Wrap-Up Discussion

W. Paul Jenkins*

Introduction

Over the two decades of the 1970s and 1980s, inflation in Canada, as measured by the consumer price index (CPI), averaged 7 per cent per year. Over the past five years, inflation has averaged just under 1.5 per cent (1.75 per cent for the CPI excluding food, energy, and indirect taxes). The monetary policy framework that the Bank has used to achieve and maintain this low-inflation environment has included (1) a clear statement of objective, as expressed by the Bank's inflation-control targets; (2) the recognition that inflation control is not an end in itself, but the means whereby monetary policy contributes to sustained, good economic performance; and (3) the requirement that the Bank be transparent and accountable for its actions and results.

This conference has given us an opportunity to take stock of the current state of knowledge and research on the various issues that are central to this low-inflation framework. In my remarks I attempt to summarize the presentations and discussions along the lines of certain issues that in most cases have cut across the various sessions. These issues, as I see them, are:

1. the costs of reducing inflation further versus the benefits;

2. international experience with inflation targeting;

3. inflation targeting versus price-level targeting;

4. the band width;

5. credibility and expectations;

6. the choice of CPI as the target; and

7. CPI biases.

1   The Costs and Benefits of Reducing Inflation Further

1.1   The costs

It has been argued that inflation may be more costly to reduce if it is already low to begin with; as well, there may be some additional costs of maintaining low inflation. Various reasons have been suggested for this, and several of the papers address these arguments.

1.1.1   Phillips curves

Dupasquier and Ricketts test for different types of non-linearities in the short-run Phillips curves for Canada and the United States. They find that the non-linearity with the most support in the data is the capacity constraint model, which implies no additional costs for a disinflation that starts from low inflation rates. That is, the short-run output loss associated with a 1 percentage point disinflation is the same whether the initial level of inflation is 10 per cent, 5 per cent, or 2 per cent. They also find, particularly for Canada, some evidence that the short-run Phillips curve gets flatter at low rates of inflation.[1] These results support their costly adjustment model, which is based on the premise that the formation of inflation expectations is held constant.

Expectations do, of course, adapt to changes in the economic environment, and how and why expectations change are important issues. If realizing a previously announced inflation objective does enhance the credibility of monetary policy, for example, the announcement of a further reduction in the target rate of inflation could result in rapid adjustments in expectations, thereby reducing the costs of disinflation, perhaps considerably. This would apply to both the capacity constraint and the costly adjustment Phillips curve models estimated by Dupasquier and Ricketts.

On balance, the evidence they present supports a non-linear (convex) Phillips curve. This implies that, if the variability of output and inflation

---

1. While a flatter short-run Phillips curve would tend to increase the costs of further disinflation, it could also increase the benefits. The reason for this is that once the lower rate of inflation had been achieved, inflation would tend to be more stable, since it would be less sensitive to the output gap.

were reduced, a higher average level of output would result over the cycle. But their findings are fragile, and the precise source of the non-linearity is not well identified. As Rowe stresses in his discussion of this paper, it is difficult to estimate Phillips curves, and therefore further work is required, particularly in the light of the policy implications of the different sources of non-linearity. However, as he points out, even if the output-inflation Phillips curve is linear, minimizing the variance of output and inflation improves welfare under an assumption of risk aversion.

1.1.2 Nominal wage floors

The issue of nominal wage rigidities is important from the point of view of adjustment both of *aggregate wages* to demand or supply shocks and of *relative wages* across industries or types of labour. The paper by Crawford and Harrison brings important new information to the issue of nominal wage rigidities. In her discussion of the paper, Bowlus correctly points out that no one data source can be relied upon to draw conclusions about the extent of rigidities. Using different data sources—based on firm size, union versus non-union contracts, and type of pay—the Crawford and Harrison analysis strongly suggests that there is considerable flexibility in nominal compensation rates at current rates of inflation.

However, as Fortin and the other discussants indicate, further work is required on the microeconomics of wage adjustment and the macroeconomic consequences. The theoretical models that have so far been used to underpin the implications of nominal wage rigidities are not very transparent in terms of capturing wage-bargaining behaviour. A key issue that requires further analysis is one raised by Konieczny (1994) at the last Bank of Canada conference on price stability. He argued that money illusion impedes labour-market adjustment by creating confusion about relative wages. This is a view that would be supported by the analysis of Crawford and Harrison, which shows that lower inflation reduces the dispersion of wage increases. Another issue that needs to be addressed is labour-market adjustment when there is nominal wage rigidity in some firms but not economy-wide.

1.1.3 The Summers effect

The Black, Coletti, and Monnier paper considers the implications of the Summers effect using stochastic simulations with the Bank's Quarterly Projection Model (QPM). The authors find that, for reasonable parameter choices (in particular an equilibrium real interest rate of 3 per cent), a lower bound of zero on the nominal interest rate has minor implications for an inflation target as low as zero. They also show that the effects are highly non-linear. If the inflation target is more than 1 percentage point below the

nominal interest rate floor (which can plausibly be set to near zero for short-term interest rates), the implication of the Summers effect becomes economically significant. The quantitative importance of the Summers effect has been investigated previously using deterministic simulations with similar conclusions (see Fuhrer and Madigan 1994). Overall, these results and those of other researchers, together with the fact that monetary stimulus can come more through asset prices and the exchange rate at low interest rates, and that stimulus can also come through fiscal policy, suggest to me that the Summers effect is not a pressing issue. However, the non-negativity constraint on nominal interest rates would still imply that the cost of ongoing deflation would be higher than the cost of an equivalent rate of inflation.

1.1.4   *Labour-market hysteresis and fiscal outcomes*

Black, Coletti, and Monnier also examine the costs of reducing inflation that are associated with potential labour-market hysteresis, and the implications for the fiscal position of governments. In the case of labour-market hysteresis, their model simulation techniques provide a new and useful way of estimating a range of the potential costs in terms of lost welfare. In the case of interactions between changes in monetary conditions and fiscal positions, their simulations also provide a fuller macroeconomic account of the additional costs than we have seen before.

1.2   The benefits of reducing inflation further

Black, Coletti, and Monnier go on to survey the literature on the benefits of reducing inflation that arise from the decrease in the inflation tax on money balances and the reduction in the distortions from the interaction of inflation and the tax system. They remind us that the more recent general-equilibrium models typically find larger benefits than the earlier partial-equilibrium models. They then compare these benefits with their estimates of the costs of reducing inflation. The analysis shows that the "shoe-leather costs" associated with inflation (the area under the money demand curve) are generally too low to justify the transitional costs of reducing inflation. However, once tax distortions are included in the calculation, the benefits of reducing inflation outweigh the costs.

In response to this conclusion, several discussants argue strongly that the solution therefore is to index the tax system. That way the major cost of inflation is avoided. This, however, is far too narrow a perspective on what is fundamentally a much broader issue. The question is, why did institutional arrangements not adapt to take account of anticipated inflation after two decades during which inflation averaged 7 per cent per year? The fact that

private contracts and the accounting system are almost always in nominal terms demonstrates that the costs of adjusting to the risks created by inflation are substantial. This argues that the best and cheapest form of indexation is one in which the central bank is entrusted with maintaining price stability (Jenkins 1990).

Much less work has been done in the profession using structural models to quantify the benefits of reducing inflation by eliminating confusion between real and nominal prices, and by reducing inflation uncertainty (or price-level uncertainty). The traditional approach to measuring the aggregate effects of these types of micro distortions has been to estimate reduced-form equations linking output growth (or the level of output) and inflation, based on time-series data for individual countries and on cross-country data. The studies surveyed in Black, Coletti, and Monnier show that the mean estimate of the effect of inflation on growth is negative, but the dispersion of the estimates is wide, with many studies finding no significant relationship at single-digit inflation. Thus, while the literature supports a negative relationship, it provides little guidance on the *size* of the effect.

In their paper, Ambler and Cardia examine the empirical literature linking inflation and growth. They point out that if output growth and inflation are both endogenous variables, shifts in exogenous variables will generally affect both of them. In addition, they argue that, given the negative relationship between inflation and growth from the quantity theory equation, shifts in these exogenous variables will tend to produce a larger estimated negative relationship between output growth and inflation than is suggested by the true underlying structure. Their results provide some insight on the circumstances under which inferences may be more reliable and on why the dispersion of results in the literature is so large.

Overall, there remains a big gap in our understanding of how low inflation (price stability) works through increased productivity to enhance economic growth. The reduced-form approach often applied has not produced results that are widely accepted. It therefore seems to me that, if further progress is to be made, it will have to be through the use of structural models that better identify and quantify the appropriate relationships. This would include the need to endogenize money supply growth, as several of the discussants of the Ambler and Cardia paper suggest.

2   The International Experience with Inflation Targets

The round-table presentations on international experience make it clear that it is hard to isolate the role of inflation targets in helping to reduce inflation. The countries represented on this panel (as well as Canada) all

started with high inflation, an unstable money demand function, and a deteriorating fiscal situation. Still, the panel members concur that inflation targets had been helpful as part of an overall monetary policy framework. By helping to increase the clarity of the policy objective and by making central banks more accountable, inflation targets generally are seen to have enhanced central bank credibility. The other common theme in this discussion is the realization of the growing importance of transparency and communications as part of a central bank's strategy in the conduct of monetary policy.

3   Inflation Targeting Versus Price-Level Targeting

The conventional view is that, if it is costly to return inflation to its target following a positive inflation shock, it would be even more costly to return the price level to a target. This implies that price-level targeting would result in more variability in output. This, however, is an "all else held equal" observation, and once expectations were allowed to adjust, the conventional wisdom need not apply.

The conference papers by Coulombe and by Black, Macklem, and Rose both formalize this notion, and suggest that a price-level target may have some desirable properties. Coulombe stresses the intertemporal information in the price level when monetary policy stabilizes the price level around a deterministic path, and argues that expected changes in the price level in this world will allow real interest rates to go negative even if the nominal rate cannot go below zero (thereby escaping the Summers effect). Both papers also point out that the expected reversion of the price level to its target provides an automatic stabilizer to the economy through real interest rates, so nominal rates need not vary as much as they would under an inflation target to maintain equilibrium in product markets.

In the Black, Macklem, and Rose analysis there is also an important link to output stability, whereby if expectations are more firmly anchored with a price-level target, it is easier (that is, less costly in terms of output variability) for the monetary authority to stabilize inflation, and in the process (with the short-run Phillips curve non-linear in the output gap) to raise the mean level of output.

These results represent an important addition to the body of research on inflation control. By challenging the conventional wisdom that price-level targets would result in increased volatility in output, these results strongly suggest that price-level rules deserve more attention than they have received. Svensson (1996) has also argued that on the basis of the work to date the relative benefits of inflation targeting versus price-level targeting are far from settled.

In his discussion of the Black, Macklem, and Rose paper, Smith suggests the need to look at historical experiences with price-level targeting. Other important research issues also deserve further attention: How should expectations be modelled in a world with trend stationary prices? How might the economy behave during the transition period from an inflation target to a price-level target? How would a price-level rule be made operational? (That is, what price index would be appropriate, and how fast should one return to the target following a shock?)

4   The Band Width

Black, Macklem, and Rose also use stochastic simulations to consider the ability of the monetary authority to control inflation under various monetary policy reaction functions. Using a reaction function patterned after the rule currently used in QPM, they find that inflation is expected to be outside bands of $+/-1$ percentage point between 30 and 40 per cent of the time, and that the 95 per cent confidence band is about $+/-2$ percentage points. These results highlight the trade-off between providing a clear objective for monetary policy, and perhaps losing credibility if the monetary authority cannot in fact control inflation tightly enough to deliver on its objectives. Black, Macklem, and Rose also find that, with a band of $+/-1.5$ percentage points, inflation is expected to be outside the bands about 15 per cent of the time, suggesting that this band width might be a reasonable compromise between the competing objectives of clarity and deliverability.

As well, these authors consider reaction functions for inflation targeting other than the QPM rule. In general, they find that inflation can be more tightly controlled using alternative reaction functions, but this typically entails more variability in other dimensions. Their results suggest that keeping inflation within bands of $+/-1$ percentage point more than two-thirds of the time requires, at a minimum, larger policy-induced interest rate movements.

5   Credibility and Expectations

The importance of credibility working through expectations is a central element of many of the papers and discussions.

Countries that have established credibility by operating in a low-inflation environment, including those that have had explicit inflation targets that have been achieved, may have lower costs of disinflation in the future. Previous research has demonstrated that credibility, defined in terms of solidly anchored inflation expectations that are directly tied to stated policy objectives, can reduce the cost of disinflation, especially if the disinflation is

announced ahead of time. Similarly, the costs of adjusting to shocks in terms of output variability can be reduced if agents firmly hold the view that monetary authorities will systematically work to attain policy objectives. In my view, one important result of the Black, Macklem, and Rose paper is that it demonstrates just how crucial firmly held expectations are to achieving a good policy outcome.

Thus a key issue is whether, in fact, central bank credibility has increased, and if so why. The paper by Johnson provides evidence that inflation control targets (as part of an overall monetary policy framework) have contributed to increasing central bank credibility. Johnson points out that the results are tentative and suggests that further work is required to assess both the degree of credibility that does exist and the factors that determine credibility.

I agree. Full credibility comes, I believe, only with good policy outcomes.[2] This suggests that the modelling of credibility is a complex question that cannot be addressed simply in terms of one component. It must be placed in a broad context that involves clarity and acceptance of the policy objective, policy actions, and results as well as accountability for those results. This is a challenging and growing area of research, and one for which the economics profession has not yet developed a complete analytic framework.

6   The CPI as the Target Choice

The consumer price index, a cost-of-living index, is only one of the possible measures of inflation that could be used as a target. Others for which there are also reasonable theoretical arguments are the gross domestic product (GDP) deflator (an index that includes investment goods), or unit labour costs (a domestic cost-of-production index). There are, however, several well-known practical reasons to favour the CPI.

The paper by Crawford, Fillion, and Laflèche suggests that, if the monetary authority manages to stabilize the rate of CPI inflation, it is likely also to do a reasonable job of stabilizing the rate of inflation as measured by either the GDP deflator or unit labour costs around the same long-run trend. So as long as the target is set in terms of an inflation rate, expressing the target in terms of the CPI alone appears to be adequate. This is largely because inflation targeting allows for price-level drift. If a price-level target were under consideration, however, this would not be the case. Under price-level targeting an important issue is which price index should remain stable

---

2. Drazen and Masson (1994) have shown that "modeling credibility solely in terms of a policymaker's preferences or intentions is seriously incomplete."

in response to relative price shocks (such as a terms-of-trade shock, or indirect tax changes). Should it be the average price of a consumer basket, the average price of domestic production, or the average cost of production? This is a more demanding question than when base drift is allowed, and it deserves more attention in the research examining price-level targeting rules.

Under inflation targeting, the problem is to disentangle the unobserved trend rate of inflation from price-level movements. The Bank of Canada uses a measure of core inflation that helps in part to disentangle shocks to the price level from the underlying trend rate of inflation. Crawford, Fillion, and Laflèche consider several other measures of core inflation, all of which are based on statistical procedures that exclude volatile components of the CPI. In general terms, they find that the behaviour of these statistical measures of core inflation is broadly similar to that of the Bank's current measure of core inflation (CPI excluding food, energy, and indirect taxes), suggesting that this latter measure is at least adequate as a measure of core. At the same time, their results suggest that their preferred statistical measure of core inflation (INFX8) deserves serious consideration either as a replacement for the current core measure or at least as an alternative that receives some prominence in monetary policy discussions. This alternative has several advantages: it provides a more scientific basis for measuring core inflation; it excludes a smaller proportion of the CPI; it removes the effects of interest rate changes (which are largely policy induced and do not necessarily reflect underlying inflation); and it appears to have some additional leading information (which is important, given the lags in the effects of monetary policy). A variation on INFX8 that excludes the effects of indirect taxes would be an even more attractive option, and bears consideration.

7 CPI Biases

Crawford, Fillion, and Laflèche put the mean estimate of the bias in the CPI relative to a true cost-of-living index at 0.5 per cent, with a reasonable upper bound of 0.7 per cent. Of the 0.5 per cent bias, about 0.2 per cent reflects the impact of new goods and new brands. Several discussants argued that it was not obvious that monetary policy should take account of this new-goods–new-brands bias in the CPI if the objective of policy is to provide a stable unit of account. If, for example, there are menu costs to raising prices, why would a monetary authority force all prices to increase in response to a measurement bias that reflects a change in utility rather than a true price change? It is also the case that the substitution bias, as well as that part of the new-goods bias that results from declines in prices of new goods after their introduction, will be reduced with the planned

introduction by Statistics Canada of annual family expenditure surveys. All these considerations suggest that the CPI bias in Canada may in fact not be a significant consideration in the future conduct of monetary policy.

Conclusions

Canada's current target range of 1 to 3 per cent for inflation control extends to the end of 1998. By that time a decision will have to be taken on the target range that would be considered consistent with price stability (Bank of Canada 1993-94).

The purpose of this conference was to provide important input for policymakers before they must make that decision. I think we can all agree that we have met that objective. The papers and discussions provide additional insights on the benefits and costs of further declines in the target rate of inflation, as well as on alternative approaches to conducting monetary policy under conditions of low inflation, or price stability. Moreover, the conference has helped to show us where we need to do more research and analysis—both in the near term and over the longer term—on how to preserve confidence in the value of money in Canada.

References

Bank of Canada. 1993-94. "Statement of the Government of Canada and the Bank of Canada on Monetary Policy Objectives." *Bank of Canada Review* (Winter): 85-86.

Drazen, A., and P. R. Masson. 1994. "Credibility of Policies Versus Credibility of Policymakers." *Quarterly Journal of Economics* 109 (August): 735-54.

Fuhrer, J., and B. Madigan. 1994. "Monetary Policy When Interest Rates Are Bounded at Zero." Working Paper No. 94-1. Federal Reserve Bank of Boston.

Jenkins, W. P. 1990. "The Goal of Price Stability." In *Taking Aim: The Debate on Zero Inflation*, 19-24. Policy Study No. 10. Toronto: C. D. Howe Institute.

Konieczny, J. D. 1994. "The Optimal Rate of Inflation: Competing Theories and Their Relevance to Canada." In *Economic Behaviour and Policy Choice Under Price Stability,* 1-40. Proceedings of a conference held at the Bank of Canada, October 1993. Ottawa: Bank of Canada.

Svensson, L. E. O. 1996. "Commentary: How Should Monetary Policy Respond to Shocks While Maintaining Long-Run Price Stability?—Conceptual Issues." In *Achieving Price Stability*, 209-27. Proceedings of a symposium held in Jackson Hole, Wyoming, August 1996. Kansas City: Federal Reserve Bank of Kansas City.