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COMMENTARY

MONETARY POLICY

What is the Ideal Monetary Policy Regime?

Improving the Bank of Canada's Inflation-targeting Program

Michael Parkin

In this issue...

The recent financial crisis has emphasized the role of sound monetary policy for ensuring Canada's future prosperity. Although much is right with the Bank of Canada's inflation-targeting regime, improvements such as price-level targeting and closer attention to potential financial instability should be considered in the lead-up to the renewal of the program in 2011.

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The Study in Brief

The Bank of Canada's current inflation-targeting program has been successful in meeting the goals of monetary policy by giving Canadians confidence in the value of their money. Yet this success should not preclude consideration of improvements to the program, especially taking into account the genesis of the recent credit crisis. This *Commentary* describes improvements that should be considered as the inflation-targeting policy comes up for review in 2011.

In order to move toward an ideal monetary policy regime, the Bank should address the following areas:

- Price-level targeting: Target the path of the CPI rather than the inflation rate and ensure that it rises by 2 percent a year on average and commit to lowering this rate of increase over the coming decade until true price-level stability is achieved. This would differ from the current policy in that it requires the Bank to "undo" past deviations from the target rather than letting bygones be bygones.
- Interest-rate rules: Begin to experiment with interest-rate rules, and ask the Bank's economists to examine the robustness of alternative rules. Use the best rules as a benchmark against which to check interest-rate decisions. Decisions based on simple, mechanical rules bring greater clarity and predictability to decisions and put the onus on policymakers to explain departures from the rule.
- Communications: Report monetary policy performance in the form of a Taylor curve graph, which shows the tradeoff between output and inflation volatility. Compare Canada's performance with those of other nations, both inflation targeters and nontargeters.
- Financial stability: Monitor financial stress indexes, asset prices, and the price of risk, and when judgment suggests financial instability is present or likely, consider modifying the interest rate to avoid financial crisis, then explain in detail both the concern and the reason for action.

Much is right with Canada's current monetary policy regime. Neither its departures from the ideal nor the gains that might be expected from moving towards the ideal are large. The improvements described here will help move Canadian monetary policy closer to the goals of stabilizing the value of money and minimizing the volatility of output. The Bank should continue to emphasize the limits of monetary policy and the success its appropriate use can achieve.

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INDEPENDENT • REASONED • RELEVANT

In their most recent Joint Statement on inflation targeting, the Bank of Canada and the government of Canada recognized that the objective of monetary policy is "to enhance the well-being of Canadians by contributing to sustained economic growth, rising levels of employment and improved living standards."

They also state: "Experience has clearly shown that the best way monetary policy can achieve this goal is by giving Canadian households and businesses confidence in the value of their money." (Bank of Canada 2006). The ideal monetary policy regime for achieving this objective is one in which an independent but accountable central bank is mandated to *stabilize the value of money* and *minimize the volatility of output.* It pursues this mandate by making clearly explained, rules-based decisions and by conducting and fostering research that systematically evaluates past decisions and current procedures.

The Bank of Canada's independence and accountability, as well as its leading role in monetary policy research, fit this description of the ideal. And in the other features of the ideal, much is right with Canada's current monetary policy regime. Neither its departures from the ideal nor the gains that might be expected from moving towards the ideal are large. It would be easier to break the current regime and lose its benefits than to improve on it.

But improvements are available and this *Commentary* describes and develops arguments to support them.[1] I approach this task by considering six sets of questions about the challenge and current success, the goals, and the procedures of monetary policy.

First, what is the challenge of monetary policy and how well is the current policy regime meeting it? Second, what do we mean by the *value of money* that monetary policy should seek to stabilize? Is it measured by a consumer price index or do we need a broader index that includes asset prices? Third, what do we mean by the term *price stability?* Is it a predictable and low average inflation rate – an inflation target? Or is it a predictable, slowly rising trend in a price index – a target path for the price level? Or is it a constant price index – the natural meaning of "stable"? Fourth, what is the appropriate *instrument* for monetary policy to use and how should it be set? Is it the overnight interest rate, the exchange rate, or a monetary aggregate such as the monetary base or a broader definition of money? How should the monetary policy instrument be set? Should its value be determined by a rule or by the votes of experts? Fifth, how should the central bank communicate and explain its decisions? How much information about its own forecasts of the price level, the real economy, and the interest rate should it share? Sixth, what role should monetary policy play in coping with financial instability and crisis?

Meeting the Challenge?

The major challenge to Canada's monetary policy regime arises from wrong diagnoses of economic ills and an overly optimistic view of the ills that monetary policy can fix. The challenge has two sources: the use of a model that is ill-equipped to cope with complexity of today's monetary and financial systems, and a tendency to confuse problems in the real economy and monetary problems.

An Ill-Equipped Model

Although the Bank of Canada uses sophisticated econometric techniques to forecast and evaluate alternative policy choices, the core of the model that dominates ideas about monetary policy is, incredibly, a model without money. Today's well-named "canonical" model can be summarized in three equations:[2] (1) inflation is generated by past

This *Commentary* has benefited from the helpful suggestions of Steve Ambler, Robin Banerjee, Charles Freedman, Thor Koeppl, David Laidler, John Murray, and Nicolas Rowe. They are not implicated in the conclusions or stands taken on controversial issues.

1 While Canadian monetary policy provides the focus and context for this *Commentary*, its conclusions are relevant to all economies.

2 Woodford (2003) provides the most extensive account of the canonical model. Not all models are devoid of money and financial assets: all the major central banks have models with a richer structure than the canonical model. The Bank of Canada's ToTEM model is an example – see Murchison and Rennison (2006). But even this model lacks a convincing account of the financial sector. Bernanke, Gertler, and Gilchrist (1996, 2000) describe a model with an explicit role for financial markets, but not for the types of markets that brought the 2007 credit crisis.

inflation, expectations of current and future inflation, and the gap between actual and potential gross domestic product (GDP), the so-called output gap; (2) the output gap is generated by the past output gap, actual and expected inflation, exogenous domestic and foreign shocks, and the monetary policy interest rate; and (3) the monetary policy interest rate is determined by the central bank's mandate and decision rule.

This model has worked well in a world of asset market stability. It has even worked reasonably well in a world with a dot-com stock market bubble and bust and an Asian financial market crisis. But it is asking a great deal of this model to provide reliable policy guidance in a world with a meltdown in credit markets and other financial markets.

The absence of money and financial markets from the standard model has two consequences, both serious and one potentially fatal. The nonfatal consequence is that the model might not predict as reliably under credit market stress as it does in normal credit market conditions. The potentially fatal consequence is that it might lead to confusion between monetary problems – problems that monetary policy can address – and real problems – problems that monetary policy cannot handle.

Real and Monetary Confusion

The old confusion between monetary and real problems was summarized in the so-called Phillips curve[3] and the (incorrect) belief that monetary policy could lower the unemployment rate permanently. We are now beyond that confusion. But a new confusion might turn out to be that of seeing the price of risk as a variable that monetary policy can (and should) influence. Lowering the policy interest rate in an attempt to offset the consequences of a high price of risk might turn out to be as mistaken as the use of a low interest rate to lower the unemployment rate permanently.

It seems hard to deny that risk is *real* and that the price of risk is the relative price that regulates the demand for and supply of risk. Markets – some of the most sophisticated yet created – enable risk to be traded, sliced and diced, shared, recycled, and repackaged. In the long run, the real quantities and prices of the risks traded in these markets are independent of the value of money.

In the short run, these real variables interact with monetary variables in ways that are potentially powerful yet currently not well understood. It is vital that, in thinking about the ideal monetary policy regime, we keep a clear head about the distinction between real and monetary factors in the markets for risk. We must not get sidetracked into thinking that we can achieve price stability goals while using monetary policy to offset a high price of risk in the pursuit of financial market stability. The real-monetary confusion that makes labour and goods markets function inefficiently might be even more troublesome for financial markets. And boosting distressed financial markets with a low interest rate might turn out to be as inflationary as was the mistaken pursuit of an unsustainably high level of real economic activity. I return to this issue in the final section of the *Commentary*.

Current Performance

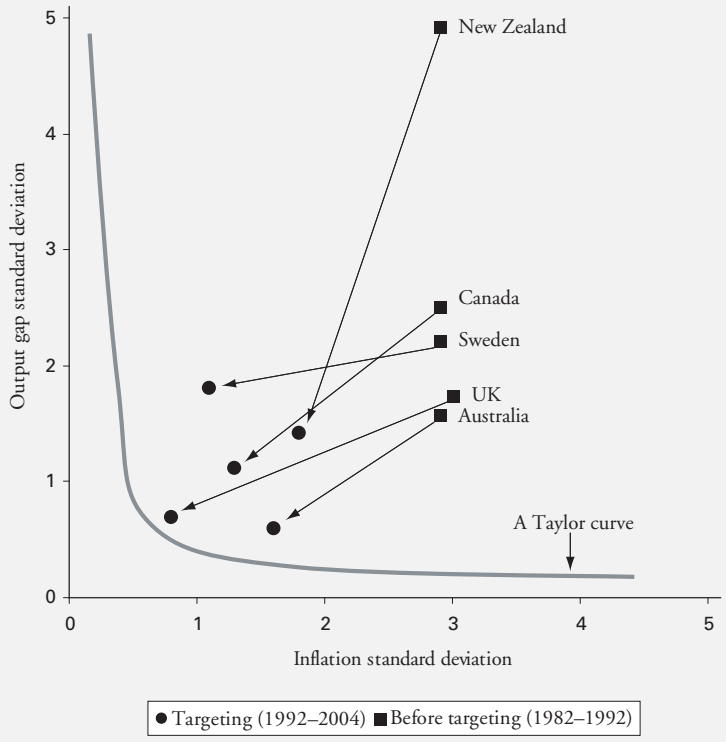
As the Bank of Canada so clearly appreciates, price stability enhances the standard of living: it does not force a choice between a high and sustainably growing standard of living and price stability. But monetary policy does face a tradeoff, between the variability of inflation and the variability of real economic activity, summarized in the so-called Taylor curve (Taylor 1979).

The Taylor curve is a bit like the more familiar Phillips curve except that its variables are standard deviations rather than means (and the conventional way of drawing the curve places the standard deviation of the output gap on the *y*-axis and the standard deviation of the inflation rate on the *x*-axis). The Taylor curve shows the tradeoff between inflation variability and real GDP variability *when the best available policy rule is employed;* it is an inverse relationship, so points on the curve with higher inflation volatility are associated with lower output volatility.[4] If the best policy rule is *not* in use,

3 The Phillips curve is a suggested long-run inverse relationship between inflation and unemployment.

4 The curve is also "convex," which means that successive decreases in inflation volatility require ever greater increases in output volatility (and successive decreases in output volatility require ever greater increases in inflation volatility).

Figure 1: The Taylor Curve: Canada and Four Other Inflation Targeters



Sources: Data from Dorsey 2006; author's calculations.

moving to a better rule provides a "free lunch" and does not involve a tradeoff; that is, by adopting a better policy rule, the volatility of *both* inflation and output can be lowered.

The Taylor curve is a handy way to describe the best that monetary policy might achieve, to describe what it has achieved, and to make cross-country comparisons. Figure 1 shows an example of a Taylor curve, as well as the performance of Canada and four other inflation targeters before and during the era of inflation targeting.[5] It is striking that inflation targeting improved performance for all five central banks. Some of the improvement in performance was most likely the result of a quieter global macroeconomic environment after 1992, and even the nontargeting United States and Japan shared in the improved performance. But the inflation targeters improved by more than the nontargeters.[6] Based on the criterion of low variability, New Zealand performed the worst of the five, while one can interpret the others as having chosen different points on the variability tradeoff.

What Is the Value of Money?

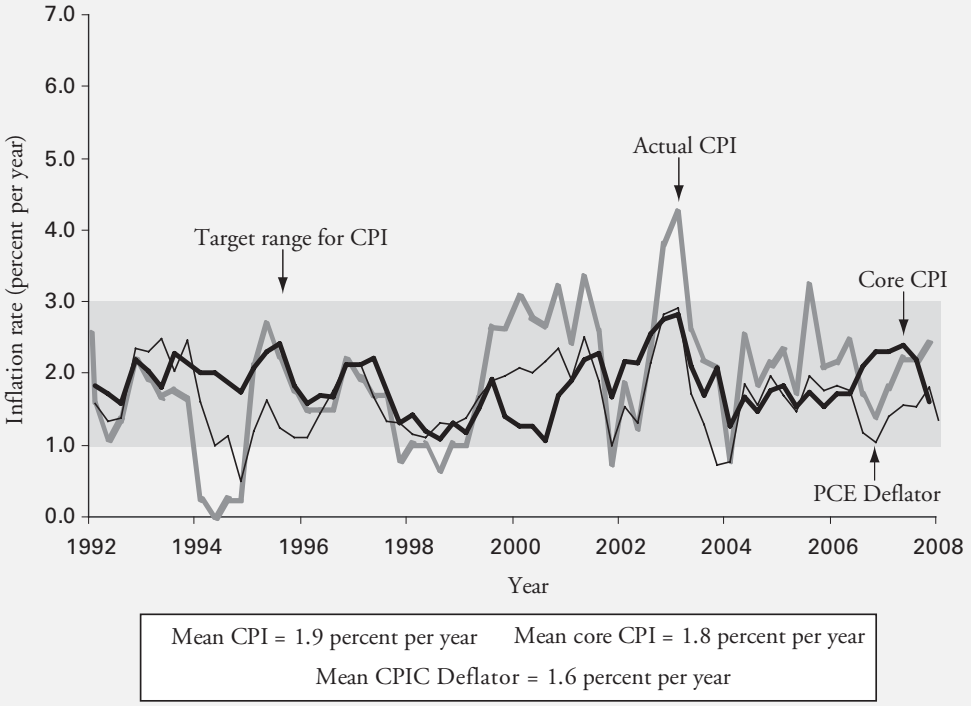
The value of money is the inverse of the price level. But what is the price level? Is it an index of the prices of current consumption goods and services, and if so, which specific index? Or is it an index of a broader set of prices than those of current consumption? If broader, how much broader: everything in GDP, or all current goods and services and assets?

The answers on which Canada's inflation-targeting regime is based are that only the prices of current

5 Computed Taylor curves depend on model specification, data, and policy rules. For a comprehensive set of calculated Taylor curves, see Levin, Wieland, and Williams (1998).

6 The data reported in Dotsey (2006) show that, for the five inflation targeters and two nontargeters, the variability of real GDP decreased by the same percentage but the variability of inflation more than halved, on the average, for the inflation targeters and decreased by only a one-third for the nontargeters.

Figure 2: Three Measures of Consumer Price Inflation in Canada, 1992–2008



Sources: Statistics Canada, CANSIM Tables 176-0003, 326-0022 and 380-0003.

consumption are relevant, that the consumer price index (CPI) is the appropriate target, and that core CPI is the appropriate "operational guide."[7] Are these answers the right ones?

Let me begin with the question of the breadth of the appropriate price index. The purpose of a price index determines its appropriate breadth. The purpose of the price index targeted by monetary policy may be presumed to be to measure the value of money. We cannot measure the value of money in some abstract or absolute way, however, but in terms of something that money buys. So what is that appropriate "something"? It might be current consumption, current production, the cost of living, or the cost of *all* the things that money buys – all transactions.

The Price Level of Current Consumption

Three price indexes are viable candidates as measures of the price level of current consumption: the CPI, core CPI, and the chain price index for consumption (CPIC). Figure 2 shows the inflation rates of these three measures in Canada since 1992.[8] All three measures show a similar mean, so the choice among them is more a theoretical than a practical matter.

The case for the CPI is that it represents an average of all the prices that consumers face, is published monthly with a short lag, and is well understood by the media and the individual consumer. The CPI has two weaknesses: volatility and bias. The variability of the CPI – measured by the standard deviation – is around twice that of the other two measures. The bias of the CPI arises from its difficulty in dealing with new goods and quality improvements and its failure to recognize substitution effects in response to relative price changes.

The case for core CPI is that it indicates the underlying inflation trend and might be a better predictor of future inflation than is the total CPI. It might also have a smaller bias than does total CPI. The weakness of core CPI is that, by omitting

7 Core CPI is a measure that strips out the most volatile elements of the CPI.

8 I begin in 1992 because this was the first year in which the Bank of Canada brought inflation into the current target range. Although 1991 was the first year of inflation targeting, it was the transition year from high inflation.

volatile prices, it omits the very prices that create public concern when inflation is rising and runs the risk of weakening public support for the monetary policy goal. This weakness becomes a matter of concern when relative prices are changing and the items omitted from core are persistently rising faster than the average.

The case for the chain price index for consumption is that it is the only price index based on the so-called Fisher Ideal index – that is, it handles substitution effects and so removes the bias of the CPI from that source, although it does not handle quality improvement and new goods bias. The weakness of the chain price index is its quarterly frequency and the long time lag that must elapse before final revisions become available.

The Price Level of Current Production

Using the GDP deflator, which measures the price of current production, would be an easy way of broadening the meaning of the value of money. Weight would be given to the prices of currently produced physical capital, including houses, and so would place some weight on asset prices. In respects other than coverage, the GDP deflator shares the strengths and weaknesses of the chain price index for consumption. It is a Fisher Ideal index (a strength), but it is calculated only quarterly, with a one-month lag for the first estimate and a long lag for final revisions (a major weakness). Moreover, the GDP deflator cannot provide data on what is happening to the value of money at the moment of a policy decision.

The Cost of Living

A cost-of-living approach to the value of money seeks an index of the money cost of a bundle of current and future consumption that maintains a given level of economic welfare – or utility, or standard of living. Reis (2005), building on ideas first proposed by Alchian and Klein (1973), defines a dynamic price index (DPI) that measures this intertemporal cost of living. The analysis of Alchian and Klein is general, and does not tell us how to calculate the appropriate price index. In contrast, Reis is specific, and provides an exact formula for measuring his DPI. The DPI is a forward-looking index that responds more to permanent price shocks than to transitory price changes and that includes asset prices. The DPI Reis constructs for the United States from 1970 to 2004 tells a dramatically different inflation story than does the CPI, since the DPI is highly volatile and heavily influenced by changes in the prices of houses and bonds.[9]

As a target for monetary policy, the DPI has some drawbacks. First, it is not as transparent as the more familiar CPI. Second, its volatility makes it unlikely that it could be targeted with any precision. Further, the attempt to target a highly volatile index would impart volatility to the performance of the real economy – the Taylor curve tradeoff between volatility in inflation and real volatility would be highly unfavourable.

The Price Level of All Transactions

The view that transactions rather than consumption or the cost of living are the objects whose prices combine to measure the value of money is attractive. Money is used to buy consumption goods, all other production including intermediate goods and services, labour services, and assets, both real and financial. The use of money to transact in factor markets equals its use to transact in markets for final goods and services. Its use in markets for intermediate goods and services is several times GDP. And money's use in financial transactions approaches 20 times GDP.[10]

Irving Fisher's famous equation of exchange states that $MV = PT$; the quantity of money, M, multiplied by its velocity of circulation, V, equals the price level, P, multiplied by the volume of transactions, T.[11] When Fisher (1911a, 1911b) wanted to put values on P and T, he used a transactions approach. He used wholesale prices, wage rates, and stock prices to calculate an index for P and quantities of exports,

9 Goodhart (2001), in a less formal and more empirically driven analysis, also suggests an approach that places some weight on asset prices.

10 The Large Value Transfer System, or LVTS, which processes the majority of payments made in Canada, handles an average of around 17,000 transactions a day valued at $140 billion, which is 18 times GDP.

11 The "velocity" of money is the number of times a unit of money changes hands in transactions.

imports, sales of stocks, railroad tons carried, and post office letters carried to calculate an index for *T*. Some of these decisions were clearly driven by the paucity of data available to him. He used wholesale prices rather than retail prices for valuing goods because they were the only prices available on a broad enough scale. He used wages as proxies for the prices of services. But significantly, he also used the prices and volume of transactions of stocks. Fisher did not use house transactions and house prices, but we can be sure that he would have done so if data had been available to him.

If the prices of labour, stocks, and other assets moved in harmony with the prices of consumption goods and services, the transactions approach and the consumption approach to measuring the price level would give the same answer. But the price of labour (the money wage rate) is less volatile than the prices of goods and services, and the prices of financial transactions are more volatile.

Also, in some periods, the discrepancies between asset prices and consumption prices are large. Before the mid-1990s, house prices rose more slowly than the CPI. Then, between 1994 and 2007, the CPI increased by 32 percent while stock prices increased by 209 percent, the price of new homes by 51 percent, and the resale price of existing homes by 98 percent.

Because money wage rates and asset prices behave so differently from consumer prices, the question of whether consumer prices alone provide an appropriate measure of the value of money cannot be dodged.[12] Resolving this issue involves more than the selection of the appropriate policy goal. It is also bound up with the transmission mechanism – the channels through which monetary policy actions influence the ultimate goals of monetary policy – and intermediate targets and indicators. Too much money chasing too few goods brings rising prices of goods, but it takes a long time for the extra money to find its way into rising prices. Too much money chasing too few stocks brings rising stock prices, and the response is instantaneous. Too much money chasing too few existing homes brings rising house prices, and although the response is not instantaneous, it is rapid. The instantaneous stock price response and the rapid housing price response to too much or too little monetary stimulus might provide signals that are dangerous to ignore.

Serious research is called for to examine the potential gains from broadening our view of the appropriate definition of the value of money. Pending that research, the case for using a consumption price index is strong. But we should keep open minds on the place of money wage rates and asset prices in defining the value of money price index. It might well turn out that we want to stick with a consumer goods price index as the formal target but use a broader index to provide early warnings of possible departures from the narrower target.[13] This question, too, needs to be high on the research agenda.

The balance of strengths and weaknesses of the alternatives considered favours the CPI. It is well understood, measures the prices that people face, and can be adjusted for bias, which is persistent rather than variable. It is the easiest index to explain to the public whose interest monetary policy seeks to serve.

What Constitutes Price Stability?

I now turn to the third question: what constitutes price stability, or, what is the appropriate operational price stability goal?[14] Is it a predictable and low average CPI inflation rate – an inflation target? Is it a predictable slowly rising trend in the CPI – a target path for the price level? Or is it a constant CPI?

Most economists would say that a constant CPI implies a falling price level – a rising value of money – because of the bias in the CPI discussed above. The

12 The context in which this question has been discussed in the recent literature is not that of the appropriate definition of the value of money but of whether monetary policy should also seek to avert financial crises by pre-emptive action in the build-up of the crisis. I address this issue later in the *Commentary*.

13 Mankiw and Reis (2003) argue that targeting an index with a heavy weight on the money wage rate is attractive in this role and achieves minimum output volatility.

14 Two branches of the literature on this topic are outside the scope of this review. One is on the optimum rate of inflation or deflation, which argues for a steadily falling price level. The other is on the possible costs of low or zero inflation that includes discussions of downward nominal rigidities and the zero lower bound on the nominal interest rate. I discuss the latter extensively in Parkin (2000); here, I do not examine these larger questions – my premise is that price stability is the appropriate goal.

Bank of Canada puts the upward bias of the CPI at 0.6 percent per year (see Rossiter 2005). So, if the CPI rises at a constant 0.6 percent per year, the price level and the value of money are stable. The current 2 percent target for the CPI implies a true inflation rate of 1.4 percent per year, and to achieve price stability, the average inflation rate would be lowered to 0.6 percent per year. A number like 0.6 does not have the magnetism of 2 or zero, and if true price stability were the goal, it would be worth adjusting the CPI for its known and approximately constant bias, so that a zero inflation rate (or, for that matter, a 2 percent inflation rate) would be measured as the same number by the CPI.

If the ultimate goal is to be an average CPI inflation rate of 0.6 percent per year (a true inflation rate of zero), should we express that goal as an inflation-rate target or a price-level-path target? And how quickly should we aim to get to the new target?

An Inflation-Rate Target versus a Price-Level Target

An inflation-targeting regime seeks to keep the inflation rate inside a specified target range. A price-level-targeting regime seeks to keep the price-level path inside a specified target range. With an inflation target, a missed target is a bygone. With a price-level-path target, above (or below) target inflation must be followed by below (or above) target inflation to keep the average inflation rate equal to its target rate and bring the price level back to its target path.

Much has been written about the relative merits of targeting the inflation rate versus targeting the path of the price level (see Côté 2007 for a useful survey). This choice is independent of the choice of the numerical target and has both long- and short-term consequences.

LONG-TERM CONSEQUENCES: Price-level targeting provides a more predictable long-term value of money, which takes on its greatest significance for life-cycle consumption-smoothing saving decisions. Working households must decide how much to save for their retirement years, and retired households must decide the rate at which to spend their retirement wealth. These choices are difficult ones because of the idiosyncratic risks that each household faces – random shocks to individual economic and physical health. But each household also faces systemic risk that arises from uncertainty about the future value of money. Targeting the price level, rather than the inflation rate, lowers this risk. The magnitude of the long-term risk, even from the current inflation target, is probably not large, but it is almost certainly large enough to be a concern. Its exact magnitude can only be estimated conditional on a model of the inflation process. Whatever the magnitude of the risk, it is its cost that matters.

What are the costs of long-term price-level uncertainty? In current conditions, the cost of inflation protection for savings turns out to be a bit less than half a percent a year. The average annual yield on Government of Canada long-term bonds between 1998 and 2008 was 5.2 percent and the annual inflation rate averaged 1.8 percent, so the real return was 3.4 percent. Over the same period, an investment in a Government of Canada real bond that avoids inflation risk yielded a return of 2.95 percent. So, over that decade, the annual cost of avoiding inflation risk was 0.45 percent.[15]

Although this number is modest, its consequences become significant over a working lifetime. If the experience of the past 10 years were to repeat over the next 40 years, a person who saved a constant amount each year and avoided inflation risk by investing in real bonds would end up with 10 percent less wealth than a person who saved the same amount but invested in nominal bonds.[16]

The cost of inflation protection after retirement by indexing retirement income is much larger. Consider an annuity to be paid for the life of the last survivor of a couple. The year-one payment on an indexed annuity is 62 percent of the year-one payment on a nonindexed annuity. The current value (at 65) of the payments stream to age 85 (life expectancy at 65) on an indexed annuity is 73 percent that on a non-

15 Of course, we do not know that this differential measures only inflation risk and we do not know how small we can drive it by reducing inflation uncertainty. My numbers are an upper limit.

16 The formula is, Wealth at retirement = $\sum_{i=0}^{40} S(1+r)^{(T-i)}$ where S is the constant annual payment, T is the final period (that is, 40), i is the index for years, and r is the discount rate. Evaluating with $r = 3.4$ and $r = 2.95$, the latter is 90 percent of the former.

indexed annuity. At this cost, only the most severely risk-averse family would consider buying inflation protection for its retirement income.[17]

While Howitt (2001) is clearly correct that more research on this topic will pay dividends, it is possible to conclude from the current body of evidence that even today's modest amount of inflation uncertainty brings significant inefficiency for life-cycle plans and that an explicit promise of a price-level path would bring significant welfare gains.

SHORT-TERM CONSEQUENCES: Most of the literature on price-level targeting versus inflation-rate targeting has focused on short-term consequences. That literature is now large; fortunately, it is well summarized by Ambler (2007) so it is possible to cut to the core of the issues.

Before Svensson (1999), it was believed that price-level targeting increases the volatility of the business cycle. The reasoning was simple: if, starting from being on target, the inflation rate rises, policy must lower aggregate demand to send real GDP below potential and keep it there long enough to lower the average inflation rate back to target. Similarly, again starting from being on target, if the inflation rate falls, policy must boost aggregate demand to send real GDP above potential and keep it there long enough to raise the average inflation rate back to target. In contrast, with no requirement to hit a price-level path, an above-target (or below-target) inflation rate is a bygone. All that policy needs to do is keep inflation close to target, with no compensation for past departures from target.

After Svensson (1999), it became clear that the traditional reasoning was flawed and, more important, that a free lunch is available from price-level targeting. The earlier and incorrect line of reasoning failed to take account of the effects of policy on inflation expectations. With price-level-path targeting, the long-term expected inflation rate is anchored. Departures from the path are temporary and the path inflation rate prevails. More interesting, the short-term expected inflation rate moves in the opposite direction to the actual inflation rate – an unexpected increase in the inflation rate lowers the expected inflation rate, because the price level must return to its target path. With long-term inflation expectations anchored and short-term inflation expectations moving in the opposite direction to unexpected inflation, one of the main sources of inflation volatility is removed, since fluctuations in inflation expectations bring one-for-one fluctuations in the actual inflation rate. With this source of inflation volatility eliminated, departures of inflation from target are less severe and less frequent, so policy actions that send output below or above potential are needed less frequently, and when they occur, they need not be as strong or as long lasting.

Further, and more important, with price-level-path targeting, smaller fluctuations in inflation expectations decrease the volatility of real GDP – the "free lunch" that Svensson discovered. Smaller fluctuations in inflation expectations bring smaller fluctuations in aggregate supply, which, in turn, lead to smaller fluctuations in both inflation and real GDP.

These conclusions turn on the commitment to a price-level path's being credible and believed. That qualification is a real problem for a central bank without a track record of delivering on its commitment. For the Bank of Canada, however, with a near 20-year record of delivering on its promises, it seems reasonable to suppose that credibility would not be a significant problem.

While the assumption of commitment cannot be dropped, the free-lunch conclusion is robust to other changes in assumptions. Svensson (1999) shows that it holds for situations in which the central bank targets the inflation rate or price level indirectly via the control of a monetary aggregate or interest rate instrument. Dittmar and Gavin (2000) show that the free lunch is available in models based on either classical or Keynesian assumptions of inflation expectations and wage and price determination.

EMPIRICAL EVIDENCE: What is the empirical evidence on the performance of price-level-path targeting? In Parkin (2000), I concluded from the then-available evidence that it was favourable, noting the "free-

17 Based on quotations obtained by the author from leading Canadian companies. Fischer (1994) argues that a lack of markets for indexed assets and annuities must mean that the cost of price level uncertainty is low. It is hard to reconcile that high price in the admittedly thin market with Fischer's conclusion.

lunch" result holds in the Federal Reserve Board's large-scale open economy macroeconometric model and appears in the work of Black, Macklem, and Rose (1998). Results from work undertaken since then are mixed, but do not reject the free-lunch claim. Kryvtsov, Shukayev, and Ueberfeldt (2008) measure the welfare effects of switching from inflation targeting to price-level targeting in a model in which private agents' beliefs about the policy switch change gradually. In their model, price-level targeting improves economic welfare in the long run but the gains are small. In the short run, imperfect credibility leads to costs that are never fully recovered by the long-run benefits. The faster the new policy becomes credible, the smaller are the transition costs.

Coletti, Lalonde, and Muir (2008) use a two-country model in which they compare the performance of inflation targeting and price-level targeting with a set of shocks that mimic those experienced by Canada and the United States from 1983 to 2004. They conclude that price-level targeting is slightly preferred to inflation targeting as it lowers the volatility of inflation at the expense of only a slight increase in output gap variability.

While Kryvtsov, Shukayev, and Ueberfeldt cast some doubt on the cost of switching, even their work is positive in the case of a credible regime switch. All the other work supports a price-level target over an inflation-rate target. Smith (1998) argues that "there is considerable historical experience with price-level targeting" that is unfavourable to the practice. But the experience that he considers is the attempt by the United Kingdom in 1926 to force a destabilizing deflation and return to the gold standard. This episode is an example of what happens when the price level is not targeted.[18]

The Adjustment Path

I have suggested that a constant price level[19] would provide the ideal monetary policy goal. I do not believe, however, that it would be wise to move to this target in one single step when the Bank of Canada's mandate is renewed in 2011. Two aspects of reaching this goal are relevant: moving from an inflation rate to a price-level-path target; and lowering the target inflation rate from 2 percent to 0.6 percent.

MOVING FROM INFLATION TARGETING TO PRICE-LEVEL TARGETING: The move from inflation targeting to price-level targeting is not a very big one, and it might have been under way, unannounced and unconsciously, for some time.[20] Two pieces of evidence point to this view: the language used in a succession of Joint Statements of the federal government and the Bank of Canada, and the behaviour of the CPI.

In Joint Statements, the language that describes the inflation-control target has changed in ways that seem nuanced but perhaps contain a significant message. Qualitative vagueness in the 1991, 1993, and 1998 statements was replaced by quantitative precision in the 2001 and 2006 statements.

The 1993 statement had envisioned that 1998 would see a major evaluation of what constitutes price stability and most likely a downward adjustment of the inflation-control target. But when 1998 arrived, the Bank was not ready to take that step. "It would be helpful," the 1998 Joint Statement asserts, "to have a longer period of time in which the economy demonstrated more fully its ability to perform well under conditions of low inflation before determining the appropriate long-run target consistent with price stability."

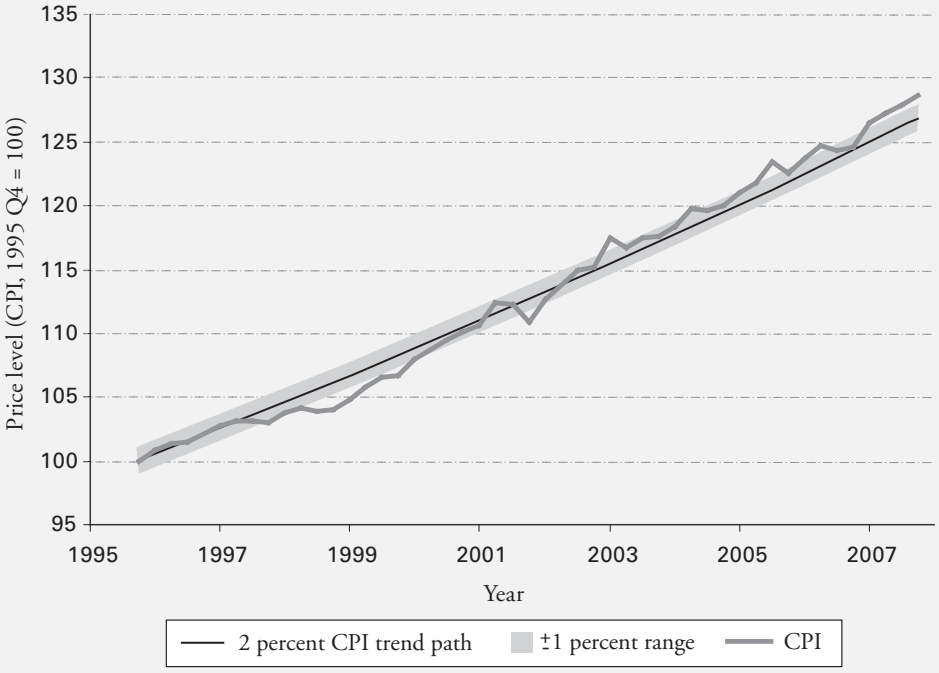
Qualitative language was more prominent than quantitative language. For example, "Monetary policy actions will continue to focus on countering persistent upward or downward pressures on the trend rate of inflation, not temporary pressures that are expected to reverse, or one-off price level changes." And, "In the case …inflation … tem-

18 Historically, only Sweden's Riksbank has practised price-level targeting; for two years, 1931-33, the targeting was clean, with a flexible exchange rate, and, it is widely agreed, delivered one of the best real economic performances. While this episode has limited relevance for today's debate, it does serve to place the United Kingdom's return to the gold standard in perspective and highlight the irrelevance of that episode. See Fisher (1935); Jonung (1979); Black and Gavin (1990); Bernanke (1995); Lundberg (1996); Berg and Jonung (1998); and Dittmar, Gavin, and Kydland (1999).

19 Equivalent to the currently measured CPI rising by 0.6 percent per year on average.

20 Charles Freedman, former deputy governor of the Bank of Canada, and John Murray, the current deputy governor, are quite sure that no such move was explicit either in the minds or the discussions of those responsible for policy during this period. Nonetheless, the evidence to which I point can be interpreted as suggesting an unconscious evolution.

Figure 3: The Price-Level Path, Canada, 1995–2007



Source: Statistics Canada, CANSIM Table 326-0022.

porarily move[s] outside the target range, monetary policy actions would then be directed to bringing the trend rate of inflation back towards the centre of the range over a period of about two years." Also, "policy actions must always be directed to responding to expected developments in inflation six to eight quarters in the future."

But by 2001, the language was bold and uncompromising: "The inflation-control target range will continue to be 1 to 3 per cent; and within this range monetary policy will continue to aim at keeping the trend of inflation at the 2 per cent target midpoint," the first mention of such a commitment. By 2006, the 2 percent midpoint precedes the 1-to-3 percent range: "The inflation target will continue to be the 2 per cent mid-point of the 1 to 3 per cent inflation-control range."

I interpret this evolution of language as indicating an increasingly clear commitment to a 2 percent inflation target with even a hint that the unconsciously preferred implicit target is a 2 percent *trend* in the price level – price-level targeting. And, as Figure 3 shows, the behaviour of the CPI is consistent with price-level-path targeting. Kamenik et al. (2008) compare two hypotheses about the behaviour of the CPI: that positive and negative shocks to inflation exactly offset each other, and that the Bank of Canada is actually targeting the CPI path, and find that the latter cannot be ruled out.

LOWERING THE INFLATION TARGET: Lowering the inflation target cannot be done lightly. It would take some time for lower inflation expectations to influence price and wage setting. so an abrupt fall in the inflation target and actual inflation rate would almost certainly bring on a recession. More important, millions of Canadians have made long-term plans based on an expectation of a 2 percent inflation rate. If inflation were lowered to around 0.5 percent and kept at that rate on the average, a large amount of wealth redistribution would occur as bond prices and interest rates adjusted to the new reality.

This second consequence of lowering the inflation target calls for even more caution than the first. In the light of these considerations, it would be imprudent to lower the target in 2011. The entrenched 2 percent expectation should be validated for long enough to avoid an unintended wealth

redistribution. But it would be appropriate for the 2011 Joint Statement to acknowledge that 2 percent inflation is not price stability and that it is intended, over a period of a decade, to move to a lower inflation rate. Intermediate targets might be set, like those of the early 1990s: a target of 1.5 percent by 2016, 1.0 percent by 2021, and 0.6 percent by 2026 would be feasible and would permit long-term planning and avoid capricious wealth redistribution.

What is the Best Policy Instrument?

What is the appropriate instrument for monetary policy to use, and how should it be set? The Bank of Canada, in principle, can target any of three variables: the overnight rate, the monetary base, or the exchange rate. For a very small open economy, the exchange rate (or better, abolishing the national currency and using that of a major trading partner) is the clear winner. But for a large economy like Canada's, fixing the exchange rate is the worst choice, and the Bank of Canada rightly has been a long-standing advocate of a freely floating dollar. The key reason fixing – or even targeting a path for – the exchange rate is inappropriate is the impossibility of distinguishing, until long after the event, equilibrium changes in the real exchange rate, which need to be permitted, and speculative movements, which are best avoided. Leaving the market to determine the exchange rate, while imperfect, is the best that can be achieved. So the effective choice comes down to the overnight rate versus the monetary base.

The Interest Rate or the Monetary Base?

The Bank of Canada's unequivocal choice of the interest-rate instrument, shared by all central banks, regardless of whether they are inflation targeters, is a consequence of history and economic reasoning. History is at work because the interest rate was the natural policy tool for maintaining the gold value of money. Raising and lowering the interest rate enabled reserves to be maintained at a level that instilled confidence in the (gold) value of money. When fiat money replaced the gold standard (and gold exchange standard), the familiar tool continued to be used.

At first, economic reasoning cast doubt on the viability of interest-rate targeting. A fixed interest rate with fiat money leaves the price level indeterminate, and an interest rate set too low brings accelerating inflation. In the Keynesian world of a given money wage rate or, more extreme, a fixed price level, the choice between setting the interest rate and fixing the quantity of money – or monetary base – becomes a standard tradeoff issue.

The seminal work of Poole (1970) provided the intellectual foundation for thinking about this tradeoff. Roughly, if the demand for real GDP is too unpredictable, fixing the quantity of money leads to interest-rate fluctuations that dampen the fluctuations in real demand for goods and services. But if the demand for money is too unpredictable, fixing the quantity of money leads to unwanted fluctuations in the interest rate that accentuate the fluctuations in real demand. In this case, fixing the interest rate and avoiding the unwanted interest-rate fluctuations is preferred. Unpredictable changes in the demand for money arising from financial innovation seemed strongly to favour interest-rate, rather than money-stock, targeting.

Another swing of the intellectual pendulum occurred with the rational expectations revolution. If money prices, such as the money wage rate, depend on the rational expectation of the price level, something must pin down the price level. A given quantity of money does the job, but a given interest rate does not – with a given interest rate, any quantity of money and any price level are possible.

The pendulum swung back quickly. In Parkin (1978), I showed that price-level targeting provides the "something" to pin down the price level even with an interest-rate-setting policy. But it was not until the work of Taylor (1993a, 1993b) that the requirements of interest-rate setting were as thoroughly understood as they are today (for a thorough review of current ideas, see Woodford 2003). In a nutshell, interest-rate setting works provided it obeys the "Taylor principle," which may be stated in two equivalent ways:

- if the inflation rate rises (falls), the real interest rate must rise (fall); or
- with the neutral real interest rate [explained below] unchanged, if the inflation rate rises (falls), the nominal interest rate must rise (fall) by a greater amount than the change in the inflation rate.

The reasoning here is that interest-rate setting must counter the direction of change of the inflation rate and keep bringing inflation (or the price level) back to its target. Interest-rate setting that violates the Taylor principle eventually will lead to massive price-level instability – either hyperinflation or severe deflation.

Ensuring that the interest rate satisfies the Taylor principle places some restriction on appropriate interest-rate decisions. But the restriction does not deliver a unique decision: the Bank of Canada has a great deal of scope in choosing the interest-rate level and in the process it uses to choose, but it does not have unlimited discretion. Its decisions lead to better economic performance if it uses a rule.

A Rule, but Which Rule?

Discretionary monetary policy is dominated by a rules-based policy because "[m]onetary policy is fundamentally about managing inflation expectations" (Woodford 2003, 15). Expectations might not be fully rational but they are not consciously irrational. In forming expectations about monetary policy and its consequences, market participants in all types of markets – assets, goods, and labour – do their best to predict what the Bank of Canada is going to do at the upcoming sequence of interest-rate decision dates.

Monetary policy rules fall into two broad groups: *instrument rules* and *targeting rules.*[21]

AN INSTRUMENT RULE: An instrument rule is a decision rule that sets the monetary policy instrument at a level that is based on the current state of the economy as described by the values of all the variables deemed relevant to influencing the policy target as well as the current forecasts of those variables. A fixed formula translates the state of the economy into a decision.

The "Taylor rule" – of which there are many variants – is the best-known instrument rule. In its simplest form, it is based on the view that only four variables are relevant for setting the overnight rate, R. They are the neutral real overnight rate, R^*; the inflation rate, π; the target inflation rate, π^*; and the output gap, G. Again in its simplest form, the rule uses the current actual values of the inflation rate and output gap, but a variant of the rule might use forecasts of these variables. In its original form, the rule is to set the overnight rate at

$$R = R^* + \pi + 0.5(\pi - \pi^*) + 0.5G.$$

The neutral real overnight rate is the level at which monetary policy is neither adding to nor subtracting from aggregate demand. This level of the overnight rate must be inferred either from a formal econometric model or by less formal judgments. Either way, a guess is involved – about the right model or about the right value for the neutral real rate. Taylor suggested that the historical average real rate be used, which he put at 2 percent.[22] Making a guess about the neutral real interest rate is not special to using the Taylor rule but an inevitable consequence of using an interest-rate instrument. The Bank of Canada has no way of dodging that guess, for it is the level of the overnight rate relative to its neutral level that determines whether monetary policy is restraining or stimulating aggregate demand. This fact is sometimes overlooked when the immediate concern is whether to raise, lower, or not change the interest rate. Raising the rate means restraining aggregate demand only if it moves above the neutral level. Raising the rate below the neutral level merely weakens the degree of stimulation. Likewise, lowering the rate means stimulating aggregate demand only if it moves below the neutral level. Lowering the rate above the neutral level merely weakens the degree of restraint.

The output and inflation variables in the Taylor rule formula might be actual current values or forecast values over the policy horizon. When they are forecasts, the central bank must be explicit about what the forecasts are and how they were arrived at, so that independent observers are able to replicate the forecasts and ensure that the rule is entirely transparent.

The weights in the Taylor rule formula need not be the ones originally suggested by Taylor, but they

21 The dichotomy was suggested by Svensson (2003) and led to a spirited discussion between Svensson (2005) and McCallum and Nelson (2005) about the normative superiority of the two types of rules.

22 Taylor's 2 percent refers to the US economy; perfect capital mobility would imply the same real rate for Canada.

must, as those weights do, satisfy the Taylor principle. Notice that the principle is well satisfied in the above formula: a 1 percentage point change in the inflation rate brings a 1.5 percentage point change in the same direction in the overnight rate and a 0.5 percent change in the same direction in the real overnight rate. As long as the interest rate reacts strongly enough to the inflation rate, the rule satisfies the Taylor principle.

So long as the Taylor principle is satisfied, the weight on the output gap can be as large (or small) as desired. The presence of the output gap in the formula can represent two concerns. First, policymakers need to be mindful of the real cost of output fluctuations and the political environment in which monetary policy is made, so even though the goal is price stability and even though monetary policy is incapable of influencing the level of real GDP on the average, it is prudent to place some weight on directly smoothing output fluctuations as an objective of policy. Second, to the extent that future inflation responds to the current output gap, making the interest rate respond to the output gap is equivalent to targeting future inflation.

The weights in the Taylor rule formula need not be constant: they might vary to reflect the degree of confidence in forecasts and an asymmetric assessment of the balance of risk. If the Bank is confident of its forecast of the output gap but has a large range of uncertainty on its forecast of inflation, it might increase the weight on the gap and lower its weight on inflation. Neither must the weights in the formula be linear. A positive output gap brings rising inflation and a negative output gap brings falling inflation, but the response of inflation to the output gap might be asymmetric – there might be a greater response to a positive gap than to a negative one. If this is indeed the case, then the interest-rate response to a positive output gap might be larger than its response to a negative output gap.

Allowing that the instrument rule might have variable and nonlinear weights makes such a rule very close to a targeting rule.

A TARGETING RULE: A targeting rule is a decision rule that sets the policy instrument at the level that makes the forecast of the policy target(s) equal to the target(s). In the case of a policy that targets the inflation rate two years ahead, a targeting rule sets the overnight rate and its two-year forecast path to make the inflation-rate forecast equal to the target rate.

A targeting rule is more complicated to describe than an instrument rule. It is a complex decisionmaking process that uses a large amount of data, alternative models of the transmission mechanism and comparisons among them and checks for robustness, models of the partly random processes that govern the exogenous variables, and a deliberation process that pools the views and ideas of a wide range of experts.

Unlike an instrument rule, a targeting rule must include a forecast of the path of the policy instrument. Deciding only the current setting of the policy instrument is not sufficient to generate the required forecast of the target variable – the entire path of the instrument influences the target, and alternative instrument paths might achieve the same objective. For example, if, in the absence of an interest-rate increase, inflation is expected to rise, it might be possible to lower inflation to its target with an initially large jump in the interest rate followed by a gradual decrease or by an initial small jump followed by a sequence of further increases. These alternative planned paths must be considered and the best one (on some criterion) chosen. But even the best path remains a forecast; it will change as currently unexpected future events occur.

The description of a targeting rule makes it sound like discretion, but there is a crucial difference. Under discretion, the central bank selects its target and the means of achieving it. Under a targeting rule, the central bank pursues a known target – announced in advance and mandated, self-imposed, or arising from an agreement between the bank and government – and uses discretion constrained by the requirement to pursue the target.

The pursuit of a targeting rule does not preclude the need to satisfy the Taylor principle. Any instrument-setting arrangement that ignores that principle leaves the economy at risk to bubbles and busts.

THE BANK'S CHOICE: For the Bank of Canada and all other inflation-targeting central banks, a targeting rule beats an instrument rule. The reasons are probably close to those supplied by Svensson, who puts it thus:

> With improved understanding of the transmission mechanism of monetary policy, increased experience, and better-designed objectives for monetary policy, central banks believe that they can do better than follow these mechanical simple rules. They have developed complex decision processes, where huge amounts of data are collected, processed, and analyzed. They construct forecasts of their target variables, typically inflation and the output gap, conditional on their view of the transmission mechanism, their estimate of the current state of the economy and the development of a number of exogenous variables, and alternative instrument rate paths. They select and implement an instrument rate or instrument rate path such that the corresponding forecasts of the targeting variables "look good" relative to the objectives of the central bank. (2005, p. 615.)

In a nutshell, central banks know enough about how the overnight rate influences the inflation rate to be able to use that knowledge at their discretion to hit the inflation target. And they can beat "mechanical simple rules." Using its discretion, the Bank of Canada can take account of term structure issues, expectations about the marginal product of capital and the long-term real interest rate, temporary changes in the exchange rate, and a host of other factors deemed relevant that are omitted from a simple rule.

Many other economists who have thought hard about this question, however, prefer an instrument rule. Starting with Taylor (1993a), it has been shown repeatedly[23] that the efficiency frontier for a well-chosen "simple mechanical rule" beats the historical performance of central bank decisions. The specific rule that does the best job varies across countries and over time, and this general survey of the issues is not the place to take a stand on the specific form of the winning rule – that must come from ongoing research.

The idea that a simple mechanical instrument rule might outperform the sophisticated decisionmaking process described in the above quotation from Svensson seems outrageous. But after some thought, it becomes clear that what is much less credible is the idea that the deliberations of a committee might outperform the data-crunching capacity of a computer.[24]

Of course, the targeting-rule decisionmaking process described by Svensson is highly sophisticated and makes much use of data and computing power. It is at the end of the process that it eschews the methods it relies so heavily on in its initial stages. Pulling all the threads together in a number of human brains and then sharing views in committee deliberation is a high-risk and imprecise activity. It is fraught with the problem of overconfidence, well known to psychologists. In contrast, for the realist instrument-rule user, the number crunching does not stop with forecasts of inflation and the output gap, conditional on alternative instrument paths and the selection of an interest rate path that "looks good" relative to the objectives.

The best instrument rule is selected not to be optimal but to be robust – to deliver good average performance and to avoid disasters. Robustness is arrived at and checked by comparing the performance of alternative rules in a wide variety of models that span the range of beliefs about the monetary policy transmission mechanism (see, for example, Côté et al. 2002). It is in this activity that we cannot (and should not) replace the human decisionmaker.

23 For a sample of these studies, see Levin, Wieland, and Williams (1998).

24 Ian Ayres's provocative book, *Super Crunchers* (2007), provides dozens of examples of situations in which the "expert" has yielded to the computer. One such is an econometric investigation by Orly Ashenfelter that produced an index of wine quality with only three variables: winter rainfall, average growing season temperature, and harvest rainfall. The index was described by the world's most influential wine expert as "an absolute total sham" until it accurately predicted the price of fine Bordeaux wines before they had even been tasted and more accurately than the experts. In another example, a statistical contribution index proved a more reliable way of spotting baseball hitting talent than sending experts to games. In medicine, marketing, moviemaking, and many other areas, as Ayres puts it, "[w]e are in a historic moment of horse-versus-locomotive competition, where intuition and experiential expertise is losing out time and time again to number crunching."

TRANSITION TO A RULE: If it is granted that an instrument rule beats a targeting rule, it does not follow that a switch should be made with any haste. In the current state of knowledge, sound monetary policy decisionmaking will use an instrument rule – in its currently best available form – and will take the decision that it delivers as the starting point for discussion. Departures from the rule will be justified by arguments that explain why, in the current situation, pertinent available information demands deviating from the rule's decision. It is difficult to imagine what such information might be, especially if the rule uses the best available forecasts of inflation, the output gap, and any other variable(s) deemed relevant. But it might be appropriate to allow for a low-probability but large-impact event or to place a temporarily greater weight on either inflation or the output gap for some specified and plausible reason. Also, a situation of unusual uncertainty might make policymakers want to move more cautiously than would the instrument rule. Alternatively, concern about future inflation or the future output gap might make policymakers want to move more aggressively than would the rule. A departure from a simple rule might also be rationalized as a response to potential credit market problems, a matter I address in the final section of this *Commentary*.

Whatever the reason for departing from the rule, by making its choice relative to a well-defined and well-understood instrument rule, the central bank brings clarity to its decision.

How Should the Central Bank Communicate?

How a central bank explains its decisions depends crucially on how it makes them. It is not possible to have clarity in communications and explanations if the policy process is itself mysterious, even to the policymakers. It is possible, and extremely desirable, to explain policy decisions where they emerge from a deliberate and well-defined set of procedures, but the explanation will depend on whether the central bank uses a targeting-rule decision process or an instrument rule.

Explaining Targeting-Rule Decisions

Because central banks today use targeting rules, we have a rich body of data on how communications and explanations vary across countries. All the inflation-targeting central banks produce a detailed report on the current and forecast macroeconomic situation in their countries and explain their most recent interest-rate decisions. Three reports are especially noteworthy: the Reserve Bank of New Zealand's *Monetary Policy Statement,* the Bank of England's *Inflation Report,* and the Bank of Canada's *Monetary Policy Report.*

There is much to admire in the Bank of Canada's report. The one-page summary that appears as the first page of the report, "Canada's Inflation-Control Strategy," explains why Canada targets inflation and how it influences and monitors inflation; it is a superbly succinct statement that bears its twice-a-year repetition. The report is well organized and provides almost all the information that well-informed Canadians need to understand the Bank's policy choices. Significantly, however, the report differs from those of the New Zealand and UK central banks in the way it presents interest-rate forecasts and in the way it describes forecast uncertainty.

INTEREST-RATE FORECASTS: All three central banks forecast three crucial variables that Svensson calls the Trinity: the inflation rate, the output gap, and nominal interest rates. All three banks publish forecasts of the first two variables, but only the Reserve Bank of New Zealand publishes an interest-rate forecast.[25] The other two indicate the likely future direction of interest rate-change, but do not provide details of their forecasts.

The reluctance of central banks to publish an interest-rate forecast is not unreasonable – a forecast can be misunderstood as an intention, and it might exert too strong an influence on market expectations. But market participants do forecast the interest rate. And knowing the current forecast of the central bank rather than guessing it surely improves the information available to financial markets and removes one source of uncertainty.

25 In recent years, some other central banks have started to publish interest-rate forecasts – namely, those of Norway (beginning in 2005), Sweden (2007), Iceland (2007), and the Czech Republic (2008).

The C.D. Howe Institute Monetary Policy Council has wrestled with how to formulate its own outlook for the interest rate, and since May 2007 has published three sets of numbers: the current recommendation, the expected recommendation at the next rate setting, and the expected recommendation six months to one year in the future. The formulation is carefully deliberated and is described thus: "if my current recommendation is implemented and if there are no intervening major new unexpected shocks, I expect to be recommending x percent at the next meeting and y percent at meetings six to twelve months in the future." The council's next-meeting forecast is intended to convey information about the direction in which members think policy needs to move in the near term, and the longer-horizon number is designed to indicate the policy pressure that will still be needed mid-way towards the current policy horizon.

If the Bank of Canada matched its C.D. Howe Institute shadow, it would not need the qualifier, "if my current recommendation is implemented." Thus, the Bank might publish two numbers, qualified by "if no currently unexpected shocks occur, the Bank expects to move the overnight rate to x percent at its next meeting and y percent at meetings six to twelve months in the future." Such a statement would clearly be a forecast, not a commitment, and would simplify the guessing game that occupies a good deal of the market's intellectual capacity. It is hard to see the losses but easy to see the gains from such an innovation.[26]

FORECAST UNCERTAINTY: The special feature of the Bank of England's report is the way in which it provides forecasts of inflation and real GDP growth. Its forecasts of both these variables are conditional on a constant interest rate – the currently set rate – and on market expectations of the interest rate. The report also provides the distribution of forecasts in the form of a set of fan charts (see Britton, Fisher, and Whitley 1998); in contrast, the other two central banks publish point values for forecasts and qualitative verbal discussions of the directions and severity of risks.

While the thoroughness of the Bank of England's forecasting exercise is impressive and the intellectual integrity of its fan charts unimpeachable, the practical gain from providing this detail might be questioned. The fan charts show that the variances of the forecast distributions are large and that the spread around the mean does not vary a great deal relative to variation in the mean. The effective information content of the fan charts are their central forecasts, which is precisely the forecast data reported by the other central banks.

The Bank of Canada is wise to avoid seductive fan charts. They emphasize uncertainty, and they do not incorporate the fact that the Bank will act when the future turns out to be different from its current expectation. There is no gain from publishing probabilities when everyone knows that the future is uncertain but no one knows just how uncertain. The goal of monetary policy is not to emphasize future uncertainty but to lessen it. It is much more informative for the policy report to state the bank's central forecast for inflation, the output gap, and the interest rate over the next eight quarters, given no future shocks. For inflation, the target is the forecast. The report needs to be unequivocal in stating that, no matter what shocks occur, policy actions will be taken to keep inflation on target over the medium term and to minimize the variability of output consistent with the price-level objective.

Explaining Instrument-Rule Decisions

There are no live examples of the use and reporting of instrument-decision rules by central banks, but it is not difficult to envisage how such decisions would be communicated and explained: the rule itself would be public knowledge, the reason for the rule would be explained, and the current state of the economy and current forecasts from which the rule formula calculates the instrument setting would be published, just as they are in today's set-up.

An instrument rule provides two gains for communicating and explaining monetary policy: it shifts the focus from forecasting time series to understanding the means and variances that the rule delivers, and it removes the need to provide a forecast of the interest rate. The rule itself and

26 Freedman (2000) believes that the market has had some difficulty distinguishing a forecast from a promise.

current forecasts of inflation and real GDP provide all the information market participants need to predict the next policy rate change. If the rule is changed, as it very infrequently would be when new research leads to the discovery of a better rule, the new rule and reason for the change would be explained well in advance of using it.

Even if the central bank does not use an instrument rule to make its decisions, it can use the rule to explain its decisions, both to itself and to the wider public – for example, the US Federal Reserve uses the Taylor rule in the internal deliberations of the Federal Open Market Committee (see Yellen 2007).

Some Missing Ingredients

Missing from all central bank monetary policy reports – not just those of the three banks singled out for special attention but others as well – is an explicit recognition that interest-rate setting must satisfy the Taylor principle. Monetary policy that violates this principle does so at its peril, yet the recent upsurge in the inflation rate around the world suggests that the principle has been absent not only from monetary policy reports, but also from monetary policy.[27]

The Bank of Canada and other major central banks that are presiding over rising inflation should be explaining that they have inappropriately permitted the real interest rate to fall as the inflation rate has increased, when instead they should have been raising the real interest rate. Equivalently, the nominal interest rate has been set too low for too long. Today's inflation was caused by monetary policy decisions made up to two years ago. It is necessary to explain why those decisions turned out to be wrong. There is no shame in not having perfect foresight – there is shame in pretending that no mistakes were made.

When inflation is outside the target range, we need to know whether this is because of some unforeseen random event that can be expected to reverse itself or because of a systematic event that must be addressed. We also need to know if there is a systemic flaw, such as using an inappropriate model of the transmission mechanism.

Another missing ingredient of monetary policy reports is the Taylor curve (of Figure 1), which should be calculated from the best available models, with inflation and output controlled by the best available policy rule. Reports also need to show where the banks are currently operating in the Taylor curve space, and where they are operating compared to other central banks.

Unwanted Distraction

There is a tendency, when inflation is outside the target range, to distract attention from the true reason. Instead of recognizing that the problem arises because monetary policy over the past two years has been too accommodating, monetary policy reports point to the prices of oil and grain as the culprits. Yet, when monetary policy is working well and hitting its targets, central banks do not say, "oil prices and grain prices are rising at the target inflation rate and keeping inflation on track." Nor should they misleadingly say that the source of an increase in the inflation rate is a faster rise in the price of oil or grain. Relative prices change. Today's increases in the relative prices of oil and grain would have occurred at a slower nominal pace in the company of faster falling nominal prices of computers and flat-panel televisions if monetary policy had been less inflationary.

What Role in Financial Stability?

What role should monetary policy play in coping with a financial crisis?[28] Should it take pre-emptive actions aimed at preventing or at least moderating the crisis? When the crisis occurs, should the goal of price stability take second place to the more urgent task of containing financial stress and easing credit flows?[29]

27 I am not claiming that the Taylor principle must be applied at each and every rate-setting moment; rather, that it must be respected on the average. A persistent upsurge in the inflation rate that is not accompanied by a larger rise in the interest rate is a worrisome indicator of the violation of the principle.

28 My treatment of this topic is selective and focused on the interaction between the pursuit of an inflation target and the need to maintain financial stability. Freedman and Goodlet (2007) provide a useful general definition of financial stability and a broader discussion of a central bank's role in promoting or restoring it. Illing and Ying Liu (2003) provide an interesting index of financial stress that might offer a concrete way of anticipating when financial stability is at risk.

29 These goals might not always be inconsistent; the question discussed here becomes relevant when they are so.

The standard way of addressing economic policy questions like this is to draw on a body of general theory and apply it to the given situation. But on the generation and cure of credit market collapse, we have no theory to apply, no model economies we can use to generate a credit crisis and check on the ability of alternative treatments to prevent or cure it.

The finance literature on asset and credit markets and derivatives – the markets for the types of asset-backed securities that played a dominant role in the post-August 2007 meltdown – is extensive. Much has been learned and written about the random events that determine the returns on these instruments and about the formulas for calculating the prices of these instruments But there is no general equilibrium macroeconomic model that incorporates these instruments – their prices and quantities – into the broader story of consumption and investment decisions. There is no model of the linkages between the markets for money – the monetary base and bank deposits – and the markets for asset-backed securities and credit derivatives. So we have no models that explain how these markets influence aggregate demand, real GDP, and inflation, and how they influence the monetary policy transmission mechanism.

Macroeconomic models that incorporate a financial sector[30] provide some insights, but the financial sectors in these models are primitive. Also, these models do not generate a financial crisis; rather, they incorporate an exogenous asset price bubble that creates a crisis when it bursts. The conclusion that emerges from these exogenous crisis models is that pre-emption does not help. Indeed, with an inflation target, the asset price bubble to some extent should be accommodated and the inflation target loosened (see Selody and Wilkins 2007).

In contrast, Cecchetti, Genberg, and Wadhwani (2003) argue that policy improvements are available if flexible inflation targeting responds to asset price bubbles. A key reason their conclusion differs from that of the exogenous bubble models is the precise question that is posed. Bernanke and Gertler ask whether asset-price targeting is better than price-level targeting; the unsurprising answer is that it is not. Cecchetti, Genberg, and Wadhwani, in contrast, compare inflation targeting that is oblivious to asset prices with inflation targeting that responds to and seeks to some degree to lean against asset price bubbles. What emerges from a dispassionate evaluation of these two lines of enquiry is that asset-price targeting is a bad idea, and a flexible inflation-targeting regime that places some weight on asset prices might be superior to one that ignores asset prices.

In the work just reviewed, asset price bubbles are exogenous. But suppose that monetary policy is partly responsible for an asset price bubble. Borio and Lowe (2002) argue that, when monetary policy achieves a low and stable inflation rate, it becomes more likely that excess demand pressure will be felt sooner in credit and asset markets than in goods and factor markets. An examination of the build-up to both the 2007 crisis and its 1997 dot-com predecessor reinforces Borio and Lowe's argument that a causal link might indeed run from monetary policy to bubble to crisis.

Two variables tell an interesting story: the price of risk and the price of housing.

Taking the historical average price of risk[31] as a crude estimate of its long-run equilibrium, fluctuations around the long run seem to have monetary policy origins. The data are characterized by relatively long periods when the price of risk is moderately below average followed by short periods when the price spikes upward substantially above average. Two episodes in recent history are remarkably similar: from 1991 through 1996 and from 2001 into 2006, the price of risk was below average. During the 2000s episode, the price of risk was close to zero. In 1997-98 and in 2007-08, the price of risk shot upward. During both low-risk-price periods, the US policy interest rate, the federal funds rate, was close to the inflation rate – a real federal funds rate of zero – and when the price of risk increased, the federal funds rate had risen sharply.

Two episodes and a loose association of the price of risk with monetary policy is a weak straw on which to hang a conclusion. But the data are suggestive of a linkage and a potential danger for monetary policy to watch out for. When the price of risk is below its long-term average for a prolonged period, trouble might be brewing, and it might be time to tighten monetary policy even when the tra-

30 Such as those of Bernanke, Gertler, and Gilchrist (1996, 2000); Bernanke and Gertler (1999); and Roi and Mendes (2007).

31 The price of risk might be measured as the gap between the interest rate on a commercial debt and a government debt of equal maturity.

ditional output gap and core inflation indicators suggest that all is well.

The ratio of the median price of a home to median income provides an estimate of the long-run-equilibrium price of housing. Looking at the US data, this ratio was around 4 until 1980. It increased to a bit more than 5 for a year in the late 1980s but then settled down to around 4.7 for the rest of the 1980s, the 1990s, and into 2000. Starting in 2001, the ratio began to rise. The rate of increase became rapid, and by 2005, when the ratio peaked, it was 6.3. Starting in 2006, the ratio began to fall and by 2007 it was below 6 and falling sharply. These movements in the relative price of housing are correlated with monetary policy. Low interest rates feed into the housing market via the mortgage market and bring an increase in demand that exceeds the capacity to increase supply. When house prices are rising especially rapidly, we have another sign that monetary policy might be too loose.

Reacting to signs of a future credit crisis with pre-emptive monetary policy tightening seems to run counter to the primacy of an inflation target. But, as Crockett notes:

> A willingness to contemplate pre-emptive tightening would not require a redefinition of ultimate objectives. Assuming the cost in terms of the traditional objectives, such as inflation and output, is the correct way of thinking about the problem. But it should be recalled that even in strict inflation targeting regimes concerns with output performance are incorporated through the length of the horizon and the trajectory chosen to return the inflation rate to within its target range, following an external shock. (2003, p. 6.)

There is a further reason pre-emptive tightening is not contrary to inflation (or price-level) targeting: it avoids the need to loosen policy at a time of potential inflationary bias and so, over the longer term, makes it more likely that the inflation target will be met. Again, Crockett puts it well: "lowering rates when problems materialise but failing to raise them when they build up could promote an insidious form of 'moral hazard', which could actually contribute to generating the problem in the first place" (2003, p. 5).

Pre-emption clearly would need to be done with caution and care. It is uncommon for all asset markets to point in the same direction – the house price bubble was not accompanied by a major stock price bubble. In pricking the house bubble, we would need to avoid sending the stock market into a speculative dive.

So far, I have focused on prevention. I now consider cure. Should monetary policy modify its near-term inflation target and tolerate a higher inflation rate to try to limit the fall in asset prices? The answer is, absolutely not. When the 1998 Joint Statement said "[t]he best contribution monetary policy can make to…[economic welfare] is through preserving confidence in the value of money by providing an environment of stable average prices," it did not mean only when times are good. Indeed, the statement might have been qualified by adding "and especially in times of turmoil, enhanced uncertainty, and credit market crisis."

A credit crisis makes forecasting difficult. Models of aggregate demand provide linkages from asset values to spending plans, and in a credit crisis the real GDP growth rate will be correctly forecast to slow. But models of aggregate supply are silent on how a credit crisis affects potential GDP. The output of the financial sector is clearly affected, but by how much and even in which direction is not easy to pin down, so the forecast of the output gap is especially uncertain. Forecasting inflation is also more challenging, primarily because of the difficulty of forecasting the effect of any policy toward the credit situation on inflation expectations. The last thing that monetary policy should do in a situation of enhanced uncertainty is depart from well-tried and well-understood rules-based decisions. Even Bernanke and Gertler (1999), who believe that asset price crashes do their worst and sustained damage when monetary policy is either neutral or reinforcing of deflationary tendencies, do not recommend abandoning the inflation or price-level target. But they do recommend a lower interest rate and easing credit markets with the provision of additional liquidity.

If interest-rate decisions continue to target inflation, should they nonetheless react to tight credit markets and, in particular, to the price of risk? If short-term interest rates are, say, 50 basis points higher than normal because of an increase in the price of risk, should the overnight rate be set 50 basis

points lower than normal to offset the higher price of risk? Reasoning from a simple view of an "*IS*" curve that links the interest rate and aggregate demand suggests that such an offset is appropriate. Reasoning from a view that the real interest rate combines the price of time and the price of risk suggests a more cautious conclusion.

The decision to save or consume, to invest or wait for improved conditions, depends on the intertemporal price, which is the interest rate inclusive of the risk associated with the decision. But today's financial markets have engineered instruments that enable the price of risk and the pure intertemporal price to be separated, so that decisions are made in the light of the appropriate marginal price. The price of risk is determined in global markets that signal the opportunity cost of risk, and setting the policy interest rate lower to offset a temporarily high price of risk encourages inefficient, excessive risk taking. A safer approach to monetary policy would be to continue to focus on inflation and the output gap, set the interest rate at the level that reflects the current and forecast values of these variables, and create the most stable environment possible in which financial markets can price risk correctly.

Continuing to target inflation does not mean ignoring the liquidity constraints that a credit crisis inflicts on banks and other suppliers of credit. Liquidity relief must be provided, but in providing it, a central bank needs to be careful not to undermine confidence in its own financial integrity. It achieves this balance by willingly providing funds at a penalty interest rate against high-quality collateral. How much of its balance sheet the bank puts to this purpose needs to be watched with care. The US Federal Reserve might be getting close to the prudent limit. In the year from August 2007 to August 2008, the Fed's monetary liabilities – the monetary base – increased by only 2.3 percent. But during that same year, the percentage of the Fed's liabilities backed by US government securities decreased from 99 percent to 56 percent. In August 2008, the other 44 percent of the Fed's liabilities were backed by private securities of varied quality under the Primary Dealer Credit Facility, Term Securities Lending Facility, and Term Auction Facility programs established in the wake of the current credit crisis.[32]

Beyond providing liquidity, a central bank must prevent bank failure from creating contagion and financial collapse. As Bernanke and Gertler put it, "[w]ell-designed and transparent legal and accounting systems, a sound regulatory structure that helps to limit the risk exposure of banks and corporations, and prudent fiscal policies that help instil public confidence in economic fundamentals, are all vital components of an overall strategy to insulate the economy from financial disturbances" (1999, pp 17-18).

Recommendations

It bears repeating that much is right with Canada's monetary policy regime – the adjustments that the Bank of Canada might make to improve it are slight:

- Target the path of the CPI rather than the inflation rate and ensure that it rises by 2 percent a year on the average, and commit to lowering this rate of increase over the coming decade until true price-level stability is achieved.
- Begin to experiment with interest-rate rules, and ask the Bank's research economists to examine the robustness of alternative rules. Use the best rules as a benchmark against which to check interest-rate decisions.
- Provide an account of the interest-rate decision rules that currently look good and that are used as a benchmark.
- Report monetary policy performance in the form of a Taylor curve graph, with the performance of Canada and other targeters and nontargeters compared against a best possible tradeoff. (Such a graph would be very slow to change, but well worth keeping in people's minds as the appropriate way to judge monetary policy performance.)
- Monitor financial stress indexes, asset prices, and the price of risk, and when judgment suggests financial instability is present or likely, consider modifying the interest rate to avoid financial crisis, then explain in detail both the concern and the reason for action.
- Continue to emphasize the limits of monetary policy and the success its appropriate use can achieve.

32 The Bank of Canada provided relief on a much smaller scale than the Fed, and all the Bank's actions were done in coordination with similar actions by the Bank of England, the European Central Bank, the Federal Reserve, and the Swiss National Bank and simultaneous actions by the Bank of Japan and the Swedish Riksbank.

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