

2000 conference

Price Stability and the Long-Run Target for Monetary Policy

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Introduction

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In February 1991, the Bank of Canada and the Government of Canada announced a series of inflation targets that outlined a desired downward path for the 12-month rate of change in the consumer price index (CPI).¹ This target path declined from 3 per cent at the end of 1992 to 2 per cent at the end of 1995. A target range of plus and minus 1 percentage point was set around these midpoints. Thus, by the end of 1995, the target range for inflation reached 1 to 3 per cent.

The target range of 1 to 3 per cent has been extended on two occasions. Most recently, in February 1998, it was extended until the end of 2001. The Bank and the government also made a commitment in 1998 to establish the long-run inflation target consistent with price stability by the end of 2001.

Although an extensive body of literature already existed on price stability issues, it was evident that further research on some key technical questions would provide useful guidance for the upcoming decision on the long-run target. Two of these outstanding issues are the implications of downward nominal-wage rigidity and the relative merits of price-level targeting versus inflation targeting. Another critical question is how to balance the evidence on all the relevant issues in order to develop an overall view on the appropriate long-run target. The June 2000 seminar was organized to further the Bank's knowledge on these three questions. A brief overview of the seminar is given below, followed by summaries of the individual papers that appear later in this volume.

If nominal wage rates are downwardly rigid, low inflation has the potential to affect adjustment in labour markets and even the equilibrium rate of unemployment. The issue of downward nominal rigidity is thus critical to defining the appropriate long-run target for monetary policy. Since different researchers have reached quite different conclusions regarding both the extent of downward nominal-wage rigidity and its impact on employment, there is a need for further work on this question.² The seminar paper by Jean Farès and Thomas Lemieux on downward nominal-wage rigidity and that by Paul Beaudry and Matthew Doyle on the shape of the Phillips curve at low inflation, approach this issue from different perspectives.³ Farès and Lemieux test for the presence of downward rigidity, using wage data to study whether the "wage" Phillips curve became flatter during the low-inflation years of the 1990s. The empirical section of the Beaudry and Doyle paper tests for a change in the slope of the "price" Phillips curve at low inflation and then considers whether downward rigidity or some other factor is the likely cause of any change.

Two of the seminar papers compare a policy regime that targets inflation with one that targets the price level (defined to include a price-level path with a trend growth rate). Dinah Maclean and Hope Pioro use the Bank of Canada's main model for economic projections and policy analysis to examine how incorporating an element of price-level targeting in the conduct of monetary policy would affect the variability of output and inflation. A paper by Richard Barnett and Merwan Engineer surveys the theoretical literature to identify the conditions under which price-level targeting has advantages over inflation targeting.

Two other papers framed the seminar by providing a broader perspective of the relevant issues, including the choice between price-level and inflation targeting and the optimal level for the long-run inflation rate. To begin, Frederic Mishkin drew upon international evidence to address these questions. Canada became the second country to adopt explicit inflation targets in 1991. Since then, a number of other industrialized countries and some emerging economies have followed a similar course. The experiences of these countries can provide valuable lessons to guide the Canadian decision on the long-run target. To conclude the seminar, Michael Parkin considered what kind of targets would lead to a monetary policy that contributes most to the economic welfare of Canadians.

Some important issues in the choice of the long-run target were not included as separate topics on the seminar agenda.⁴ One of these is the implication for monetary policy of the zero lower bound on nominal interest rates. We can learn from the considerable research being done elsewhere on this issue and from previous work done for Canada.⁵

Downward Nominal-Wage Rigidity: A Critical Assessment and Some New Evidence for Canada

Jean Farès (Bank of Canada)

and Thomas Lemieux (University of British Columbia)

One argument in favour of a positive inflation target is based on the premise that nominal-wage rates are downwardly rigid. If nominal wages are rigid and the inflation rate is low, real wages (that is, wages relative to prices) may decline only very slowly following a decrease in the demand for labour. In the simple textbook model, the less real wages adjust, the more employment will decline with the decrease in demand. In contrast, downward nominal-wage rigidity will not constrain the adjustment process if the inflation rate is sufficiently high, since the decrease in real wages can be achieved through the increase in price level. Thus, some observers have suggested that setting the inflation target at too low a level will lead to a permanent increase in unemployment in an economy subject to periodic negative demand shocks. Based on their review of the existing literature, Farès and Lemieux conclude

that there is evidence of downward rigidities at the micro level but that it is less clear that this rigidity has had a significant effect on aggregate wages and employment.

The primary focus of the Farès and Lemieux paper is to provide new evidence on the aggregate effects of downward nominal-wage rigidity in Canada. Since nominal-wage floors are more likely to be a binding constraint at low inflation levels, downward nominal-wage rigidity implies that a given decrease in demand will cause a smaller decrease in real wages in periods of low inflation than in periods of higher inflation. Thus, Farès and Lemieux test whether the "real-wage" Phillips curve—defined as the relationship between the growth in real wages and the unemployment rate—became flatter during the period of low inflation in the 1990s.

Their empirical tests use wage data constructed from Statistics Canada's Survey of Consumer Finances (SCF). This database provides a wide range of information on individuals, including wages, human capital (age, education, etc.), and job characteristics (industry, occupation, job seniority, etc.). The authors note that the raw SCF data probably overstate the true rigidity of aggregate wage growth over the business cycle, since the average skill level of the labour force tends to fall during expansions and rise during recessions.⁶ To correct for this, the authors use regression methods and the information on human capital and job characteristics to adjust the raw data for the effect of changes in the composition and skill mix of the labour force. The adjustment is performed on real-wage data that are obtained by dividing the nominal wage by the CPI. Consistent with their expectations, the authors show that the adjusted series for real wages displays more flexibility over the cycle than the unadjusted series.

Farès and Lemieux estimate their wage equation using aggregated data for adjusted real-wage growth at both the national and provincial levels over the 1982-97 period. They argue that an advantage of using the provincial data is that cross-provincial variations in unemployment rates help to improve the estimates of the slope of the Phillips curve. Both the national and cross-provincial estimates imply that the slope of the real-wage Phillips curve did not change during the sample period. The authors conclude that these findings suggest downward nominal-wage rigidity did not significantly affect aggregate wages and employment during the post-1991 period of low inflation in Canada.

Farès and Lemieux also examine the cyclical movements of wages for different categories of workers. The real wages of older and more senior workers remained relatively constant at all levels of inflation, which they interpret as evidence that nominal-wage floors did not lead to additional real-wage rigidity during the low-inflation years. In addition, since the real wages of young workers and new employees appear to be quite flexible over the cycle, they conclude that downward nominal rigidity does not have a significant effect on those groups. The authors suggest that this disaggregated evidence helps to explain why downward nominal-wage rigidity appears to have had little effect on aggregate real wages.

What Happened to the Phillips Curve in the 1990s in Canada?

Paul Beaudry and Matthew Doyle (University of British Columbia)

In the early 1990s, CPI inflation fell in Canada and then remained near 1.5 per cent, on average, for the rest of the decade. Since, by most estimates, there was persistent excess supply in product markets over this period, a logical question is why did inflation not continue to decline throughout the 1990s. One explanation is that, as the targets gained greater credibility, inflation expectations have been more tightly focused on the midpoint of the target range.⁷ Another factor may be that a given amount of excess supply had less effect on inflation in the 1990s than would have been expected by historical standards. In more technical terms, the latter hypothesis implies that the slope of the "price" Phillips curve—defined in terms of the relationship between inflation and the output gap—has fallen in recent years. Some observers have argued that such a change in slope is evidence of downward nominal-wage rigidity. It is thus important to understand the recent behaviour of the Phillips curve in Canada and to identify the reasons for any changes that may have occurred during periods of low inflation.

Beaudry and Doyle test for a change in the slope of the Phillips curve using data for Canada and the United States from the 1961-99 period. Their empirical results suggest that, in both countries, the slope fell after peaking in the early 1980s. There was a particularly sharp reduction in the estimated slope of the Canadian Phillips curve in the 1990s. Whereas a traditional interpretation would link this decrease to wage- and price-setting institutions, they argue instead that it reflects changes in the behaviour of the monetary authorities.

To support this explanation, Beaudry and Doyle develop a theoretical model that describes the behaviour of the monetary authority under conditions of imperfect information about productivity (supply) shocks. In their model, inflation deviates from its target only to the extent that the central bank's estimate of the productivity shock in the previous period was incorrect. As a result, the model generates a Phillips curve that becomes flatter as the central bank becomes more aware of productivity shocks and makes fewer errors. Thus, the authors conclude that the empirical finding of a decrease in the slope may have occurred because monetary authorities are now better able to identify and respond to the supply shocks affecting the economy. To justify this interpretation, Beaudry and Doyle suggest that the economics profession became more aware of the importance of supply shocks after the oil shocks of the 1970s.⁸

Beaudry and Doyle consider several alternative explanations for this decrease in the slope. First, if monetary policy had been conducted with the sole aim of stabilizing prices, it could be argued that the increase in inflation stability was achieved at the cost of greater output instability. Contrary to this view, they show that the variance of the output gap did not increase during the period when the slope was declining.

Another competing explanation is that the flatter Phillips curve reflects the impact of downward nominal-wage rigidity at low rates of inflation. This hypothesis implies that the Phillips curve would become non-linear at low inflation, with the flattening more pronounced over the range of the curve corresponding to excess supply.⁹ The authors show, however, that the decrease in slope was not restricted to the excess-supply section of the curve. They therefore conclude that the evidence is not consistent with downward nominal-wage rigidity as the cause of the observed change in slope.

When Is Price-Level Targeting a Good Idea?

*Richard Barnett (University of Arkansas)
and Merwan Engineer (University of Victoria)*

In recent years, a body of literature on the relative merits of targeting the price level versus targeting the inflation rate has emerged. The traditional view is that price-level targeting would reduce the costs arising from uncertainty about the long-run price level but that the need to restore the price level to its target path following shocks would lead to greater output variability than under inflation targeting. In contrast, recent studies suggest that price-level targeting would change inflation expectations in ways that would reduce inflation variability and improve economic welfare.¹⁰ Barnett and Engineer review this literature to evaluate the validity of the arguments in favour of price-level targeting.

The authors define *price-level* targeting as the polar case where the central bank sets a target path for the price level, and any shock that pushes the price level away from its target path is *completely* reversed in the long run.¹¹ Thus, in their definition, price-level targeting means that there is *no* long-run drift in the price level away from its target path.¹² Barnett and Engineer define *inflation* targeting as a regime in which the central bank has a target for the inflation rate (ex ante), but there can be price-level drift in the long run. Their definition of inflation targeting encompasses a hybrid policy in which there is a partial reversal of the price-level effects of shocks.

Barnett and Engineer conclude that the case for price-level targeting depends on various factors, including whether the monetary authority can credibly commit to future policy ("commitment") or whether it sets a new plan each period ("discretion"), whether current inflation is controllable by the monetary authority, and how inflation expectations are formed. They consider two types of inflation expectations. Expectations are "forward-looking" if expected future inflation enters the current trade-off between inflation and the output gap. Alternatively, expectations are "predetermined" if the trade-off in the current period depends on expected current inflation.¹³

They begin by considering the case where the central bank can credibly commit to a future policy. If current variables can be controlled by the central bank and if expectations are completely forward-looking, the optimal policy with commitment is price-level targeting.¹⁴ In this case, the adoption of price-level targeting leads to a better trade-off between inflation and output in the current period, because the anticipated policy response to a price-level shock reduces the variability in inflation expectations and, hence, in current inflation. More generally, if there is a mix of predetermined and forward-looking inflation expectations, the optimal policy is inflation targeting with price-level drift. The optimal policy in this situation does, however, include some reversal of the price-level effect of shocks, with the amount of long-run drift in the price level inversely related to the relative weight on forward-looking expectations in the Phillips curve. If current inflation cannot be controlled because of lags in the monetary-transmission mechanism, inflation targeting is the optimal policy.

In contrast to the commitment case, the central bank is said to act with discretion when it cannot credibly commit to a policy for the future. Under discretion, Barnett and Engineer conclude that price-level targeting can give a better outcome than inflation targeting if there is sufficient persistence in the output gap or if expectations are completely forward-looking.

Price Level Targeting—The Role of Credibility

Dinah Maclean and Hope Piro (Bank of Canada)

Recent studies suggest that price-level targeting can reduce inflation and output variability (compared with inflation targeting) if the price-level target is fully credible. Full credibility means that agents understand that a price-level target implies that movements in the price level away from the target will be reversed, and they base their expectations solely on the price-level target because they believe the central bank will take the actions required to bring about this reversal. Credibility of the price-level target is essential to reducing volatility because the expectation that price-level shocks will be reversed helps to stabilize the economy.¹⁵

The condition that all agents base their expectations solely on the price-level target is a strong assumption, particularly during the period following the introduction of such a policy. This paper attempts to examine how much credibility is needed for some degree of price-level targeting to reduce inflation and output variability. For this purpose, the authors make various assumptions about the expectations process and then examine the variability of inflation and output in an economic model that is subjected to repeated shocks. They use the Bank of Canada's Quarterly Projection Model (QPM) and shocks designed to broadly represent the historical distribution of shocks in Canada.¹⁶

Experiments are conducted with two types of monetary policy rules, which describe how the short-term interest rate should respond to shocks. Much of the research in this area uses Taylor-type monetary rules in which the central bank adjusts its policy instrument in response to the current value of the output gap and the current deviation between inflation and its target.¹⁷ To study the effect of adding an element of price-level targeting, Maclean and Piro extend the usual Taylor rule to include weight on a price-level gap,

which is defined as the percentage difference between the current price level and the target price level. Price expectations are modelled as a weighted average of three components: a backward-looking process, the model-consistent expectation, and the perceived target. The latter is interpreted as a credibility effect in which agents base their expectations directly on the perceived target of the monetary authority.

Maclean and Pioro find that the results are indeed sensitive to the assumed process for inflation expectations. One scenario considered is the case where inflation expectations are highly backward-looking or adaptive. In this situation, there are no clear gains from adding an element of price-level targeting to the policy rule, since there is, at best, a trade-off between slightly decreased inflation variability and significantly greater output variability. The increase in output variability occurs because a secondary cycle in output is induced by the policy action taken to restore the price level to its target path.

Another scenario involves highly forward-looking inflation expectations in which a large weight is placed on the model-consistent expectation.¹⁸ In this setting, Maclean and Pioro show that the addition of a price-level element to the policy rule can reduce both inflation and output variability, provided that the price-level element does not completely replace the inflation target. A similar result is obtained when a high percentage of agents believe the target is credible and incorporate the target directly into their expectations.

These results suggest that some degree of price-level targeting is appropriate if the regime is highly credible or if most agents are forward-looking. Maclean and Pioro also consider the impact of introducing price-level targeting under less-extreme assumptions. They consider a mixed process, in which expectations of the price level are assumed to be 70 per cent backward-looking, 20 per cent model-consistent, and 10 per cent based on the perceived inflation target (proxied by the model-based solution four to five years ahead). In this model, placing some weight on the price-level target in the policy rule lowers the variability of inflation and output if the 10 per cent of agents who incorporate the perceived inflation target into their expectations switch to using the price-level target. Thus, there are benefits from some degree of price-level targeting even when there is a significant backward-looking component in expectations.

To check the sensitivity of the results, the authors study the impact of price-level targeting when the Taylor rule is replaced by a forward-looking inflation-forecast-based (IFB) rule. With an IFB policy rule, the central bank changes interest rates in response to the forecast deviation of inflation from its target. The benefits from adding the price-level target are found to be greater with the IFB rule than with the Taylor rule. The forward-looking dimension gives a smoother policy response and less cycling in output and interest rates.

Maclean and Pioro note that the results may be sensitive to the assumptions made regarding the transmission mechanism for monetary policy. In QPM, the monetary instrument is the short-term interest rate, while the link to real activity is through the *spread* between long-term and short-term interest rates. Price-level targeting may do better in models where the transmission mechanism depends primarily on the level of longer-term interest rates. If real activity depends on long-term rates rather than the interest rate spread, changes in inflation expectations can have a greater stabilizing influence on economic activity.

Issues in Inflation Targeting

Frederic S. Mishkin (Columbia University)

Mishkin considers key issues related to the design of an inflation-targeting regime. In formulating his views, he considers theoretical studies as well as the international evidence on the experiences of inflation-targeting countries.

Price-level versus inflation targets

Mishkin begins by evaluating the view that targeting the price level rather than an inflation rate will lead to better economic performance. He notes that price-level targeting can reduce uncertainty about the price level over long horizons and that it yields less variability in output in some theoretical models. But since this result depends on key assumptions about the price-setting process and the degree of forward-lookingness, Mishkin does not find the argument that price-level targeting would give less output variability very convincing. Moreover, he suggests that a price-level target may lead to more frequent periods of deflation, which could result in financial market instability and adverse effects on economic activity.

Mishkin does not agree with the view that the zero floor on nominal interest rates would make monetary policy less effective in offsetting negative shocks to an economy with a low-inflation regime. He argues that monetary policy can be effective even when short-term interest rates reach zero, because policy actions can affect spending by changing the prices of many assets other than short-term debt securities. Nevertheless, he suggests that policy may become more difficult to conduct when the lower bound on nominal interest rates is reached (such as during a deflationary period). This problem would arise because the central bank could not use its well-established policy rules based on adjustments to short-term interest rates (such as a Taylor rule) when the zero bound is reached.

These concerns about the risk of deflation lead Mishkin to advocate an inflation target rather than a price-level target. He recommends, however, that future research should focus on hybrid policies in which misses from the inflation target would be offset to some extent in later periods. To improve communication of the policy objectives in such a regime, he suggests that the central bank announce both an intermediate inflation target and a target for the average inflation rate over a longer period, perhaps five years.

Numerical level for the long-run target

One argument for a positive inflation target is the view that nominal wage rates are downwardly rigid. Although inflation could facilitate adjustments in real wages, Mishkin notes that inflation might also create allocational inefficiencies by making it harder to identify movements in relative real wages. On balance, he concludes that downward nominal-wage rigidity is *not* a persuasive reason for setting a positive level for the long-run target. In his opinion, a stronger argument against reducing the long-run inflation target to zero is the increased risk of deflation. To provide some insurance against this risk and to accommodate measurement bias in the price index, he suggests that a reasonable long-run target is about 2 per cent.

Other design issues

Two design issues facing an inflation-targeting regime are the horizon for the targets and whether the targets should be specified as a point or a range. On the first issue, Mishkin comments that too short a time horizon (such as one year) can result in frequent misses of the target, excessive movement in policy instruments to achieve the targets, and insufficient weight given to output fluctuations in policy decisions. He therefore recommends that policy focus on a target two years ahead (as currently practised by the Bank of Canada).

Mishkin suggests that the use of a target range may lead the central bank to focus too much attention on keeping inflation just within the range rather than trying to achieve the midpoint of the range. Thus, he believes a point target is better than a range, and that other ways should be used to communicate to the public that the central bank does not have precise control over inflation. One way to communicate this limitation would be to publish confidence intervals around the inflation forecast of the central bank.

What Have We Learned About Price Stability?

Michael Parkin (University of Western Ontario)

Parkin's paper discusses what kind of targets for the behaviour of the price level would lead to a monetary policy that contributes most to the economic welfare of Canadians. The author begins by reviewing the evidence on the merits of a system with formal targets. He concludes that inflation targeting helps to achieve and maintain low inflation by influencing inflation expectations. Moreover, he argues that a targeting regime provides a framework for macroeconomic stability that: does not preclude the central bank from placing significant weight on output stability; gives a well-defined objective while leaving the central bank free to use its discretion to achieve that objective; and takes persistent aggregate supply shocks into account. Thus, he concludes that a system with formal targets should be continued in Canada.

Price-level versus inflation targets

Parkin's analysis of the merits of different targeting regimes focuses on a recent result of Svensson (1999). Using a model in which price changes depend on inflation expectations for the current period, Svensson finds that price-level targeting gives lower variability of inflation and identical variability of output relative to inflation targeting (a "free lunch"). Parkin cites a number of studies that lead him to conclude that this result is applicable to the actual economy, including those of Dittmar and Gavin (2000) and Vestin (2000), who show that the free-lunch outcome is also obtained in models with forward-looking inflation expectations. Parkin notes, however, that price-level targeting can increase output variability if expectations are backward-looking. Accordingly, the central bank should pursue the price-level target in a transparent manner so that forward-looking expectations can respond to the bank's actual policy.

Numerical level for the long-run target

In Parkin's view, our knowledge of the benefits of zero inflation has not changed much in recent years because these benefits are difficult to measure. Accordingly, his analysis of the appropriate level for the inflation target focuses on various arguments as to why some positive trend rate of inflation might be preferred to zero inflation. One reason for a positive target is that the price index used to define the target contains a measurement bias. If measurement bias is the only reason for a positive target, Parkin concludes that the target rate for CPI inflation should be 0.5 per cent a year. He notes that this objective would be identical to maintaining a fixed level for a "value-of-money" index (VMI), which would equal the CPI adjusted for the estimated measurement bias.

Parkin also reviews the implications of downward nominal-wage rigidity and the zero lower bound on nominal interest rates for the choice of the inflation target. With respect to the former issue, he stresses two related questions. First, what is the evidence from the wage data on the amount of rigidity? Second, if rigidity exists, what are its effects on employment? On the first question, he highlights a recent study by Smith (2000), which uses U.K. wage data collected from annual interviews with a large number of individuals over the period 1991 to 1996. Unlike similar data sets from other countries (including Canada), the U.K. data set contains information that allows Smith to adjust for various factors (rounding, measurement error, and annual contracts) that may cause the raw data to overstate the actual amount of rigidity. After making these adjustments, Smith concludes that just 1 per cent of workers who remain in the same job from one year to the next have pay that might be downwardly rigid. While the U.K. evidence is not direct evidence for Canada, Parkin stresses that comparable Canadian data sets are similar to the U.K. data before corrections (in terms of the proportions of wage freezes and wage cuts) and that nominal rigidity effectively disappears in the U.K. data when adjustments are made for various sources of apparent rigidity.

Regarding the effects of rigidity on employment, Parkin discusses recent papers that consider whether downward nominal-wage rigidity creates a permanent trade-off between inflation and output at low rates of inflation. After surveying this evidence, including

the papers by Farès-Lemieux and Beaudry-Doyle in this volume, Parkin concludes that the employment costs of downward nominal-wage rigidity do not appear to justify a positive inflation target.

Another common argument for a positive inflation target is that it reduces the probability of encountering the zero lower bound on nominal interest rates. This constraint means that a central bank operating in a low-inflation regime may not be able to reduce real interest rates as much as needed in order to counteract a negative demand shock. In evaluating this argument, Parkin cites studies that suggest monetary policy can affect aggregate demand through various channels even when short-term interest rates are constrained by a zero lower bound. He also notes that Reifschneider and Williams (1999) show the zero-bound problem can be attenuated if the monetary authorities can make a credible commitment to an augmented Taylor rule in which the setting of short-term interest rates takes into account the effect of past constraints on interest rates arising from the zero bound. Specifically, if there is an expectation that future short-term rates will be held at low levels to compensate for previous constraints, the zero bound will not limit the movement in long-term rates (the key rate affecting spending in their model).

Parkin concludes by considering three options for the targeting regime in Canada after 2001: (i) extend the current inflation target of 1 to 3 per cent; (ii) maintain the current target inflation rate but formulate it as a target path for the price level; or (iii) commit to a lower, possibly zero, target inflation rate formulated as a target path for the price level. Based on his review of the evidence, Parkin believes option (iii) is the preferred route. He recommends setting a formal target for maintaining the VMI index at an average value of 100, which is equivalent to the CPI rising at a trend rate equal to the estimated measurement bias.¹⁹

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1. The operational target for policy is the 12-month percentage change in the CPI excluding food, energy, and the effect of changes in indirect taxes.
2. References in this literature include Fortin (1996); Simpson, Cameron, and Hum (1998); Crawford and Hogan (1998-99); and Faruqui (2000).
3. The Phillips curve relates inflation to a measure of economic activity (such as the unemployment rate or the output gap) and other factors including expected inflation.
4. Some topics were covered in two previous conferences on price stability held by the Bank. Proceedings of those conferences are published in Bank of Canada (1994) and Bank of Canada (1998) and are summarized in Poloz (1994) and Macklem (1997-98).
5. Canadian evidence on the importance of the zero lower bound is provided by Black, Coletti, and Monnier (1998). The zero lower bound is also discussed in this volume's papers by Mishkin and Parkin and in a series of papers in the November 2000 issue of the *Journal of Money, Credit and Banking*.
6. This cyclical pattern occurs because the younger and less-educated workers tend to be the first to lose their jobs during downturns.
7. See Perrier and Amano (2000) for further discussion of the relationship between the credibility of monetary policy and inflation expectations.
8. Evidence of increased awareness of the role of supply shocks is provided in Laxton and Tetlow's (1992) account of the historical evolution of techniques used to estimate potential output.
9. They suggest that the change in slope would be concentrated in the excess-supply section of the curve because downward nominal-wage rigidity should not be a factor in a tight labour market.
10. Svensson (1999), Dittmar and Gavin (2000), and Vestin (2000) have made recent contributions to the literature on price-level targeting.
11. The price-level target could be a fixed price level or a trend price-level path with a constant growth rate.
12. For example, if the target path for the price level has an annual growth rate of 2 per cent, a shock that raises current inflation above 2 per cent would push the price level above the target. Inflation in later periods would have to fall below 2 per cent for some time to return the price level to its target path.
13. Predetermined expectations imply that inflation expectations are based on information from previous periods. This assumption is comparable to the "backward-looking" case in the Maclean-Piolo paper.
14. Optimality is defined in this paper as the policy that minimizes a quadratic loss function that depends on the output gap and the deviation of inflation from its target. Note that this definition of optimality does not consider other potential benefits from price-level targeting, such as reduced uncertainty about the long-run price level.
15. The expectation that price-level shocks will be reversed also helps to circumvent the constraint on real interest rates imposed by the zero lower bound on nominal interest rates. See Coulombe (1998).
16. QPM has a well-defined steady state and dynamics that determine the adjustment path between the initial conditions and the steady state. It is calibrated to reflect empirical evidence from the Canadian economy. See Poloz, Rose, and Tetlow (1994) for a description of the model.
17. See Armour and Côté (1999-2000) for a discussion of monetary policy rules.
18. This scenario assumes that most agents know the structure of the economy, the nature of the shocks, and the policy rule followed by the monetary authority.
19. Parkin suggests that the VMI might also exclude highly volatile components of the CPI (provided they have a zero mean over a reasonably short period), interest-sensitive prices, and the first-round effects of changes in indirect taxes.