD CURVE



REAL RETURN VERSUS NOMINAL GOVERNMENT BOND YIELDS

