

## *Wrap-Up Discussion*

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### **Introduction: The Central Question**

The central question of this conference, and for that matter of its predecessor in October 1993, was expressed by George Rich as “What should the central bank’s reaction function look like?”<sup>1</sup> I am delighted to see the question raised in this form. The central bank’s reaction function is surely the most neglected topic in our teaching of macroeconomics to undergraduates. We all believe that macroeconomic performance will improve and uncertainty will be reduced if policy responses as far as possible follow known rules, yet there is little explicit discussion of what form those rules have taken or should take. My remarks therefore focus on what the conference papers and discussions do, and in some cases do not, say about the monetary policy reaction function for Canada.

The conference papers and discussions shed light on four separate aspects of any reaction function. The first is what arguments should be in the reaction function. The second is what target levels should be set for each argument. The third is how quickly and strongly the central bank should react to gaps that appear between actual levels and targets. The fourth is what current indicator can and should be used when there are substantial lags between the policy action and the intended consequence.

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1. See the general discussion following the round-table session.

## 1 What Arguments to Set as Targets

Either inflation or the price level should, of course, be the primary target of monetary policy, but which of the two? The first paper and the last (Coulombe, and Black, Macklem, and Rose) shed some useful new light on the much-discussed issue of zero inflation versus price stability. Coulombe establishes that if the central bank pursued a price-level target, the price level would be mean-reverting, whereas pursuing a zero-inflation target would leave the price level to follow a random walk. The policy issue is whether and how this matters. Both papers suggest that there are large and important benefits from making the price level mean-reverting. I am sceptical.

The papers identify three possible benefits. First, when the price level is mean-reverting the current price level will contain useful intertemporal information, on today's price level relative to tomorrow's. This seems valueless at the margin, since Coulombe's analysis shows that, in the alternative regime of zero inflation, that same intertemporal information is contained in an equally available nominal interest rate.

The second benefit is that when the public believes the price level is mean-reverting, the central bank can achieve negative real interest rates even with a zero floor on nominal rates, and thereby avoid what might otherwise be a constraint on the ability of monetary policy to stimulate the economy—the Summers effect (Summers 1991).

The third benefit (simulated also in the Black, Macklem, and Rose paper) is that when the public believes the price level is mean-reverting, demand shocks generate less inflation for the central bank to remove, and less nominal interest rate movement is needed to remove a given amount of inflation. Less nominal interest rate volatility may not matter much within the range we would encounter with low inflation rates, but having less inflation to get rid of when demand shocks occur translates directly into lower output volatility, and output volatility does matter.

The Summers effect is a theoretical possibility, like the liquidity trap. Whether it matters in the real world is an empirical question. It is a reflection of the quality of the conference that two papers shed useful light on this empirical question. In one of their sets of simulations, Black, Macklem, and Rose show that the Summers effect could be empirically relevant if tight inflation control were to be adopted as central bank policy. They include stochastic simulations of a policy reaction function in which deviations of inflation from the target range are corrected quickly, of course at the expense of greater variance of output. Greater variance of output is achieved by more vigorous use of the central bank's interest rate instrument. Such a reaction

function would require negative nominal interest rates more than one-fifth of the time even if the target inflation rate were 2 per cent.<sup>2</sup>

Black, Coletti, and Monnier show, however, in a modified projection for the actual Canadian economy, that with the base-case reaction function the Summers effect would occur hardly at all. These authors incorporate an interest rate floor into the Quarterly Projection Model (QPM) and calculate the percentage of time that the floor is binding when output volatility is accounted for entirely by demand shocks. This percentage is tiny. If we take the reaction function in the QPM as representing likely central bank responses (what other reaction function would be put into this model?) then the likely empirical relevance of the Summers effect must also be tiny.

The third benefit—that is, better macroeconomic performance—comes from the public's *expecting* the price level to be mean-reverting. But I do not believe that the public would adopt such an expectation, so I do not believe the third benefit is, in fact, available. In practice, no central bank promise to drive the price level back down to some historic mean will be believable: when the time comes to raise interest rates and to generate a recession for that purpose, few of us will expect the central bank to carry out such a promise. But unless the public expected prices to be mean-reverting, neither of the benefits of price stability over zero inflation would materialize, and the pursuit of price stability would leave us with greater volatility of output than would a zero-inflation rule.

To see why such a policy rule is time-inconsistent, consider a scenario in which a demand shock has just raised domestic price levels. Under either zero-inflation or price-level target rules, the central bank will raise interest rates to reduce the inflation rate to zero. Under a price-level rule, the central bank must count on public support for going beyond that to generate deflation, with a policy of raising the unemployment rate (and the bankruptcy rate, and many other sociological stress indicators). A rational voter with experience of Canadian elections would not expect such a policy to get any support, either from the public or from politicians.<sup>3</sup> Without

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2. The mean nominal interest rate is 5 per cent, and the standard deviation is 6.6 per cent in their simulations. The area under the tail of the normal distribution of the nominal interest rate below 0 per cent is 0.225, over one-fifth.

3. Were our independent central bank to start generating deflation anyway, there would be a huge clamour for the government to issue a directive to stop it.

public support, however, the central bank would be unable to deflate, and therefore unable to abide by a price-level rule.<sup>4</sup>

There is an important issue of whether the central bank should explicitly attempt to keep output stable around its trend (reducing output variances), as well as keeping inflation low. Output-stabilization policy has had a bad press over the last two decades, under the heading of “fine-tuning,” but the Dupasquier and Ricketts paper revives the issue. If there is significant convexity in the short-run Phillips curve, then a policy rule that reacts quickly and aggressively to keep capacity utilization and unemployment rates close to their natural rates will also achieve better cycle-average levels of each, with an obvious net social benefit. If reducing output volatility were not already desirable for itself, it would be desirable for this spillover effect.

The difficulty is that it is hard to show empirically that there are asymmetries. Dupasquier and Ricketts even report U.S. studies estimating that the U.S. Phillips curve may be concave. Furthermore, as Rose’s Monte Carlo results have shown,<sup>5</sup> and as one would expect from an economy that has moved up and down its short-run Phillips curve only five times in the last 45 years, we should not expect robust empirical results any time soon.

Where does that leave us? On the question of whether the central bank should act when it can (without sacrificing its inflation objective) to stabilize capacity utilization and employment rates, Rowe’s comment in his discussion paper is convincing: we do not need convexity in the short-run Phillips curve to justify reducing volatility of output; we need merely be risk-averse. Where we are left agnostic is just on the question of whether output volatility should matter more or less than can be attributed just to risk aversion. Even on this issue, the more successful we are at keeping output volatility down, the less difference it will make whether the Phillips curve is linear or convex.

## **2 What Range to Set for the Inflation-Control Target**

There is important common ground on the question of an inflation-control target range. First, there is no constituency of opinion in favour of deflation. Second, I sense no disagreement with the notion that any target for measured inflation control should be at least as large as whatever upward

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4. As a historical example, one might consider the likelihood of the central bank’s having received any support in 1991-95 had it tried to restore the consumer price index to its 1986 level. Another example (in his discussion of the Black, Macklem, and Rose paper) is Smith’s analysis of the British attempt to restore prewar price levels by bringing back the gold standard after World War I.

5. See the general discussion following the Dupasquier and Ricketts paper.

bias Statistics Canada chooses to leave in our inflation measure. Third, it seems to make some but little difference which of the plausible measures of inflation we use. The area of disagreement among macroeconomists seems to be whether the inflation-control target range should be between  $-0.5$  and  $1.5$  per cent (centred on zero true inflation plus an upward bias of roughly half a percentage point, following the Crawford, Fillion, and Laflèche paper), or between something like  $2$  and  $4$  per cent. If I am correct, this is a modest zone of disagreement.

Within this zone, the arguments for a zero inflation target seem weaker than at the 1993 Bank of Canada conference on this topic, and those for a target range of around  $3$  per cent seem stronger. I reach this conclusion as follows:

There are four separate benefits from zero inflation, the first three of which are well summarized in the survey paper by Black, Coletti, and Monnier. These are (1) benefits from greater money holding as lower inflation brings lower nominal interest rates; (2) benefits from less of the distortion of relative yields caused by inflation and an unindexed tax system; (3) benefits from a possible connection between inflation and either output levels or output growth rates; and (4) probably unmeasurable but possibly significant benefits from better resource allocation when there is no inflation to confuse agents' interpretations of price signals. On the other side is a single argument, discussed in the Crawford and Harrison paper, for increasing inflation to some modest level: this is that workers' resistance to nominal pay cuts is strong enough to make the price-wage mechanism seriously inflexible near zero inflation, so a little inflation that provides room for larger relative and real wage decreases without any nominal pay cuts would improve the allocation of labour and raise employment rates. My reading of the literature and of this conference is that the four benefits of zero inflation now look weaker than in 1993, and the counterargument is both new and significant.

Black, Coletti, and Monnier model the costs of disinflating by  $1$  per cent, and compare those costs explicitly with estimates from the literature of the first three types of benefit listed above, all nicely adjusted to the same welfare scale. The benefits from greater money holding are small, as expected for an economy in which money holdings are an insignificant share of total financial wealth. The benefits from less of the inflation-induced tax distortion are large enough to make a case for disinflation. But as a recent survey paper done at the Bank of Canada has concluded (Ragan 1997), and as Cliff Halliwell commented in the general discussion of the Black, Coletti, and Monnier paper, the policy implication of welfare losses from a poorly indexed tax system may be that we ought to index it better, not contort the economy so that lack of indexation does not matter. If there is a case for

3 per cent rather than zero inflation, in other words, then the distortions from poor tax indexation are not a counterargument if they can be more cheaply removed by proper indexation. I am unconvinced that rough indexation of the tax system is anywhere near as expensive as running recessions whenever inflation bounces up.

Black, Coletti, and Monnier's survey of the possible benefits from the relationship of inflation and output levels or growth rates shows results that are either enormous or zero. The fragility of the enormous results is so clear that the authors do not include these results in their key diagrammatic comparison of costs and benefits. The Ambler and Cardia paper provides a theoretical rationale for disregarding these empirical results entirely, a rationale that Galbraith in his discussion paper boils down to their suffering from many counts of simultaneous equations and omitted variable bias. The combination of empirical fragility and theoretical irrationality seems fatal to the previous consensus that there was some growth dividend to be had from low inflation.

The fourth benefit from zero inflation is the largely unmeasurable but potentially significant benefit from the improved functioning of the price mechanism, well discussed by Ragan (1997). This is the argument that higher inflation throws extra sand into the delicate gears of the price mechanism:<sup>6</sup> agents become more confused about whether price signals reflect relative or general price changes, and therefore make more mistakes in allocating resources. When this argument is spelled out fully, the extra confusion and resource misallocation arises because inflation is more variable and not just higher on average. If an inflation target of 3 per cent rather than zero does not imply more variable inflation, then this last source of benefits from zero inflation disappears.

Does higher inflation mean more variable inflation? One cannot deny the robust empirical evidence correlating average inflation and the variance of inflation in the time-series data of many countries over the past four decades. But one can feel that it is irrelevant to the comparison between an inflation-control target range from  $-0.5$  to  $1.5$  per cent and an inflation-control target range from  $2$  to  $4$  per cent. The time-series evidence comes from four decades during which Canada and many other economies alternated between regimes in which inflation seemed under control at rates below  $4$  per cent and regimes in which it was uncontrolled at much higher rates. I simply do not believe that adopting an inflation target range  $1$  percentage point higher than we currently have, centred on the inflation rate that the U.S. economy has maintained for the last five years, would bring with it any increase in the volatility of inflation. Indeed, some of the

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6. The metaphor is from Groshen and Schweitzer (1996).

Bank of Canada's pronouncements have warned Canadians of the dangers of deflation in the Canadian economy, as something that might get out of hand, and deflation is much more probable with the lower target range.

That leaves the counterargument against zero inflation in a relatively strong position: there does not have to be much downward rigidity of nominal wages for that counterargument to carry the day, if the benefits are as weak as I have concluded above. The Crawford and Harrison paper ends up unconvinced that there is significant downward rigidity in unit labour costs when both inflation and labour productivity growth are low, despite the dramatic picture that Fortin (1996) extracts from wage settlements data for large firms. I remain more convinced of Fortin's results because extending the research to the Survey of Labour and Income Dynamics data base (Simpson, Cameron, and Hum 1997) supports both the hypothesis that there is significant downward nominal rigidity of wages, and the Fortin hypothesis that it is large enough to explain much of Canada's slow growth of employment in the 1990s.

Note that the target range for inflation implied by the Fortin hypothesis is very little larger than our current mid-range target of 2 per cent. For the 1983-90 period, when inflation and productivity growth were high enough that downward rigidity was irrelevant, 95 per cent of the first-year wage increases in the wage settlements data lie within a band 4 per cent on either side of the mean. To preserve that range of variation when there is strong resistance to nominal pay cuts, the average nominal wage increase would need to be 4 per cent. That implies growth of unit labour costs, and ultimately domestic prices, of 4 per cent less productivity growth, or something like 3 per cent. If productivity growth speeds up, as Lipsey (1996) has suggested should happen when we have absorbed the current rash of technological changes in communication and computation, the minimum rate of inflation will be even lower.<sup>7</sup>

### **3 The Response to Gaps Between Actual and Target Values**

Little comment is needed on whether the reaction function should return the economy to its target range gradually or suddenly. The conference did not address this issue much, but the Black, Macklem, and Rose paper devoted some thousands of its simulations to comparing quicker-acting versus slower-acting reaction functions. The results of this useful exercise confirm my earlier belief that policy rules that try to counter inflationary

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7. This would be despite the finding in Oliner and Sichel (1994) that little increase in productivity growth can be attributed to the use of computers over the last two decades.

shocks more quickly will do so at the cost of greater volatility of both output and interest rates. This leads Black, Macklem, and Rose to recommend a forward-looking strategy of targeting the inflation rate some eight quarters ahead. For one raised like myself on Friedman's notion that the lags in monetary policy are at least long, if not also variable, this seems entirely sensible (Friedman 1990).

#### **4 The Choice of the Current Indicator**

When the policy rule targets an inflation rate two years away, there is a long lag between when the policy is executed and when the desired inflation outcome does or does not appear. Such a long lag leaves the central bank not quickly accountable for its actions. Until some observable consequences of the central bank's actions have appeared, the main evidence that the policy is correct is just the central bank's own forecasts that it will be correct. Of course one observable consequence will be a change in exchange rates, which is likely to occur quickly; however, that variable is subject to so many other shocks that its movements cannot be used to evaluate monetary policy at all reliably in the short run. Responses of aggregate demand are mostly much slower to appear.

Hall and Mankiw (1994) have suggested that central banks in this situation adopt a reaction function that targets the expectations of professional private sector forecasters about inflation two years ahead. Such expectations are available with little lag, so it would be quickly obvious whether a monetary policy action had changed at least these expectations of future inflation as desired. Such an innovation in the reaction function was not discussed at all at this conference, though private sector forecasters came in for their share of attention in the Johnson paper. There are several arguments in its favour.

First, the Johnson paper argues correctly that private sector forecasts give monetary policy credibility when they agree with the central bank's targets, and there seems to be a consensus that reaction functions work better if they are credible. A policy that adjusted interest rates until private sector expectations were in line with central bank targets would build in such credibility, always presuming that the private sector forecasts used were representative of the expectations of those private sector agents whom policy must affect.

Of course, the private sector agents could be forecasting incorrectly, in which case the central bank's interest rate changes would be wrong. But the same is true of the central bank's forecasting: it too could be wrong. The main benefit of relying instead on an average of private sector forecasts is that an average reflects a wide range of forecasting approaches (possibly



including the central bank's own approach), rather than just one. If one thinks of different forecasting approaches as each containing some design or paradigm error, then the reliance on some sort of average of private sector forecasts would be diversifying across such paradigm errors.

A reaction function that took private sector forecasts so seriously would undoubtedly have some other political effects as well. The private forecasting community, and the large financial houses employing some of them, would be much more engaged in the policy process, and therefore much more likely to be a constituency of support for it than if the central bank used only its own forecasts.<sup>8</sup>

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8. It has been argued that any indicator such as a monetary aggregate would change its behaviour if ever it were selected as a guide to monetary policy. The same would probably be true of private sector forecasts; they would become the focus of much more attention than now, and would likely improve in quality as a result.

