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Price-Level Uncertainty and Inflation Targeting

Robert Dittmar,
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International discussions of monetary policy today often are focused on inflation targeting. At least eight central banks around the world have now adopted explicit targets for inflation. In all of these cases, the central bank has a flexible policy process that focuses on inflation but also cares about other variables, such as employment, output growth, and the behavior of a short-run policy guide such as the federal funds rate or an exchange rate.[1] Even among countries that do not have explicit inflation targets, their policy behavior has been portrayed as if they have inflation targets. Taylor (1993) explains how U.S. monetary policy can be characterized as a rule for targeting inflation. In this rule, the Federal Reserve systematically adjusts the federal funds rate in response to deviations of output from potential and inflation from an implicit target.

One of the perceived advantages of inflation targeting is that a long-run price stability goal may be pursued in combination with other short-run objectives, usually for real output. There is some confusion about this point in the literature. In a chapter titled "The Rationale for Inflation Targeting," Bernanke et al. (1999) argue:

> …the increased emphasis on controlling inflation arises not because unemployment and related problems have become less urgent concerns, but because economists and policy-makers are considerably less confident today than they were thirty years ago that monetary policy can be used effectively to moderate short-run fluctuations in the economy, (page 10).

Later in the same chapter, they clearly define inflation targeting to be a framework with multiple short-run objectives:

> *If* inflation targeting were to be treated as a policy rule in the classical sense (which, again, we do not think it should be), it would indeed be open to some serious criticisms. First, the idea that monetary policy literally has no goals other than to control inflation would find little support from the public, from central bankers, or from monetary economists. Second, given that governments and central banks do care about production, employment, exchange rates, and other variables besides inflation, treating inflation targeting as an ironclad policy rule could lead to very poor economic outcomes.

As the two quotes suggest, inflation targeting is appealing to those who think that having a target for inflation focuses policymakers' attention on the inflation objective as well as those who want rule-like policy, but still believe that the central bank can achieve multiple objectives. In this paper we examine inflation-targeting regimes to see how having multiple objectives affects uncertainty about future price levels.

We make two points about commonly proposed rules for inflation targeting. First, we argue that there is a great deal of uncertainty about the price level and inflation inherent in current proposals to target inflation. We show that the degree to which the central bank cares about the real economy can have a large impact on price-level (and inflation) uncertainty. Indeed, we find that

[1] See Bernanke et al. (1999) and Siklos (1999) for recent descriptions of inflation-targeting regimes.

Table 1

Inflation Statistics in the G-10 plus Switzerland — Different Time Periods

	1957:1 - 97:4		1957:1 - 73:1		1973:2 - 84:4		1985:1 - 97:4	
Country	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Belgium	4.19	3.52	3.05	2.44	7.82	3.57	2.33	1.77
Canada	4.64	3.72	2.83	2.40	8.84	3.07	3.07	2.34
France	6.01	4.85	5.30	5.05	10.76	2.91	2.58	1.42
Germany	3.21	2.72	2.95	2.78	4.57	2.48	2.30	2.41
Italy	7.75	6.69	3.73	3.41	16.13	5.85	5.11	2.19
Japan	4.59	5.71	5.04	4.40	7.56	7.67	1.35	2.72
Netherlands	4.21	4.52	4.62	5.77	6.26	3.29	1.84	2.04
Sweden	6.13	6.94	4.63	8.26	9.90	5.85	4.57	4.42
Switzerland	3.42	3.12	3.50	2.68	4.34	3.96	2.49	2.49
United Kingdom	6.82	6.80	4.33	4.10	12.77	8.42	4.51	4.03
United States	4.47	3.36	2.79	1.86	7.99	3.80	3.35	1.55
Average Across Countries	5.04	4.72	3.89	3.92	8.81	4.62	3.05	2.49

NOTE: Std. Dev. is the standard deviation of inflation measured quarterly at annual rates.

the magnitudes of uncertainty that prevailed across the G-10 countries throughout the last four decades are the expected consequence of commonly proposed inflation-targeting regimes. Second, we show that if central banks want both to stabilize business cycle fluctuations and to achieve price stability, then it may be useful to adopt a long-term objective for the price level. A long-run price-level objective can be implemented in a way that represents a minor change in the way central banks currently implement policies oriented around inflation objectives. Yet, this minor change in the central bank's decision-making process has the potential to deliver price stability.

In this paper, we deliberately chose a model from the inflation-targeting literature that implies a tradeoff between output and inflation variability. In preliminary work for this article, we used the general equilibrium model of Gavin and Kydland (1999), which was modified to include a central bank that targets inflation or the price level. Also, the central bank incorrectly believes that the Phillips Curve represents a viable framework for making monetary policy. In this general equilibrium model, the classical dichotomy approximately holds, so there is no measurable tradeoff between inflation and output variability. In the final analysis, we chose to use the simple Phillips Curve model as the representation of the economy (rather than the general equilibrium model) for two reasons. First, the results for inflation and the price level from the general equilibrium model are almost identical to those presented in this article. Second, since monetary policymakers do not normally use the general equilibrium framework, we want to make it clear that our results do not depend on it.

THE INFLATION EXPERIENCE IN THE G-10: 1957-1997

Since World War II, the monetary policies of the leading economies of the world have framed their discussion about price stability in terms of inflation, not the price level. Figure 1 shows the inflation rates for the G-10 countries (including Switzerland). Generally, these countries were part of the fixed exchange-rate regime set up at Bretton Woods after WWII. As Figure 1 shows, inflation rates were relatively low and close together during this period. By March 1973, all of the countries began to

experience higher and more variable inflation. There were a variety of monetary experiments; some countries began to target monetary aggregates, others joined together in smaller groups to fix exchange rates. By 1985, all of the countries appear to have gained more control over inflation. The period following 1985 appears to be one of relatively stable inflation, more like the period under the Bretton-Woods Agreement.

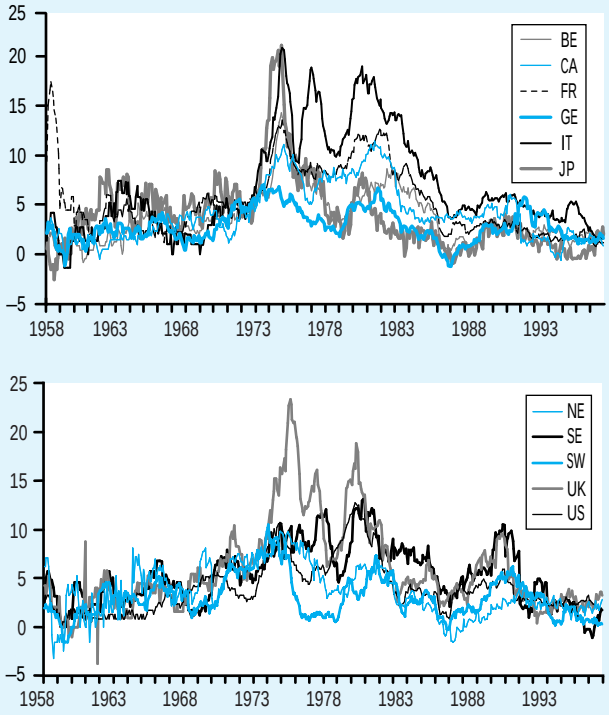
Table 1 depicts the average inflation rates for the full 40-year period and for three subperiods. The unweighted average inflation rate in these 11 countries for this 40-year period was 5.04 percent and the standard deviation of quarterly inflation was 4.72 percent at an annual rate. During the first period, 1957:Q2 to 1973:Q1, inflation averaged just 3.89 percent with an average quarterly standard deviation of 3.92 percent (annual rate). In the period following the breakdown of the Bretton-Woods agreement, average inflation rose to 8.81 percent and the standard deviation averaged 4.62 percent. Since 1984, the average inflation rate has dropped dramatically to 3.05 percent, almost a full percentage point below the average during the period of Bretton Woods. The average standard deviation of inflation also has been much lower at 2.49 percent.

The inflation rates shown in Figure 1 were associated with widely varying behavior of price levels. Figure 2 shows the Consumer Price Index (CPI), normalized to one in January 1957, for each of the G-10 countries plus Switzerland. Italy had the highest average inflation (7.75 percent annual rate) throughout the last 40 years. The lowest average inflation was in Germany where the inflation rate averaged 3.21 percent during the full period. The broad range of experience shown in Figure 2 provides a frame of reference for considering the magnitude of uncertainty about the price level implied by alternative monetary policy regimes.

Figure 1

CPI Inflation for the G-10 Countries

Monthly data, year over year growth



Levels Versus Growth Rates

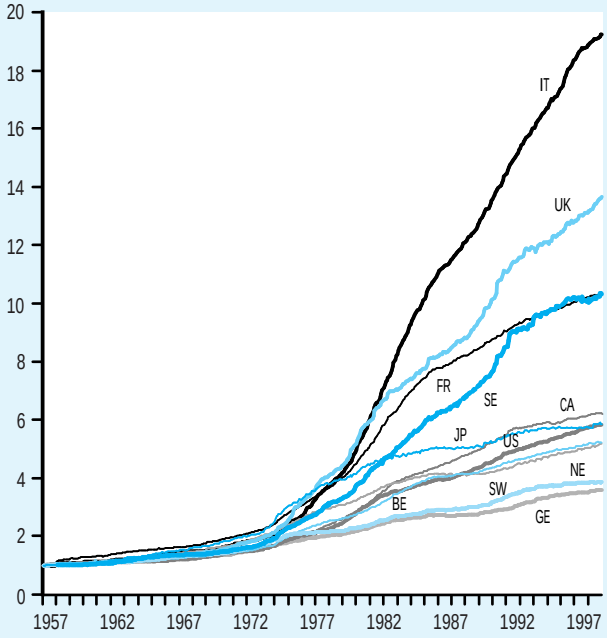
A period-by-period inflation-targeting regime causes the error in forecasts of the price level to rise with the forecast horizon. Price-level targeting has been recommended as a means of reducing long-term uncertainty about the price level. McCallum (1997) dismisses the notion of price-level targeting by comparing the log of the price level that followed a pure random walk to a preset target path. Figure 3 shows the amount of price-level uncertainty inherent in a policy that makes the price level a pure random walk with annual drift of 5 percent inflation, approximately the post-war average inflation for the G-10. We assume (as did McCallum) that the random walk has an unpredictable component at the quarterly frequency that is approximately equal to the standard deviation of one-step ahead forecast errors for the United States throughout 1954-91 (0.0045 percent at a quarterly rate).

After 20 years, the 95-percent confidence interval for the price level under the random walk assumption is plus and minus 8 per-

Figure 2

The CPI for the G-10 Countries

Indexed to 1 in January 1957



cent of the path for the price level implied by a deterministic 5 percent inflation. After 40 years, the 95-percent confidence interval rises to plus and minus 12 percent. Clearly, the outcome for the price level under this random walk assumption is much more certain than the range of uncertainty implied by the G-10 experience. The pure random walk implicitly assumes that the central bank can commit to an inflation target, ignore other variables, and control inflation up to a small random error. In the rest of the paper, we explore what happens when we drop the assumption that the central bank ignores other variables.

INFLATION TARGETS AND THE PHILLIPS CURVE

In this section we derive optimal policy rules using alternative specifications of a central bank loss function. A simple Phillips Curve model calibrated to approximately match econometric estimates in Rudebusch and Svensson (1998) portrays the economy. Not surprisingly, our optimal policy function looks much like a class of inflation-targeting rules that have been proposed by a variety of authors.[2]

To examine the price level implications of inflation-targeting rules we adapt a Phillips Curve model used by Svensson (1997a, 1997b). The model has three main elements: a multi-period objective function for the central bank, an aggregate supply equation, and a rational expectations assumption.

As in Svensson (1997b), the central bank minimizes a quadratic loss function

$$(1) \quad L^A = \sum_{t=0}^{\infty} \beta^t \left(\lambda y_t^2 + (\pi_t - \pi^*)^2 \right),$$

where y_t is the deviation of output from the target level and $(\pi_t - \pi^*)$ is the deviation of inflation from the central bank's inflation target. The term, λ, gives the weight on output gap relative to the weight on inflation in the central bank's loss function. As shown by Svensson (1997b), the real economy in this model behaves marginally better (the variability of the output gap is lower) when the central bank cares more about output stabilization.

In this article, the economy is represented by a short-run aggregate supply curve with persistence in the output gap:

$$(2) \quad y_t = \rho y_{t-1} + \alpha(\pi_t - \pi_t^e) + \varepsilon_t,$$

where ρ determines the persistence in the output gap, α determines the response of the output gap to unanticipated inflation, and ε_t is an i.i.d. technology shock with mean zero and variance σ_ε^2.

We used this model in Dittmar et al. (1999) to challenge an assumption often made by those who analyze monetary policy in a Phillips Curve framework. The assumption is that price-level targeting would cause large output variability. With a highly persistent output gap, the inflation-output variability tradeoff is better with price-level targeting than it is with inflation targeting.

The inflation-targeting rule derived in Dittmar et al. (1999) is given by:

[2] For a recent discussion of this literature, see Cecchetti (1998) and Rudebusch and Svensson (1998).

$$(3)\quad \pi_t^A = p_t^A - p_{t-1} = \pi^* - \frac{\alpha\lambda\rho}{1-\beta\rho^2}\, y_{t-1} - \frac{\alpha\lambda}{1-\beta\rho^2+\alpha^2\lambda}\, \varepsilon_t,$$

where the superscript A refers to the price or inflation-rate target that is optimal, given equations 1 and 2.

Uncertainty About the Price Level and Output Stabilization. This section reports the results of computational experiments that calculate the amount of price-level uncertainty expected in policy regimes that are distinguished by alternative values of λ, the relative weight on output stabilization in the central bank's loss function. In the model there is a tradeoff between persistence in the output gap and the weight the central bank puts on output in its loss function. If output is more persistent, inflation is more variable for a given value of λ. In the computational experiments we set ρ equal to 0.9 and α equal to 0.5. These assumptions imply a Phillips Curve with a slope of 0.2 when the Phillips Curve is written in terms of the inflation rate. Using this form, Rudebusch and Svensson (1998) estimate the slope to be 0.14. We could match this number by increasing the persistence of the output gap or the slope of the Phillips Curve. Doing either would increase the uncertainty about the price level implied inflation targeting, so we decided to stay with the assumptions that are used in our earlier paper. We assume that the interest rate is 4 percent at an annual rate, so the quarterly discount factor is approximately 0.99. The standard deviation of the random error in the aggregate supply function 2 is assumed to be 0.75 percent at a quarterly rate. This calibration results in an output gap series that has a standard deviation that is about half as large as observed in U.S. data. Again, increasing the assumed variance of the supply shock would tend to increase uncertainty about the long-term path of the price level for a given value of λ.

Figure 3

Price Level Uncertainty with a Random Walk Inflation Policy

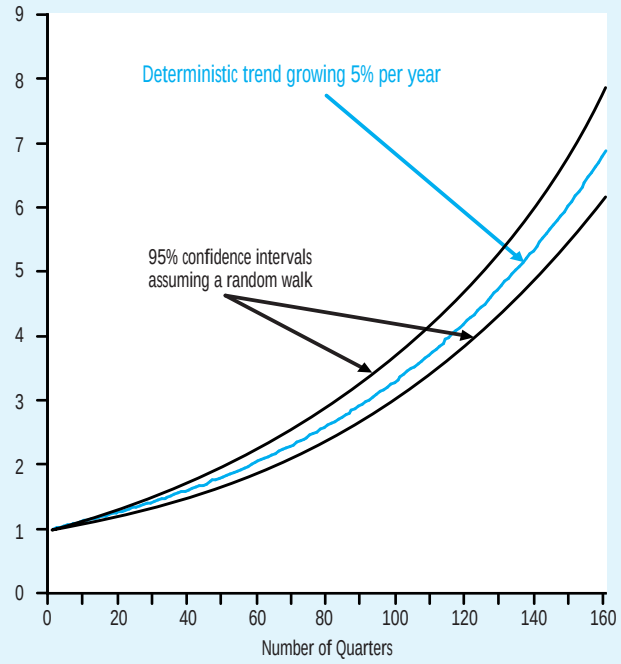


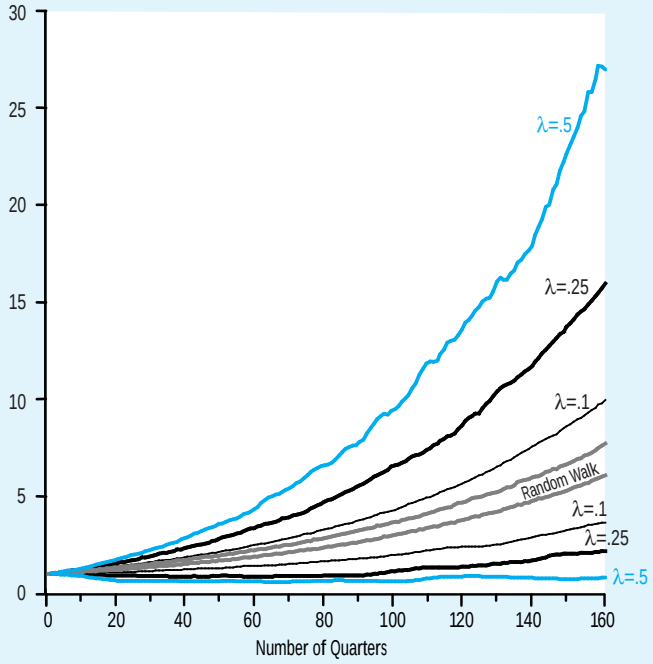
Figure 4 shows the 95-percent confidence intervals for the price levels expected in our three experiments as well as for the random walk experiment shown in Figure 3. The three cases include λ equal to 0.5, 0.25, and 0.1. These values for λ correspond to coefficients on the lagged output gap in the policy rule equal to 1.13, 0.57, and 0.23, respectively. As shown in Figure 4, with $\lambda = 0.5$, the 95-percent bounds encompass the high inflation of Italy and the low inflation experience of Germany. With $\lambda = 0.25$ we still have an enormous range of uncertainty about the price level. Only in the case of Italy does the actual CPI lie above this range. Since the only source of uncertainty is from output, setting $\lambda = 0$ in this model would result in a deterministic path for the price level as shown in Figure 3. Even setting λ as low as 0.1 would result in much greater uncertainty than implied by the random walk.

How does one reconcile the recent rel-

Figure 4

Price Level Uncertainty with Inflation Targeting and Concern about the Output Gap

(95% confidence intervals under alternative assumptions about policy)



ative stability and convergence of inflation rates in the G-10 with our model? There are at least two ways consistent with our model. First, policymakers actually may be cognizant of the past deviations from inflation targets and attempt to offset them in the future. Second, an inflation target probably focuses attention on price stability and reduces the weight on the real economy. In practice, inflation targets have been useful because they give central banks political cover to pursue anti-inflation policies even in times when the economy is weak. And third, central banks around the world have been lucky; that is, the deviations of output from trend have been relatively small since 1990. The challenge for monetary policy, here and abroad, is to adopt policy institutions that will continue to deliver low and stable inflation rates.

AN ERROR-CORRECTION RULE WITH A LONG-TERM PRICE OBJECTIVE

One way to reduce uncertainty about future inflation is to adopt a long-term objective for the price level. The benefits of having such a long-term goal can be lost in analysis that portrays the central bank's options as one of two extremes: either inflation targets or price-level targets. In this section, we analyze an inflation-targeting procedure that is anchored to a deterministic path for the price level. We could define such a policy rule just by adding an error correction term to our inflation-targeting rule, equation 3. As you will see, this is in fact what happens if the policymaking committee is made up of two types of individuals: type A, who want to target inflation, and type B, who want to target the price level.

If the policymaker cares about deviations of the price level rather than the inflation rate, the natural logarithm of the price level replaces the inflation rate in the loss function. We reformulate the objective function as below:

$$(4)\quad L^B = \sum_{t=0}^{\infty} \beta^t \left(\lambda y_t^{\,2} + (p_t - p_t^*)^2 \right),$$

where the target path for the price level may or may not be constant. Combining this objective function with the aggregate supply equation leads to the following decision rule for price-level targeting:

$$(5)\quad p_t^B = p_t^* - \frac{\alpha\lambda\rho}{1-\beta\rho^2}\, y_{t-1} - \frac{\alpha\lambda}{1-\beta\rho^2+\alpha^2\lambda}\, \varepsilon_t,$$

where the superscript *B* indicates the price-level target that is optimal for a policymaker who has the objective function described in equation 4.

Suppose that there is a policymaking committee that includes a mixture of types A and B. The monetary policy rule can be rewritten as a combination of the two rules:

(6) $$p_t = \delta p_t^A + (1-\delta) p_t^B.$$

When $\delta = 1$, all the policymakers want to target inflation and the central bank is following the rule given in equation 3. When $\delta = 0$, nobody on the committee wants to target inflation and the central bank is following a price-level rule. When δ falls between 0 and 1, there are some of both types on the committee and the central bank is following a combination rule that is equal to the inflation-targeting rule with an error-correction term on the deviation of the price level from a target path. To show this, we note that $p_t^* = \pi^* + p_{t-1}^*$ and substitute equations 3 and 5 into 6 to get

(7) $$\pi_t = \pi^* - \frac{\alpha\lambda\rho}{1-\beta\rho^2} y_{t-1} - \frac{\alpha\lambda}{1-\beta\rho^2+\alpha^2\lambda}\varepsilon_t + (1-\delta)(p_{t-1}^* - p_{t-1}).$$

Equation 7 has the same form as equation 3 except for the addition of the error correction term.[3] This general form of the model is used to examine the effects of changing the relative weight on the alternative rules.

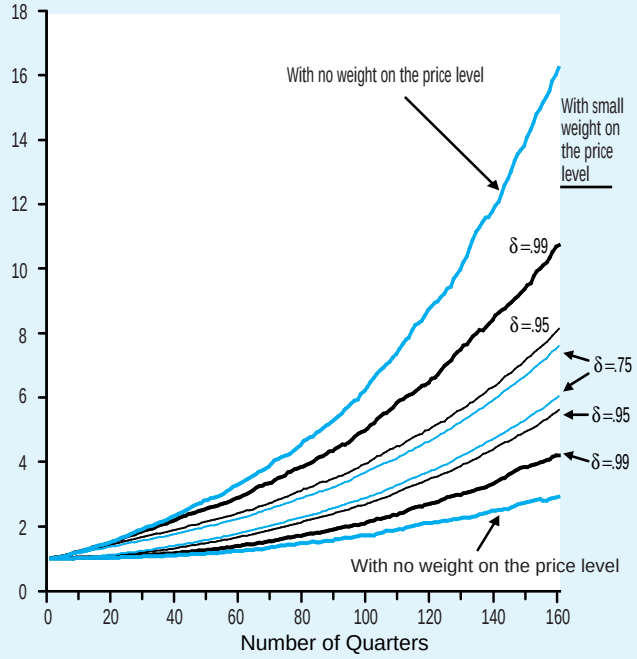
Uncertainty About the Price Level with the Mixed Rule. In computations below, we set $\rho = 0.9$, $\alpha = 0.5$, $\lambda = 0.25$, and $\sigma_\varepsilon = .0075$. In all of our experiments the price level objective is a deterministic path growing smoothly at 5 percent per year (as shown in Figure 3). The experiment was run four times, each with alternative values of the error correction parameter, $(1-\delta)$: 0, 0.01, 0.05, and 0.1. Each experiment consisted of 1,000 repetitions, each drawing a new set of random shocks to output—the only source of uncertainty.[4]

Figure 5 shows the results. The highest and lowest lines represent the 95-percent confidence intervals for the expected position of the price level with $(1-\delta) = 0$ and $\lambda = 0.25$ (also shown in Figure 4). Setting $(1-\delta)$ equal to 0.01 eliminates much of the uncertainty about the price level. If we set it as high as 0.1, we find the 95-percent bounds are about equal to plus and minus 12 percent, the expected bounds for the random walk after 40 years. Note that at 20 years, the 95-percent confidence bounds also are plus and minus 12 percent, while random walk confidence intervals were plus and minus 8 percent. The confidence bounds stabilize at a constant percent of the price level with a nonzero error-correction parameter. With a random walk the uncertainty grows with the time horizon.

Figure 5

Inflation Targeting with a Long-Run Price Objective

(95% confidence intervals with l =.25)



OBJECTIONS TO PRICE-LEVEL TARGETING

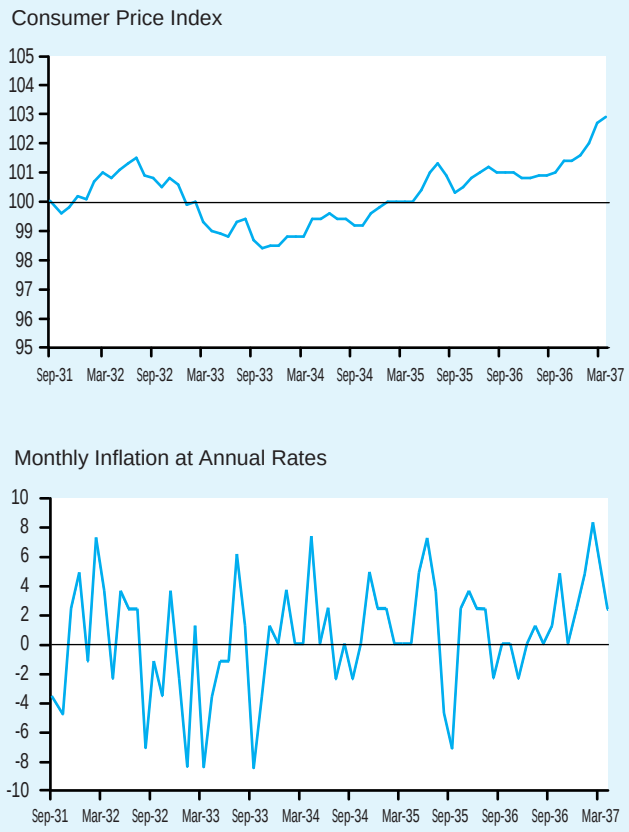
Kiley (1998) objects to the Neoclassical form of the Phillips Curve used by Svensson (1997a,b)—and in this paper. He suggests that if Svensson had used a New Keynesian specification he would

[3] Black, Macklem, and Rose (1997) report results using the Bank of Canada's policy model in which some part of the efficient frontier in an output-inflation variability tradeoff is determined using an error correction framework with a long-term price-level objective.

[4] We used a common seed for the random error so the sequence of random errors was identical for each of the four separate experiments.

Figure 6

Sweden's CPI target in the 1930s



not have found such a favorable result for price-level rules. Dittmar and Gavin (1999) show that this is not the case. They show that using the New Keynesian Phillips Curve actually strengthens the case for price-level targeting relative to the Neoclassical specification.

Simulation results using econometric models typically find targeting the price level destabilizes output, often in dramatic fashion. These papers have assumed backward-looking expectations for inflation. For example, see the results and references in Haldane and Salmon (1999). In our judgment, the Lucas (1976) critique is very important for this issue. For example, when Black et al. (1997) and Williams (1999) use econometric models with forward-looking inflation expectations, they find that some forms of price-level targeting appear to reduce inflation variability (relative to short-run inflation targeting) without increasing output variability.

There also is some confusion about terms in the debate over price-level targeting. It is important to distinguish between prolonged bouts of deflation, such as the one that occurred in the United States during the depression, and the normal fluctuations in a price index, which are caused by measurement problems and real shocks. Deflation cannot persist unless it is accompanied by a shrinking money supply (validated by monetary policy decisions). Fischer (1994) and Cecchetti (1998) argue that with a constant price-level target, you will get deflation half the time. But if the deviations of the price level from a target path are the result of real factors and not the result of monetary policy decisions, then they are unlikely to grow larger over time. Our results show that only small corrections would be needed to return the price level to its target path.

The belief that having a policy regime with a long-term price-level objective would be bad comes from the assumption that monetary policy actions, even those that are part of a systematic response to shocks, can have large real effects. We are skeptical about this assumption, but realize that it is widely shared in the community of policy advisors. That is why we choose the Phillips Curve approach in our analysis and why we chose such small values for the error-correction parameter in the previous section. The small value means that the short-term reaction to the deviations of the price level from the long-run path will be small relative to the central bank's reaction to the output gap. Of course, if the price-level gap becomes large, then even with a small error-correction parameter, the required policy reaction may approach the scale of response implied for output gaps.

THE SWEDISH MONETARY EXPERIMENT

There is at least one case of a price-level target in history. It occurred during a period when there were large real shocks. In Sep-

Table 2

Sensitivity of output gap and in ation variability to alternative values of λ and δ

Alternative values of λ	Output Gap		Inflation		Correlation: inflation and the output gap
	Standard Deviation	First Order Autocorrelation	Standard Deviation	First Order Autocorrelation	
(δ = 1.0)					
0.50	0.98	0.88	1.24	0.88	–1
0.25	1.22	0.88	0.77	0.88	–1
0.10	1.42	0.88	0.36	0.88	–1
Alternative values of δ					
(λ = 0.25)					
0.99	1.22	0.88	0.76	0.87	–0.99
0.95	1.22	0.88	0.68	0.84	–0.89
0.90	1.22	0.88	0.61	0.79	–0.78

tember 1931, the Swedish Riksbank left the gold standard and began to target the Consumer Price Index (CPI). The CPI was normalized to 100 in September and stayed near 100 until April 1937—when the directors of the Riksbank decided to abandon the CPI objective, rather than let the currency appreciate *vis-à-vis* the pound Sterling.[5] Figure 6 shows the CPI levels and inflation rates from September 1931 to March 1937. The top panel shows that the price level reached a peak of 101.5 in July 1932 before falling to a trough of 98.4 in October 1933. The index began a gradual climb and did not reach a new high until December 1936 (101.6). It rose above 102 during the first three months of 1937, leading to the abandonment of the target in April (when it rose to 104).

The bottom panel of Figure 6 shows the monthly inflation rate (annualized). In these 67 months, the Riksbank recorded 32 months of inflation, 21 months of deflation and 14 months when the CPI was unchanged. The question is how one should think about the monthly changes. Fischer (1994) and Cecchetti (1998) imply that such deflation is likely to have negative consequences for the real economy. As a matter of record, some economists of the day blamed Sweden's high unemployment on the Riksbank's decision to target the CPI.[6] Looking back, it seems more likely that Swedish monetary policy was a success. Sweden had much less deflation during 1932 and 1933 than did most of Europe. They had one of the least severe depressions, not only in Europe, but also around the world. Bernanke (1995) concludes that it was the decision to go off the gold standard and prevent deflation that was the key to Sweden's success.

As the Swedish example shows, it is important to distinguish between the normal random variation in the price level that should be expected in a regime of price stability (shown in Figure 6) and the persistent deflation in countries that did not go off the gold standard. In the United States, the CPI fell at an average annual rate of 9.7 percent between September 1931 and April 1933.[7] That deflation was associated with failing banks and a collapsing money supply. The recurring bouts of inflation and deflation in Figure 6 most likely are due to real disturbances that continually buffet markets.[8]

We have argued that the policy adjustments that would be needed to achieve a price-level objective would not have to be large. One way to gauge the size of policy

[5] Fisher (1934), Jonung (1979), and Berg and Jonung (1998) provide details about this episode.

[6] See Berg and Jonung (1998), page 33.

[7] These data were taken from Chart I in Fisher (1934), page 326.

[8] Jonung (1979) concludes that money-supply growth was relatively stable during this period. Berg and Jonung (1998) report that there were no reversals of the bank discount rate after 1931.

adjustments is to multiply the error-correction parameter (for this exercise, assume it is equal to 0.1) by the percent deviation of the price level from target. In the case of Sweden during 1932, that deviation peaked around 1.5 percent, suggesting a policy-correcting deflation of 0.15 percent. In December of 1936, the Riksbank would have had to change policy in a way that would encourage a deflation of 0.16 percent. By April 1937, the CPI was at 104 and would have required a policy setting intended to reduce the price level by 0.4 percent at an annual rate. These policy-induced changes are more than an order of magnitude smaller than the monthly standard deviation of the inflation rate. In our model, they are effective because they represent a small persistent correction that stays in place until the price level returns to target.

PRICE LEVEL OBJECTIVES AND CREDIBILITY

In principle, any conclusion about the size of adjustments will depend upon how the central bank implements the price-level objective and how the economy works. Using a linear, rational expectations framework, Balke and Emery (1994) show that having a long-term price objective is likely to result in less, not more, variability of short-run inflation. They also show that a long-run price-level objective does not interfere with short-run output stabilization. Both of these results hold in this model. Table 2 shows the output gap and inflation statistics associated with different relative weights on the output gap and different weights on the long-term price-level objective. Putting more weight on the output gap reduces the variability of the output gap and raises the variability of inflation. For a given weight, λ, however, raising the relative weight on the long-term price objective has no effect on the short-run variability of the output gap, but reduces the short-run variability of inflation. In practice, adopting a long-term price objective may enhance the efficacy of short-run output stabilization policy, if it makes the price stability goal credible and concentrates people's expectations about long-run average inflation.

There is some concern that a small error-correction response to price-level deviations would not be credible. We think the credibility would be enhanced in spite of a small error-correction parameter because the policy would be transparent. In the context of the United States today, our proposal would be implemented by having the Federal Open Market Committee (FOMC) debate and decide on a long-term inflation objective (say four to five years). Once the debating and voting is done, the FOMC report to Congress would include a multiyear path for the chosen index growing at the desired inflation rate as well as the annual targets for money and credit. Deciding on a long-term objective would be the major change in policy. On a daily basis, the Open Market Desk at the New York Fed would continue to operate as today, buying and selling Treasury debt to maintain a target for the federal funds rate. The minor, but important, difference would occur at FOMC meetings where policymakers would monitor the price level relative to its long-term objective. At every FOMC meeting there would be some members who would support shading the policy decision to encourage the price level to return to its long-run target path. The existence of a public commitment would give those members' opinion more weight in the final vote. As we saw in experiments with the error-correction model, the change in short-run behavior would be difficult to measure in the quarterly statistics, but the status of the price stability objective would not.

CONCLUSION

We show that when the central bank cares about the real economy, an inflation-targeting regime will lead to much more uncertainty about inflation and the price level than has been commonly suggested. We find that the magnitudes of uncertainty about inflation that prevailed throughout the last four decades are the expected consequence of commonly proposed inflation-targeting regimes. The adoption

of inflation-targeting regimes around the world has been associated with lower inflation and less variable inflation. The lower variability probably indicates that central banks have begun to put less weight on the state of the real economy as they focus more sharply on the inflation objective.

For policymakers who believe that the central bank can, and should, stabilize the business cycle, it is a drawback of inflation-targeting regimes that in order to reduce inflation uncertainty, the central bank must ignore the state of the real economy. We show how this drawback may be overcome by putting just a small weight on a long-term price level objective. Doing so allows the central bank to concentrate people's expectations about the long-term inflation outcome without necessarily giving up short-run concerns about the real economy.

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