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Considerations in Reducing Inflation From Low to Lower Levels

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Abstract

In recent years, many countries have successfully reduced their inflation rates to relatively low levels of 2 to 3 percent. The question then arises as to whether it would be desirable to move to even lower rates of inflation. The paper examines the benefits and costs of moving from low inflation to even lower inflation by drawing together recent work on this issue. Once a country has decided to move to an even lower rate of inflation, the question then becomes whether it would be better to achieve this objective through inflation targeting or price-level targeting. The paper critically reviews the arguments for both approaches.

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Summary

In recent years, the rate of inflation in all of the major industrial countries has moved to low levels, averaging just 2 percent in 1997. Despite a degree of estimation bias in calculating inflation rates, these low rates are not generally viewed as consistent with price stability. In the low-inflation environment that now characterizes many industrial countries, should a policy of further disinflation be pursued? This paper reviews the central considerations in making that decision.

The evidence on possible growth effects of disinflation and the mitigation of tax-based distortions is reviewed. Three channels are identified through which a further reduction in inflation could impose economic costs. These are (i) the employment/output effects resulting from downward nominal wage rigidities; (ii) the impossibility of engineering negative real interest rates through monetary policy under price stability; and (iii) the effect of further disinflation on the real cost of servicing government debt. At very low rates of inflation, it also becomes important to ask whether the objective of price stability and the associated benefits can best be realized through targeting the rate of inflation or the price level itself. The paper thus reviews the advantages and disadvantages of price-level versus inflation targeting in a low-inflation environment.

How the potential benefits might stack up against the costs of further inflation reduction appear to depend principally on the extent and duration of nominal wage rigidities in the economy. The superiority of a policy of inflation versus price-level targeting hinges largely on whether a price-level target will tend to induce greater macroeconomic instability. This issue remains unsettled, but a price-level targeting regime, contrary to the dominant view in the literature, need not produce increased output and employment variability.

I. INTRODUCTION

In recent years, the rate of inflation in all of the major industrial countries has moved to low levels, averaging just 2 percent in 1997, and the rate is estimated to fall to 1.7 percent in 1998.² Most would agree that, despite a degree of estimation bias in calculating inflation rates, these low rates are not generally consistent with price stability.³ In the low-inflation environment that now characterizes many industrial countries, should a policy of further disinflation be pursued? Reaching a judgement on this question requires weighing the benefits from a further reduction in inflation against potential costs. For example, the Government of Canada and the central bank recently grappled with this question and decided to extend its official core inflation target of 1–3 percent through 2001.⁴ This paper reviews the important factors that need to be considered in deciding whether to move from low to even lower inflation.

Regarding the possible benefits of disinflation from already low rates, the evidence on possible growth effects and the mitigation of tax-based distortions are reviewed. Three channels are identified through which a further reduction in inflation could impose important economic costs. These are (i) the employment/output effects resulting from downward nominal wage rigidities; (ii) the impossibility of engineering negative real interest rates through monetary policy under price stability (the so-called “Summers Effect”); and (iii) the effect of further disinflation on the real cost of servicing government debt. Finally, the paper reviews the advantages and disadvantages of price-level versus inflation targeting in a low-inflation environment.

II. THE BENEFITS OF A LOWER INFLATION OBJECTIVE

There is a large literature that describes the growth and efficiency gains from moving to a lower inflation environment, but the major share of such gains appear to accrue as rates are reduced from high to moderate, or moderate to low levels. It is difficult to gauge what remains to be gained in moving closer to price stability from already low rates of inflation, in view of the relative lack of historical experience with long-term price stability. Recent

²World Economic Outlook, International Monetary Fund, May 1998, Statistical Table A9, p. 157.

³There seems to be general agreement that measured percentage changes in consumer prices overstate the actual rate of inflation, but the degree of overstatement is subject to debate. For example, in the United States, the CPI is believed to overstate inflation by as much as 0.5–1.5 percent, while in Canada, the degree of overstatement is about 0.5 percent.

⁴Core inflation excludes the effects of changes in food and energy prices, as well as changes in indirect taxes.

empirical work provides evidence that a reduction in the rate of inflation does increase the rate of economic growth (e.g., Fischer (1993) and Barro (1996)). The panel data used in these studies, however, include insufficient examples of very low inflation to offer much assurance that the results apply also at these low levels. Barro (1996) estimates that if inflation falls from 5 percent a year to zero, the growth rate will increase by between 0.1 and 0.15 percent a year, but even these relatively modest gains would certainly be more-than-proportionately smaller if the economy were to start from 3 percent inflation.⁵ In a recent paper, Hess and Morris (1996) acknowledge the weak relationship between growth and low inflation, but they argue that it is still justifiable to pursue anti-inflation policies in a low-inflation environment because of other benefits, namely reductions in inflation uncertainty, real growth variability, and relative price variability.

Feldstein (1996) estimates the gains in moving from very low inflation to price stability stemming from the elimination of the annual deadweight loss associated with tax distortions in a non-indexed tax environment.⁶ He concludes that moving from a stabilized 2 percent inflation rate to price stability, for virtually all assumed parameter combinations, results in a net gain.⁷ For the “most plausible” parameter values, Feldstein concludes that the benefits of price stability exceed the transition costs within six to nine years. On the other hand, lower inflation may reduce tax revenue in the absence of full indexation, requiring an increase in other taxes, which may offset some of the gains from lower inflation. It is central to Feldstein’s analysis, although not necessarily critical to his results, that the nominal rigidities responsible for the employment/output costs associated with disinflation are not permanent. Whether the present value of the gains from reducing inflation will exceed the capitalized costs of disinflation will depend on how long nominal rigidities might persist, and this remains very much an open question.

III. THE IMPORTANCE OF DOWNWARD NOMINAL WAGE RIGIDITY

The existence (and persistence) of downward nominal wage rigidities is a major factor to be considered in deciding whether to try to reduce inflation further. During periods of

⁵In any case, Barro’s estimated effects at low rates of inflation are not statistically significant.

⁶Feldstein (1996, p. 5) acknowledges that the deadweight loss attributable to inflation in a non-indexed tax environment could, in principle, be eliminated by fully indexing the system or by shifting to a system based only on consumption or labor income. But he also points out that no industrial country “has fully (or even substantially) indexed its tax laws.”

⁷Feldstein (1996, p. 51) estimates that the transitional (one-time) cost of disinflating from 2 percent to zero would be about 5 percent of current GDP. The gains from permanently eliminating tax-based distortions resulting from a sustained 2 percent inflation (without indexing), on the other hand, would amount to an estimated 35 percent of current GDP.

disinflation, there is a tendency for nominal wage increases to lag behind the decline in the inflation rate, thereby raising real wages and leading to a rise in unemployment. Once inflation expectations adjust, however, to a new lower level in line with the decline in inflation, real wages should return to a level consistent with the natural rate of unemployment. This process is slowed down at low rates of inflation by the presumed reluctance of workers to accept actual declines in nominal wages, but eventually wages are expected to adjust and unemployment would return to the natural rate.

Akerlof, Dickens, and Perry (ADP, 1996) challenge this view, developing a model in which the existence of potentially *temporary* downward nominal wage rigidity, monopolistic competition, and significant demand and supply shocks that affect independent firms differently, lead to a *permanent* trade-off between inflation and unemployment at low rates of inflation—a long-run Phillips curve that becomes negatively sloped at low rates of inflation. As ADP point out, the observation that there may be a permanent employment-inflation trade-off under downward nominal wage rigidity is not novel as it was also made by James Tobin in 1971. The contribution of the ADP paper is that it both formalizes Tobin's idea and presents quantitative estimates of the long-run unemployment-inflation trade-off. The latter is achieved by calibrating the model to conform with U.S.-based stylized facts and then running a large number of simulations to arrive at estimates of the implied long-run employment-inflation trade-off.⁸ The ADP simulations suggest that the employment loss associated with downward wage rigidity can be quite large at low rates of inflation. The vertical portion of the simulated ADP Phillips curve was calibrated to occur at an unemployment rate of 5.8 percent and the sustainable unemployment rate at 3 percent inflation increases to just 5.9 percent. However, as inflation is reduced further, the long-run equilibrium unemployment rate increases to 6.1 percent at 2 percent inflation and to 6.5 percent at 1 percent inflation. Price stability (zero

⁸In their model, ADP assume the existence of downward rigidities, but they provide for workers to adjust their wage demand behavior to reflect a new lower inflationary environment and the profit performance of individual firms. They assume, however, that firms are monopolistically competitive and that individual firms are subject to demand and supply shocks that affect them differently. It is principally the influence of these independent shocks to firms in the face of downward nominal wage rigidities that produces the possibility of a permanent trade-off between unemployment and inflation, as adjustments in real wages across individual firms is affected. In critiques of the ADP model, it has been pointed out that the magnitude of ADP's permanent trade-off between inflation and unemployment would be diminished considerably if firms were allowed to enter and exit, allowing new firms not constrained by the previous history of nominal wage agreements to absorb labor that is shed by firms going out of business (see Howitt (1997)). The trade-off would also be reduced if firms and workers were treated as forward-looking wage bargainers, instead of just focusing on recent profitability as in the ADP model (see Hogan (1997) and Lavoie (1997)).

inflation) produces a long-run equilibrium unemployment rate of 7.6 percent.⁹ The economic setting characterized by the ADP model implies that a small amount of inflation provides needed “grease” to the workings of the labor market, facilitating real wages cuts when nominal wages are rigid downward. In the ADP framework, because there is a permanent trade-off between unemployment and inflation, the optimal inflation target is not zero.

The analytical framework that produces the strong results of ADP can be challenged on a number of fronts. First, firms may be reluctant to fire workers when hit by transitory shocks because it is costly to do so. Howitt (1997, p. 61) and Hogan (1997, pp. 12–15), for example, point out that firms incur a number of costs in hiring and training workers, so firms may choose to retain workers when faced with shocks perceived to be transitory; evidence of such “labor hoarding” is presented in Bernanke and Parkinson (1991). Second, the ADP framework does not allow for the possibility of entry or exit of firms. For a variety of reasons, firms go out of business and release workers that could be hired by new firms or firms that are expanding and do not face a nominal wage constraint. For both of these reasons, the costs (in terms of unemployment) of adjusting to shocks may not be as large as that simulated in Akerlof, Dickens, and Perry.

Even if there is a long-run trade-off between unemployment and inflation as described by Akerlof, Dickens, and Perry, the labor market grease introduced by a moderate amount of inflation must still be weighed against the “sand” effects of inflation as described, for example, in Groshen and Schweitzer (1997) and Mishkin and Posen (1997). Higher inflation generally introduces greater uncertainty about the future price level and this uncertainty tends to make it more difficult to discern changes in relative prices, which leads to a misallocation of resources. Thus, higher rates of inflation may add uncertainty (add “sand”) to wage and price adjustments, which, other things being equal, is welfare reducing. But the sand effects are much more important at high rates of inflation than at lower rates. Groshen and Schweitzer (1997) find empirical evidence for the existence of “grease” and “sand” effects in the United States and conclude that at high rates of inflation, the “sand” effects dominate the “grease” effects. At levels of inflation up to about 5 percent, they find that the “grease” effects tend to dominate the “sand” effects but the measured effects are not statistically significant. In work on U.S. labor markets, Card and Hyslop (1996) found weak evidence for the hypothesis that inflation greases the wheels of the labor market. Their analysis suggested that when inflation was near 10 percent, about 6–10 percent of workers experienced no change in their nominal wage and the proportion rose to over 15 percent when the inflation rate was reduced to 5 percent. The authors conclude that a 1 percent increase in the rate of inflation reduces the portion of workers with nominal wage rigidities by about 0.8 percent and permits real wages to decline 0.06 percent faster. Thus, the authors find weak evidence that real wage adjustments occur faster when inflation is higher.

⁹Akerlof, Dickens, and Perry (1996, p. 31).

A number of studies have attempted to uncover empirical evidence for the existence of nominal wage rigidities, but the results are not conclusive. Survey data from interviews with U.S. employers, for example, indicate that firms tend to cut wages only reluctantly and under extreme circumstances.¹⁰ Wage settlement data from the U.S. Bureau of Labor Statistics demonstrate a clear asymmetry in the distribution of yearly wage changes, with the distribution being almost completely truncated below zero.¹¹ Examining longitudinal microeconomic data on the distribution of yearly nominal wage and salary changes, Kahn (1997) also finds evidence that the frequency distribution of nominal wage/salary changes spikes at zero. On further inspection, however, he concludes that U.S. wage earners exhibited downward nominal stickiness whereas salary earners do not. For Canada, Fortin (1996) found that in over 1,000 large non-COLA wage settlements over the period 1992–94, there were wage increases in 47 percent of the cases, wage freezes in 47 percent of the cases, and wage cuts in only 6 percent of the cases. In a study on New Zealand, another country that has reduced its rate of inflation in recent years by adopting an inflation-targeting framework, Chapple (1996) found evidence of a concentration in wage changes around zero during the period 1988–93. The authors of these various studies concluded that the relative infrequency of observed wage cuts and the significant number of wage freezes point to the existence of effective nominal wage floors.

Other studies, however, cast some doubts on the existence of strong downward nominal wage rigidities. Parkin (1997) notes that Fortin's evidence is strongly influenced by the presence of public sector wage settlements in the data; when only private-sector settlements are examined, the proportion of settlements with wage freezes, taken as evidence supporting downward rigidities, diminishes. Parkin also notes that conclusions regarding the degree of rigidity are dependent on how wage changes are classified. For example, he observes that Fortin classified multiyear wage settlements that contained a one-year freeze, but future increases, as a zero wage change. If such cases were treated as wage increases, the percentage of wage freezes falls to about 12 percent in Fortin's data, and the suggestion that the relative frequency of wage freezes indicates resistance to wage cuts looks less convincing.¹² Moreover, conclusions about the extent of downward rigidity depend on whether consideration is limited to wage changes or to changes in total compensation. Using a data set that includes information on nonwage compensation (such as bonuses), Crawford and Harrison (1997) find for Canada that the wage-settlements data overstate downward rigidity. In adjusting to external shocks, firms may find it easier to reduce or modify nonwage compensation as a means of reducing total labor costs. In a study using panel data for U.S. firms,

¹⁰See Bewley and Brainard (1993).

¹¹See ADP (1996). These data indicate, however, that under conditions of "extreme duress," such as during deep recessions, there tended to be less resistance to downward wage adjustments.

¹²Hogan (1996), pp. 8–9.

McLaughlin (1994) also finds evidence of a relatively high degree of downward flexibility in total labor compensation.

Overall, the empirical studies of the U.S. and Canadian labor markets suggest that there is some degree of downward nominal wage rigidity. The question arises, however, whether this might be a function of the inflationary environment of the late 1970s and 1980s. As noted by Laidler (1997), the evidence for downward nominal wage rigidity is drawn either from a period of moderate-to-high inflation or from a period when high inflation was still a recent memory. Laidler (1997) and Howitt (1997), among others, have argued that resistance to nominal wage cuts might diminish or disappear once expectations adjust to a low-inflation environment. This is an important consideration. If the economic benefits of moving from a low to a lower inflation rate (or price stability) may be more than proportionally less than those resulting from a move from moderate to low inflation, then the net gain from reducing inflation further is likely to depend critically on how long it might take for nominal rigidities to become less prevalent or even disappear. For example, the rate of inflation in Canada has been reduced sharply over the past five years with little evidence that nominal wages have become noticeably more flexible downward.

IV. THE "SUMMERS EFFECT"

Moving from low to lower inflation also has implications for the effectiveness of monetary policy. Conducting policy in a very low-inflation environment implies that it becomes increasingly difficult for the central bank to engineer significantly negative real interest rates because the lower bound on the nominal interest rate is zero. As a consequence, it will become more difficult for the central bank to stimulate aggregate demand during periods of less than full employment.¹³ In this context, Summers (1991) observes that real interest rates in the United States have been negative in about a third of the years since World War II, and that the real after-tax rate of interest has been negative in about three-quarters of the years during this period. In Canada, real short-term interest rates have remained positive in the past decade even during periods of slow and negative economic growth, especially since 1992 as the inflation rate has declined sharply. Fortin (1996) argues that these high real interest rates, induced by monetary contraction in pursuit of essentially a zero inflation target, caused the Canadian economy to perform poorly in the early 1990s.¹⁴

¹³See Summers (1991) and Fischer (1996). It should be noted, however, that the prevalence of negative real interest rates in Summers' data should not be taken necessarily as evidence that this proposition is correct. The effect on aggregate demand of an expansionary monetary policy depends on whether there are induced changes in *expected* real rates, and such interest rates are more difficult to measure.

¹⁴In Fortin's opinion, Canada's average inflation rate since 1991 of around 1½ percent
(continued...)

While the ability of monetary policy to generate negative real interest rates may be applicable to a large economy (such as the United States), the scope for a small, open economy with liberal capital markets (such as Canada) to engage in similar monetary policy actions would be significantly constrained. If the uncovered interest parity condition tends to hold,¹⁵ and if expectations of changes in bilateral exchange rates are largely determined by relative purchasing-power parity (PPP),¹⁶ real interest rates in a country such as Canada will tend to be tied (in an *ex ante* sense) to those in the United States. Moreover, in a Mundell-Flemming model of a small, open economy with flexible exchange rates and a high degree of capital mobility, monetary policy influences aggregate demand principally through its effect on the exchange rate (and expectations regarding the change in the exchange rate). In such circumstances, an inability to engineer negative real interest rates need not undermine the effectiveness of an expansionary monetary policy, as policy can still induce a real currency depreciation (at least in the short term).

V. EFFECTS OF REDUCING INFLATION ON THE REAL COST OF SERVICING PUBLIC DEBT

Another factor to consider in moving to a lower-inflation environment is that the real cost of servicing outstanding government debt for which the nominal rate is set will tend to increase. As a consequence, a windfall transfer of wealth to public creditors (holders of government bonds) occurs because debt holders will be repaid in money that has greater purchasing power than was anticipated at the time the debt was incurred. This shift in wealth from debtors (government) to creditors (the public) in a disinflationary environment will have implications

¹⁴(...continued)

effectively translates into zero inflation, given a potential upward bias in the change in the consumer price index of as much as 2 percentage points. The Bank of Canada, however, estimates the upward bias in the CPI measure of inflation to be only about ½ percentage point.

¹⁵The *uncovered interest-parity condition* says that if capital is perfectly mobile between any two countries and economic agents are risk neutral, a nominal interest rate at home must equal the equivalent nominal interest rate abroad plus the expected rate of appreciation of the foreign currency. This, of course, is an *ex ante* relationship.

¹⁶*Relative PPP* says that changes in nominal bilateral exchange rates will tend to reflect inflation differentials. There is little, if any, empirical evidence that exchange rates are determined by relative PPP in the short to medium run.

for the fiscal outlook.¹⁷ This issue, however, is not something unique to the question of disinflating from an already low inflation rate.

VI. INFLATION VERSUS PRICE-LEVEL TARGETING

At very low rates of inflation, it also becomes important to ask whether the objective of price stability and the associated benefits can best be realized through targeting the rate of inflation or the price level itself.¹⁸ Neither a price-level target nor an inflation target can be hit with certainty.¹⁹ If they could, inflation targeting and price-level targeting would produce identical results. Policymakers, however, cannot hit these targets precisely because the general price level depends not only on the stance of monetary policy, but also on a variety of factors that are beyond their control. The substantive differences between inflation targeting and price-level targeting stems from how the monetary authorities respond to a missed target under each of these regimes. If an inflation target is missed it is treated as a bygone that is not relevant to the next period's inflation target. When a price-level target is missed, the desired change in the price level is adjusted in the next period (or periods) to attempt to move the price level back toward the targeted path. Thus, if inflation overshoots the target in the current period, an inflation targeter does not modify the inflation objective. A price-level targeter, on the other hand, would cut the next period's inflation goal in order to compensate for the overshooting of the targeted price-level path. When there is no attempt to compensate for random errors (the case of inflation targeting) the actual price level tends to drift away from the path associated with a predetermined rate of inflation.

Because of the potential for base drift, targeting the inflation rate results in uncertainty about the future price level that increases with the length of the planning horizon. Thus, even though economic agents may believe that on average the central bank will hit its inflation target, that belief is consistent with a relatively wide range of possible outcomes for the future price level.²⁰ A price-level target that is subject to the same degree of randomness, on the other

¹⁷This shift in wealth would be a zero-sum transfer from the perspective of the economy as a whole if all debt were held domestically; however, a substantial amount of debt could be held by foreigners (e.g., Canada).

¹⁸See, for example, Svensson (1996).

¹⁹Price-level targeting need not involve a stable price level (a zero inflation rate) as its objective. Instead, provision could be made for a predetermined rate of increase in the price level over time (a nonzero inflation rate).

²⁰Figure 1 shows the results of four simulations in which the targeted inflation rate is set at 0.75 percent per period, and the inflation outcome in each period deviates from the target
(continued...)

hand, produces less price-level uncertainty (*ex ante* and *ex post*) since it is understood that the authorities will systematically correct for past inflation errors (Figure 1); higher-than-targeted inflation outcomes will be followed by a lower target for inflation in subsequent periods (or vice versa) to bring the price level back in line with its targeted path.

The greater price-level uncertainty associated with inflation targeting, however, generally is not considered to have significant adverse effects on economic decision making over the long term. McCallum (1997, pp. 18–19), for example, points out that with a zero inflation target and a price level that behaves as a random walk with the error component's standard deviation at a quarterly frequency set at 0.45 percent (which he identifies as approximating the one-step ahead forecast errors for the United States from 1954 to 1991), a 95 percent confidence interval for the (log) price level in 20 years would be plus or minus 8 percent.

Although a price-level targeting regime offers reduced uncertainty about the future price level over longer planning horizons, it requires the monetary authorities to vary the stance of monetary policy (and the inflation rate that is targeted in any particular period) from one period to the next, depending on whether the price-level target was over or undershot in previous periods. Indeed, in the special case of targeting a fixed price level, the monetary authorities would need to aim for deflation about half the time. The need to target deflation on occasion is often cited by critics of price-level targeting as a factor weighing heavily in favor of the inflation-targeting approach.²¹ However, as indicated above, a price-level targeting regime need not necessarily target a fixed price level. The price level can be allowed to rise over time, and in such a price-level targeting regime, there would be fewer instances where deflation was targeted; if the targeted price-level path is sufficiently steep (i.e., the implied inflation objective is sufficiently high) and/or the variance of inflation shocks is sufficiently low, very few periods of actual deflation need occur (Table 1).²²

²⁰(...continued)

reflecting a random disturbance that is assumed normal with a mean of zero and a standard deviation of 0.25 percent. This implies that a 95 percent confidence interval for the inflation outcome in each period ranges from 0.25 percent to 1.25 percent.

²¹See, for example, Fischer's (1994, p. 282) observation that, "... there are good reasons not to target negative inflation. Price-level targeting is thus a bad idea, one that would add unnecessary short-term fluctuations to the economy." However, the paper subsequently notes (p. 284) that a price-level target need not imply zero inflation.

²²In the four simulations presented in Table 1, in no period would it have been necessary to pursue a deflationary monetary policy in order to achieve the predetermined price level for the next period. Over 1,600 observations, the per period targeted inflation ranged from a low of 0.05 percent to a high of 1.56 percent. The corresponding per period inflation outcome (which reflects the targeted inflation and the random shock) did, however, produce 20 periods (continued...)

Apart from the possibility of needing to target periodic deflation, a prominent concern in the literature regarding the use of price-level targeting is that it may tend to result in greater variability of real output, with attendant economic costs associated with frequent adjustments in goods and factor markets. In this view, the increased variability in the stance of monetary policy under price-level targeting results in greater inflation variance (as revealed, for example, in the simulation results displayed in Table 1) and, because of the existence of nominal rigidities, greater variability in output and employment.

However, some additional considerations serve to mitigate concerns about greater output variability with a price-level target. While an inflation targeting regime may produce less variance in inflation outcomes per period (say quarterly) than a price-level targeting regime, the variance of the average inflation rate over more than one period (say the annual average) tends to be lower under price-level targeting (Table 1).²³ Given the long and variable lags associated with the effects of monetary policy, the possible existence of employment persistence in labor markets, and the complexity of expectations formation, it is not at all clear whether a greater variance in single-period inflation rates (price-level targeting), or a greater variance in the average inflation rate over more than one period (inflation targeting) will produce greater real output instability.

Moreover, in a rational expectations framework without nominal rigidities, it is not inflation variance *per se* that generates variability in output and employment, but *unanticipated* changes in inflation (or the price level). Under an identical stochastic structure for inflation shocks, the unanticipated portion of the variance of an inflation-rate series is identical for a price-level or an inflation targeting regime. Consequently, the full amount of the increased inflation variance under price-level targeting would reflect predictable changes in the stance of policy, and this predictability would tend to mitigate the effects of inflation variance on real output and employment.

In addition, the literature is beginning to cast doubt on the proposition that inflation targeting as implemented in practice would produce lower single-period inflation variance. That proposition relies on the use of a mechanistic (exogenous) monetary policy rule. Svensson (1996)

²²(...continued)

(1.25 percent of the total realizations) of deflation. Under the same stochastic properties, outcomes under an inflation targeting regime resulted in just one period of actual deflation.

²³The reason is that while the inflation targeting regime ignores under and overshooting of targeted inflation rates, a price-level targeting regime corrects for over and undershooting and, in so doing, tends on average to be closer to the targeted trend increase over a series of periods. In technical terms, with an identical stochastic structure for serially independent inflation shocks, the inflation outcome in the case of price-level targeting will display negative serial correlation as a result of the policy rule, whereas the inflation outcome under inflation targeting will be serially uncorrelated.

and Gavin and Stockman (1991) have evaluated price-level versus inflation targeting regimes when central bank behavior is endogenous, in the sense that the bank's decisions depend on the goals assigned by society (e.g., price-level versus inflation targeting), the institutional structure (including penalty rules for deviations), and the personal preferences of central bankers. Both papers point out that central bankers may have incentives to deviate from a designated inflation or price-level target. In Svensson's model, the inflation outcome under inflation targeting depends on the *level* of the unemployment rate, whereas it depends on the *change* in the unemployment rate under price-level targeting. If the unemployment rate has a moderate degree of persistence (firms are slow to lay off workers in the face of a negative demand shock), the *change* in the unemployment rate is less variable than the *level*, and thus, inflation variability will be *greater* under inflation targeting than under price-level targeting. A price-level targeting regime is unambiguously superior in Svensson's framework because it produces no price-level drift and because it results in lower inflation variability than an inflation-targeting regime. In a similar vein, Gavin and Stockman develop a model of central bank behavior in which inflation outcomes are observable but inflation (or price-level) targets are not. They show that under a reasonable penalty structure a central bank that is assigned a price-level target will have a greater incentive to adhere to that target than one assigned an inflation target. In their model, policymakers have an increased incentive under inflation targeting to blame overshooting on random events and to maintain an inflation bias.

VII. SUMMARY AND CONCLUDING COMMENTS

While the essential factors to be considered in reaching a judgement on adopting a lower inflation target (or moving to price stability) have been reviewed here, it is not possible from the available economic literature to draw firm conclusions on the desirability of such a policy choice. Both empirical evidence and theoretical considerations indicate that substantial benefits will accrue when moving from high or moderate to low levels of inflation. It is difficult, however, to find statistically significant evidence of a positive growth effect when inflation is reduced from low to lower rates, although this may in part reflect the lack of experience with very low rates of inflation. Nevertheless, reducing the rate of inflation further to a very low level would help to mitigate distortions caused by a lack of full indexation in the tax system. It may also help to reduce relative price uncertainty, thereby further improving resource allocation. How these benefits might stack up against the potential costs of further inflation reduction appear to depend principally on the extent and duration of nominal rigidities in the economy. Output and employment losses stemming from further disinflation could fall somewhere along a spectrum from being permanent (as argued by Akerlof, Dickens, and Perry) to being short-lived, vanishing once economic agents become accustomed to a new lower inflation environment. If the output and employment losses are relatively long-lived, the present value of the costs arising from the move from a low to a lower inflation rate could exceed the present value of the benefits that would accrue from further inflation reduction. From a political economy perspective, the time that it might take the benefits to offset the initial losses from a policy of further disinflation may also be a determining factor in deciding

whether to pursue such a policy action; the longer the expected “payback period,” the more difficult it may be to take the decision to further disinflate.

The superiority of a policy of inflation versus price-level targeting hinges largely on whether a price-level target will tend to induce greater macroeconomic instability. This issue remains unsettled. Until recently, the dominant view in the literature was that greater price-level uncertainty over distant planning horizons associated with inflation targeting would impose relatively smaller social costs compared with the costs potentially arising from greater variability in output and employment associated with price-level targeting. The latter proposition, however, has been challenged on a number of grounds. If the expectations of economic agents are formed utilizing information about the nature of the monetary policy regime, the increased variability in the stance of monetary policy associated with price-level targeting need not imply a concomitant increase in macroeconomic instability. The same conclusion can be reached if the actions of central bankers depend on the monetary policy rule assigned to the central bank, the institutional structure for implementing the policy rule, and the preferences of the central bankers. In that case, a price-level targeting regime need not produce increased single-period inflation variance and thus, regardless of assumptions about expectations, need not produce increased output and employment variability.

Table 1. Price-Level Versus Inflation Targeting: Simulation Results

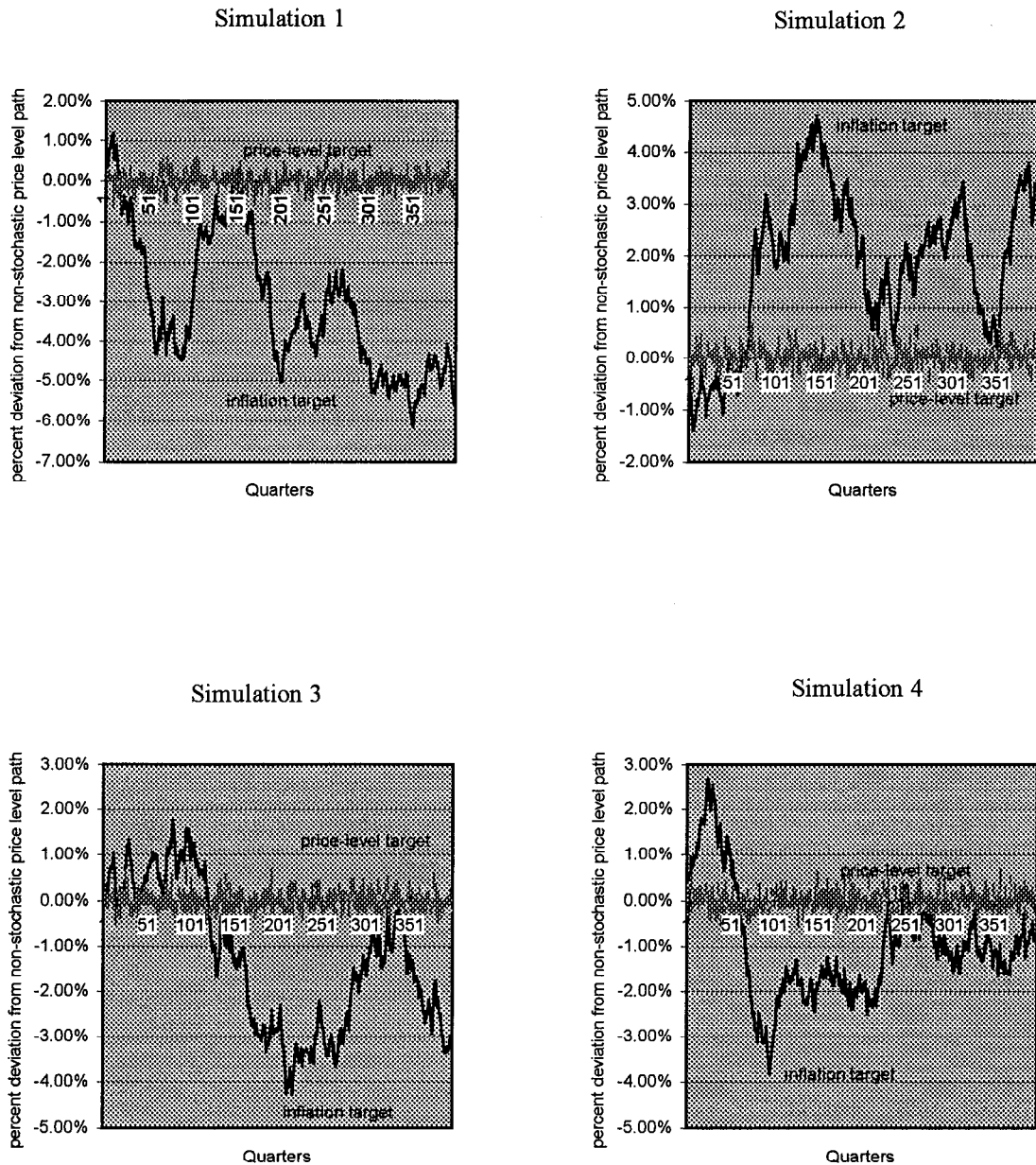
(In percent)

Descriptive Statistics	Inflation Targeting	Price-Level Targeting
A. Simulation 1		
Mean π outcome	0.74	0.75
SD π outcome	0.25	0.34
Min quarterly π outcome (target)	-0.05	-0.25 (0.07)
Max quarterly π outcome (target)	1.43	1.89 (1.56)
Mean 4-quarter annualized moving average π	2.98	3.04
Std Dev of mean 4-quarter annualized moving average π	0.54	0.35
B. Simulation 2		
Mean π outcome	0.76	0.75
SD π outcome	0.24	0.32
Min quarterly π outcome (target)	0.09	-0.10 (0.08)
Max quarterly π outcome (target)	1.42	1.66 (1.42)
Mean 4-quarter annualized moving average π	3.07	3.04
Std Dev of mean 4-quarter annualized moving average π	0.51	0.35
C. Simulation 3		
Mean π outcome	0.74	0.75
SD π outcome	0.24	0.36
Min quarterly π outcome (target)	0.07	-0.33 (0.05)
Max quarterly π outcome (target)	1.45	1.93 (1.43)
Mean 4-quarter annualized moving average π	3.00	3.04
Std Dev of mean 4-quarter annualized moving average π	0.49	0.37
D. Simulation 4		
Mean π outcome	0.75	0.75
SD π outcome	0.24	0.35
Min quarterly π outcome (target)	0.12	-0.34 (0.10)
Max quarterly π outcome (target)	1.41	1.85 (1.38)
Mean 4-quarter annualized moving average π	3.03	3.04
Std Dev of mean 4-quarter annualized moving average π	0.46	0.36

The simulations include 400 observations based on a per-period (e.g., quarterly) inflation target of 0.75 per-cent and an inflation shock that is independent and identically distributed as normal with mean zero and standard deviation 0.25 percent.

Figure 1. Price-Level Variation Under Inflation Versus Price-Level Targeting

(Percent deviation from non-stochastic case)



Sources: IMF Staff simulations. A targeted inflation rate of 0.75 percent per period was subjected to a normally distributed random shock with a zero mean and a standard deviation of 0.25 percent. This implies that a 95 percent confidence interval for the inflation outcome in each period ranges from 0.25 percent to 1.25 percent.

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