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Deflation and Real Economic Activity Under the Gold Standard

Christopher J. Neely and Geoffrey E. Wood

In the past few years, several countries have announced explicit target ranges for inflation. New Zealand did this in 1990, Canada in 1991, the United Kingdom in 1992, and Sweden and Finland in 1994. Even when an inflation target is achieved, the future price level is not easy to predict because none of these countries has committed itself to reversing the consequences of shocks to the price level. Indeed, in New Zealand there is an explicit commitment *not* to reverse certain such shocks.

One alternative to inflation targeting is price level targeting.[1] The adoption of a constant price level target would have several advantages over an inflation target. Chief among these is that consumers and firms could write simpler contracts and make long-run plans without worrying about inflation. Price level targeting also may avoid the "time-inconsistency" problem of an inflation targeting regime in that the monetary authority would have less incentive to inflate the economy in a one-time bid to increase output temporarily. Under a price level target, any "surprise" inflation must be reversed.

Critics of price level targeting argue that making a commitment to reverse surprise increases in the price level is undesirable because a fall in the general price level, or deflation, can have harmful effects. One such critic, Stanley Fischer, put it this way:

> "I argue for the inflation target because I fear the consequences of having to aim to deflate the economy half the time, which is what the price level approach requires."[2]

Since the end of World War II, year-over-year declines in the price level have been rare in the industrialized world; during the period of the gold standard, however, both long downward trends in the price level and much shorter periods of falling price levels were common.[3] Ironically, although Irving Fisher advocated a price level target precisely to avoid the protracted downward (and upward) swings in the price level observed under a gold standard, the experience of this period provokes, in part, the criticism of price level targeting today. Perhaps more important for these beliefs about deflation is the deflationary period (not examined here) from 1929 through 1933, in which the price level fell by 20 to 30 percent. Bernanke (1995) argues persuasively that this price decline, caused by the U.S. determination to stay on the gold standard, was a major contributor to the severity of the Great Depression. This article reexamines the facts surrounding temporary periods of deflation that occurred under the gold standard from 1870 to 1913. We first describe the behavior of price, money and output data, then perform some simple tests to determine whether output growth grew more slowly during periods of falling prices and whether knowledge of a falling price level would, in fact, have helped predict lower output growth. Although we must be cautious about drawing conclusions from 100-year-old data generated under a much different monetary regime, another look at this experience is warranted because several countries have adopted policies that are likely to be associated with temporary periods of deflation.

The next section briefly reviews why deflation may affect real output. A description of our data set and an explanation of our statistical tests follow. We then report the results of our tests, before concluding with some ideas for future work.

[1] A price level is a weighted average of prices in a country. Price level targets may be either constant over time (static) or have a trend. In this paper, we will use price level targeting to refer to a static price level target. The shaded insert on pp. 34 and 35 distinguishes price level and inflation targets.

[2] *The Financial Times*, June 24, 1994. Note that Fischer refers to a static price level target. A price level target with a positive trend would only require the monetary authority to "disinflate" half the time, that is, to run a rate of inflation below the long-run trend.

Disinflation is not the only potential drawback of price level targets. Some oppose them because they might lead to greater short-run volatility in the inflation rate.

[3] Periods in which prices fall on a year-over-year basis are considered periods of deflation.

PRICE STICKINESS, DEFLATION AND OUTPUT

It is now widely accepted that there is no long-term trade-off between inflation and output or employment; the existence of a short-run trade-off, on the other hand, is not generally denied. There are several explanations for this trade-off: lags between actual and expected inflation (see Hume, 1752; Fisher, 1926; and Friedman, 1968); misperceptions about relative and general price shifts (Lucas, 1972); and staggered wage or price setting (Fischer, 1977; Taylor, 1980).[4] None of these theories, however, predicts that lowering the price level is more costly than lowering inflation. Nevertheless, prices have not fallen (by anything more than a trivial amount) in any major economy since 1945.

The means by which deflation might reduce output, however, are often not explicitly stated.[5] One view is that deflation interferes with the adjustment of relative prices because nominal wages or some prices do not adjust downward easily. If wages and/or prices are sticky downwards, a negative demand shock will tend to cause persistent unemployment as prices and wages are slow to fall as required to clear markets. With a sufficiently high inflation trend, relative prices can adjust to a negative demand shock without any actual prices having to fall. Because markets work better with a little inflation, according to this view, output will be less variable over business cycle horizons and, perhaps, even higher in the long run.

Critics of the theory of downward price rigidity point out that many wages and prices do, in fact, decrease, and that the extent to which prices are sticky depends on whether people expect inflation. An atmosphere of overall price stability will make people more willing to accept reductions in their wages or prices.

There is mixed evidence from microeconomic data on the idea that prices are sticky; certainly, some prices change more frequently than others. There is, however, little evidence of asymmetry in price stickiness.[6] Blinder (1991) presents the results of a survey in which firms report asymmetric price rigidity. He finds greater upward rigidity. Nevertheless, despite evidence to the contrary, many economists continue to believe that some prices are inflexible downward and that even temporary periods of deflation might reduce output through this channel.[7]

Bernanke and James (1991) argue that deflation might alternatively affect the economy by increasing the real value of nominally denominated debt. For example, a 2 percent annual deflation would translate a nominal interest rate of 4 percent into a real interest rate of 6 percent. Increasing the real rate of interest might promote debtor insolvency and financial distress.

The opposition to price level targeting from those who fear the results of deflation, either because of downward price rigidity or the consequences of debt-deflation, makes the study of the historical association between output and deflation worthwhile. A review of the evidence would be a first step in considering whether a central bank should now adopt a price level target.

THE RELATION BETWEEN PRICE AND OUTPUT GROWTH DURING THE GOLD STANDARD ERA

We use two sets of data. The first consists of 44 annual observations on money, prices, interest rates and output in the United Kingdom from 1870 to 1913. The period 1880-1913 is generally considered the heyday of the classical international gold standard. We end the sample before the beginning of World War I in 1914. The source for the monetary series is Capie and Webber (1985).[8] The interest rate is a short-term one from the last quarter of each year. The output series is Feinstein's (1972) compromise estimate of GDP and, therefore, his implicit price deflator is used as the price series.[9] All data are annual to conform to the necessity of using annual GDP data.

The second data set consists of 44 annual output and inflation observations (1870 to 1913) from nine of 10 industrialized countries compiled for comparison of international business cycles by Backus and Kehoe (1992), from which more complete description of the data is available.[10]

[4] An excellent review of these issues can be found in McCallum (1989), Chapter 9. Ohanian and Stockman (forthcoming) consider the consequences of monetary shocks for the economy when some, but not all, prices are sticky. That paper also sets out several explanations for price stickiness in addition to those reviewed in McCallum.

[5] Barro (1995) finds benefits of lower inflation in the form of higher long-run growth in a cross-country study. Here, we are concerned with short-run effects.

[6] See Wynne (1995) for a survey of price stickiness and Craig (1995) for evidence on wage rigidity.

[7] Advocates of this view might point out that real wages rose substantially during the severe deflation of the Great Depression.

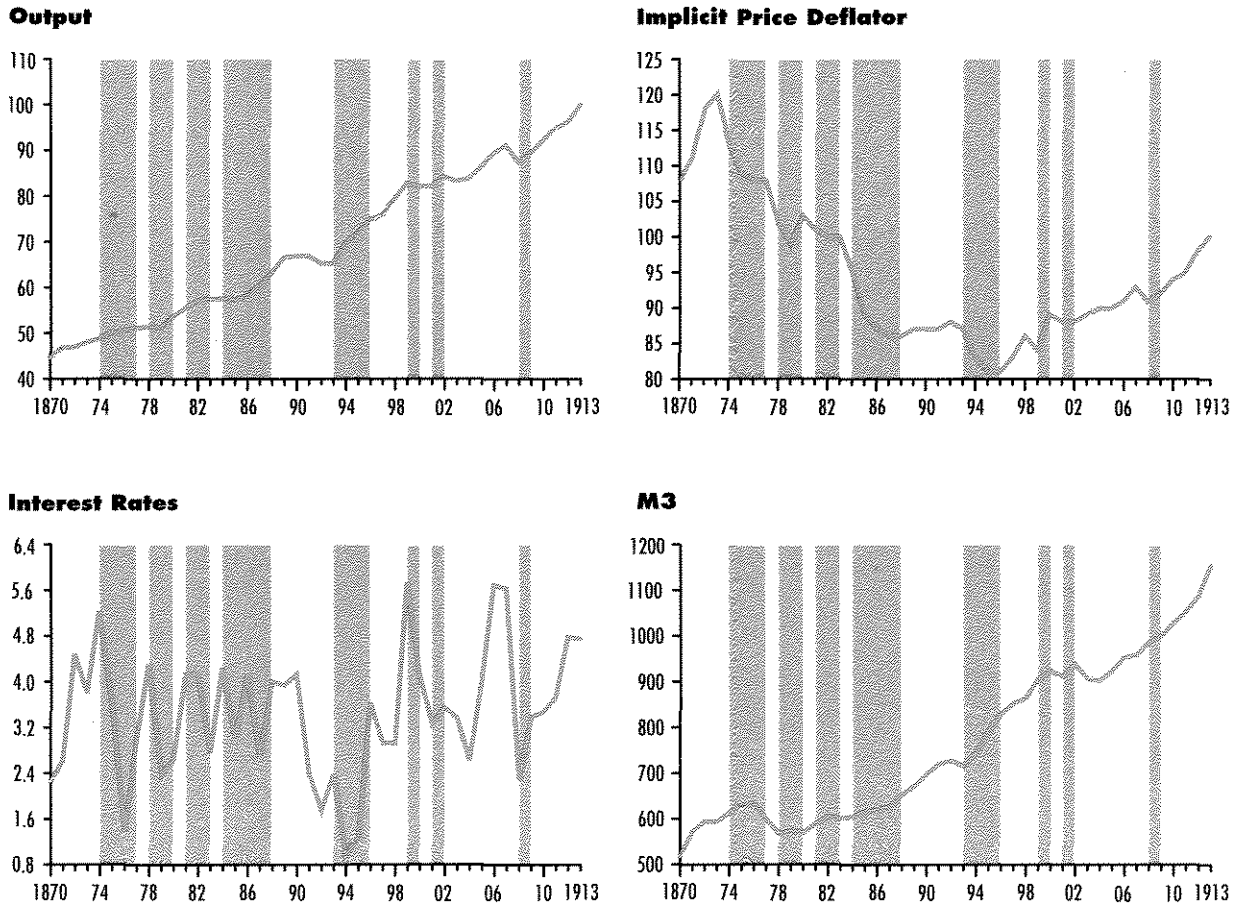
[8] Various series existed before publication of that volume, but they had deficiencies that were remedied (as well as some new data permitted) by Capie and Webber. See Capie and Webber for discussion of previous series deficiencies and how they are remedied. The crucial point is that these previous series contained a spurious trend.

[9] There has recently been some discussion of the reliability of that output series—see the interchange between Greasley (1986, 1989) and Feinstein (1989), and the discussion in Crafts, Leybourne and Mills (1989)—but there seems to be general agreement that whatever its deficiencies, it is the best available.

[10] We dropped Japan from the sample because it did not have a metallic standard during the 19th century and because its national banking and financial system was just forming (see Backus and Kehoe, 1992). Uniquely, Japan's growth under falling prices (5.4 percent) was substantially higher than its growth under rising prices (1.5 percent).

Figure 1

Time Series of the Levels of the United Kingdom Data



The Time Series

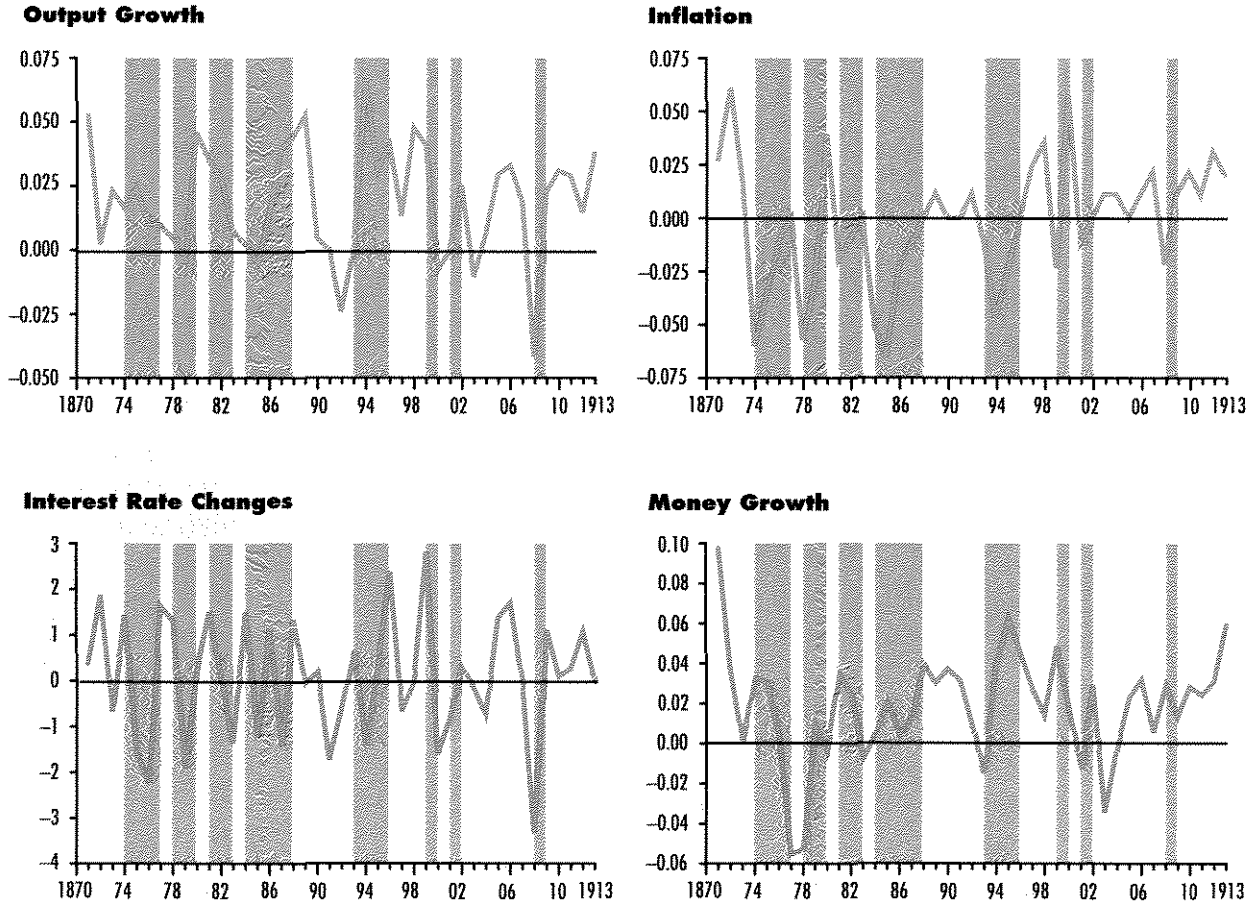
Figures 1 and 2 display the time series of the log levels and log differences of the four United Kingdom series from 1870 to 1913. The shading in the figures represents periods in which the price level fell (not periods of recession). The monetary series, M3, and the output series generally grew over time. The price deflator series does not display the consistent rise typical of modern price indices; rather, periods of rising and declining prices seem to be nearly equally common. The long downward trend in the price level until 1896, followed by an upward swing through the end of the sample in 1913, was caused by fluctuations in the world supply of and demand for gold. For example, the downward drift in prices until 1896 was partly due to the United States and France returning to the gold standard, raising the demand for and price of gold. The nominal interest rate seems to display typical cyclical fluctuations around a stationary mean.

Inflation and Output During the Two Subperiods

Figure 3 shows the higher average rates of inflation, displaying a scatterplot of the mean rates of output growth vs. mean inflation rates for each of nine countries from the Backus and Kehoe data set for each of the two subperiods (1870-96 and 1897-1913). The figure shows that average inflation rates were uniformly lower in the first period (1870-96) than they were in the second period (1897-1913).

Figure 2

Time Series of the Differences of the United Kingdom Data



Consistent with the idea that deflation reduces output growth, the mean levels of output growth also appear to be lower during the first period. Curiously, across countries there seems to be a negative relationship between output and price changes in the first period and a positive relationship in the second.

Output Growth and Deflation Over Short Horizons

Examining inflation and output growth over the two long subperiods is a convenient way to examine the relationship between average inflation and average output growth over longer periods. It does not, however, get directly at the question of whether price declines were associated with lower output growth over short periods. To see this, we sort the data on output growth by the rise or fall of prices. For the purpose of categorization, we define a deflationary period as any year in which prices fell; we make no distinction between the episodes on the basis of length, severity or cause. For the United Kingdom data, five of nine deflationary episodes lasted more than one year, and three lasted more than two years.

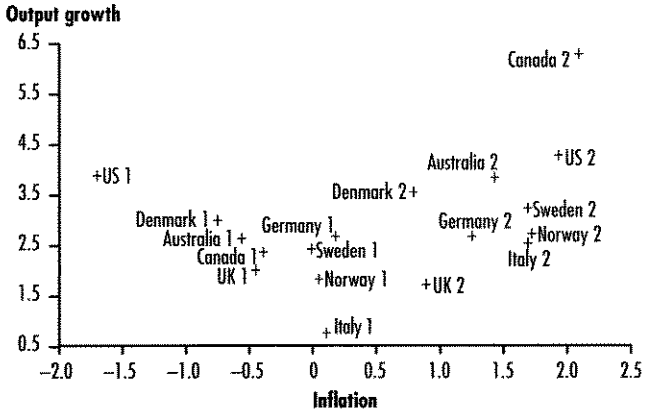
Table 1 (page 32) provides some summary statistics for data from the nine countries used by Backus and Kehoe for the period 1870-1913. The first two columns provide the unconditional means of output growth and inflation. The third column shows the percentage of the time that prices were rising during the sample period. Mean

price declines were of comparable magnitude to mean price rises, and periods of mild price rises were only slightly more common than periods of declining prices; the data show that prices rose about 46-67 percent of the time during the sample.

Figure 4 is analogous to Figure 3 in that it depicts mean output growth for the nine countries from the Backus and Kehoe sample, conditioned on whether prices rose or fell. Again, the means of output growth during periods of rising prices appear generally higher than the means during periods of falling prices. This positive relationship between price changes and output growth is again consistent with the idea that deflationary periods were associated with relatively hard times.

Figure 3

Mean Output Growth in the First Period (1870-96) and the Second Period (1897-1913)



Note: Sample 1 = 1870-96, sample 2 = 1897-1913.

TESTING THE RELATIONSHIP BETWEEN DEFLATION AND OUTPUT GROWTH

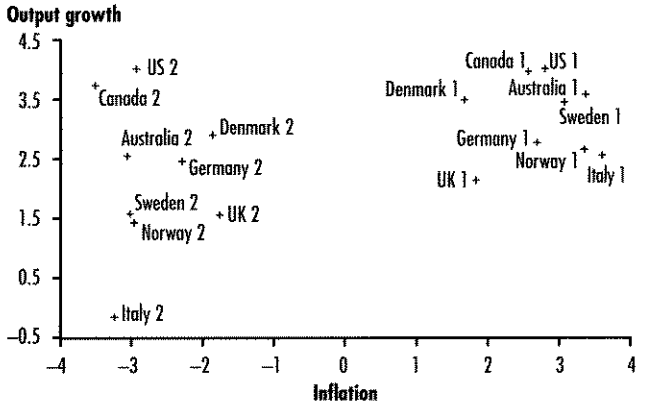
The positive relationship between price changes and output growth must be interpreted with a great deal of caution. First, the positive correlation between price changes and output growth could be due to chance. In other words, how likely is it that the observed data would have been generated if the means of output growth were equal under deflation and inflation? Second, the previous section only examined the relationship between price changes and output growth period by period; we would like to know about their relationship over time as well. Third, even if deflation is statistically associated with lower output growth, that does not mean it causes lower output growth—a third factor could be causing both.

Is It a Coincidence That Output Growth Is Lower During Periods of Deflation?

To test whether the apparent relationships between output growth and price level changes pictured in Figures 3 and 4 could be coincidence, we can determine if it is likely that such a relationship would have been generated if mean output growth were really equal under inflation or deflation. That is, we test the statistical significance of the correlation.

Figure 4

Mean Output Growth Conditional on Inflation or Deflation



Note: Sample 1 = inflation, sample 2 = deflation.

The second and third columns of Table 2 present results of the F-tests of the hypothesis that the mean output growth for each of the nine countries in Figure 3 was the same during the second period (1897-1913) as in the first period (1870-1913). The third column gives the probability that we would obtain at least as extreme a result if the means were truly the same. This number, called the "p-value," is often loosely interpreted as the strength of the evidence against the hypothesis that the means are the same. Values less

Table 1

International Output Growth and Inflation Statistics Under Rising and Falling Prices

	Unconditional Statistics		Proportion of Years Prices are Rising (percent)	Rising Prices		Falling Prices	
	Mean Inflation	Mean Output Growth		Mean Inflation	Mean Output Growth	Mean Inflation	Mean Output Growth
Australia	0.23	3.10	51.16	3.37	3.60	–3.06	2.57
Canada	0.59	3.90	67.44	2.57	3.98	–3.51	3.75
Denmark	0.14	3.20	48.84	1.67	3.51	–1.86	2.91
Germany	0.61	2.66	58.14	2.69	2.79	–2.29	2.48
Italy	0.74	1.45	58.14	3.60	2.58	–3.24	–0.13
Norway	0.71	2.17	58.14	3.35	2.68	–2.96	1.45
Sweden	0.66	2.73	60.47	3.07	3.47	–3.02	1.60
United Kingdom	0.08	1.88	51.16	1.83	2.16	–1.76	1.58
United States	0.26	4.03	46.51	2.80	4.03	–2.93	4.03

Table 2

Tests of the Equality of Mean Output Growth Under Inflation vs. Deflation

	Test of Equality of Mean Output Growth Between the Subperiods 1870-96 and 1897-1913		Test of Equality of Mean Output Growth Conditioned on Inflation or Deflation	
	Test Statistic	p-value	Test Statistic	p-value
Australia	1.44	0.23	1.06	0.30
Canada	15.45	0.00	0.05	0.82
Denmark	0.32	0.57	0.36	0.55
Germany	0.00	1.00	0.10	0.76
Italy	3.19	0.07	7.36	0.01
Norway	0.82	0.37	1.52	0.22
Sweden	0.66	0.42	3.50	0.06
U. K.	0.09	0.77	0.33	0.56
U. S.	0.16	0.69	0.00	1.00
Aggregate	11.01	0.28	15.32	0.08

than 0.1 or 0.05 are usually interpreted as meaning that we can reject the idea that the means are the same. A lower p-value means that it is less likely that the means are the same. These tests of equality of means reject the idea that the conditional means are equal for Canada and Italy, but not for the other countries if our criterion for rejection is a p-value less than 0.1.

If we pool the observations from all the countries, we can test the hypothesis that the overall mean output growth for all nine countries for the second period is the same as the overall mean output growth for the first period. The p-value from such a test is 0.28 (see the third column, last row of Table 2), which strongly suggests that it is very possible that the data were generated by processes with equal means. That is, for only two countries could we conclude that aggregate mean output growth in the second period was statistically significantly higher

Table 3

Fit of Asymmetric Vs. Symmetric Models of Prices and Output

	Preferred Model Under the Akaike Criterion	Schwarz Criterion
Australia	symmetric	symmetric
Canada	symmetric	symmetric
Denmark	asymmetric	asymmetric
Germany	asymmetric	symmetric
Italy	symmetric	symmetric
Norway	symmetric	symmetric
Sweden	symmetric	symmetric
UK	asymmetric	symmetric
US	symmetric	symmetric

Table 4

Tests of Linear Forecasting Ability of Price Changes and Output Growth

	Granger Causality Statistics (p-value)	
	Test that Price Changes Do Not Help Forecast Output Growth	Test That Output Growth Does Not Help Forecast Price Changes
Australia	20.537 (0.000)	7.367 (0.010)
Canada	3.875 (0.018)	8.848 (0.000)
Denmark	1.848 (0.172)	5.768 (0.007)
Germany	5.493 (0.024)	0.343 (0.562)
Italy	2.262 (0.119)	0.061 (0.941)
Norway	1.347 (0.253)	7.245 (0.010)
Sweden	0.210 (0.649)	5.071 (0.030)
US	2.020 (0.130)	1.443 (0.248)
UK	1.346 (0.253)	2.089 (0.156)

than the mean of output growth in the first period.

Columns four and five of Table 2 present results of similar tests for equality of means for the data in Figure 4. For Italy and Sweden, we reject the idea that the mean of output under inflation was the same as that during deflation. For this test, however, aggregating the observations across countries leads to the conclusion that output growth was significantly lower in a statistical sense during periods of deflation. The p-value for the test of that hypothesis is 0.08 (see the fifth column, last row of Table 3).

Do Price Changes Have an Asymmetric Effect on Output?

The previous analysis described the period-by-period relationship between average output growth and average price changes conditioned on the sign of the price changes. Macroeconomic variables, however, influence each other not just contemporaneously, but also over time. The symmetry of the dynamic relationship between output growth and price changes is important, because an essential implication of the idea that deflation is harmful to output is that output reacts asymmetrically to price changes over time.

To explore this issue, we again break the price changes into positive and negative changes so that we can fit two systems of regression equations (called vector autoregressions, or VARs) in which we regress output growth and price changes on their own lagged values. VARs are a commonly used, general method of modeling the dynamic relationship between macroeconomic variables.

In the first system of equations, we treat positive and negative price changes as two different variables and allow them to influence output growth (and each other) differently.[11] In the second system, we treat price changes as one variable, forcing positive and negative changes to have mirror-image effects on output growth. Then we examine which model fits the data better.

We judge the fit of the systems according to two commonly used criteria: the Akaike information and the Schwarz information criteria. These measures of the fit of the two models on the Backus and Kehoe data are shown in Table 3. The results indicate that the Akaike criterion favors the asymmetric model for Denmark, Germany and the United Kingdom, but the Schwarz criterion favors it only for Denmark. For the other countries, the simpler symmetric model

[11] The three variables in the system are output growth, positive price changes (INFLDP) and negative price changes (DEFDP), where

$INFLDP = DP$, if $DP \geq 0$

$= 0$, otherwise

$DEFDP = DP$, if $DP < 0$

$= 0$, otherwise

and DP is the rate of change of prices.

PRICE LEVEL VS. INFLATION TARGETING

Price stability has attracted a lot of attention lately. Unfortunately, the important choice between inflation and price level targeting has been neglected. Either would lead to a lower and more stable inflation rate than we have observed over the past 25 years, but there is a fundamental distinction between the two. Price level targeting "corrects" past errors in monetary policy, while inflation targeting ignores them.

To make this distinction more concrete, consider the problem of a monetary authority with an inflation target of zero to 2 percent in which the 1995 inflation rate is 3 percent, 1 percentage point above the target range. In choosing monetary policy for 1996, the authority will aim, as usual, for an inflation rate of zero to 2 percent. It will not try to make up for past errors. In contrast, if the same monetary authority has targeted a static price level (zero percent inflation on average) and observes 1 percent inflation, it will have to try to reduce the price level by 1 percent in the years ahead.

This difference makes price level targeting a long-run commitment in ways in which inflation targeting is not. There are three major consequences of this divergence between the two.

First, the average rate of inflation over a long horizon can be predicted very well under a price level targeting regime; it is less certain under an inflation targeting regime.[1] Advocates of price level targeting often point to the greater certainty of the price level (average inflation rate) in the long run as an advantage. As the accompanying chart shows, uncertainty about the future price level associated with an inflation targeting range of zero to 2 percent increases as the time horizon grows. In contrast, the level of uncertainty associated with a price level target is constant (and small), even over long time horizons. For example, an investor evaluating the real return on, or the present value of, a project can do so much more easily because the price level can be predicted over long periods.

Second, an important theoretical advantage of the long-run nature of price level targeting is that by being a multi-period commitment, it does not suffer from the time-inconsistency problem described by Barro and Gordon (1983). In their model, a monetary authority has an incentive to produce a one-time monetary stimulus that results in a burst of output

[1] The expected prediction error for future average inflation would go to zero under a price level targeting regime as the time horizon increases, while it would remain constant under an inflation targeting regime.

is favored.[12] These tests provide mixed evidence on the hypothesis that price changes have an asymmetric effect on output for the countries considered here.

Does Deflation Forecast Lower Output Growth?

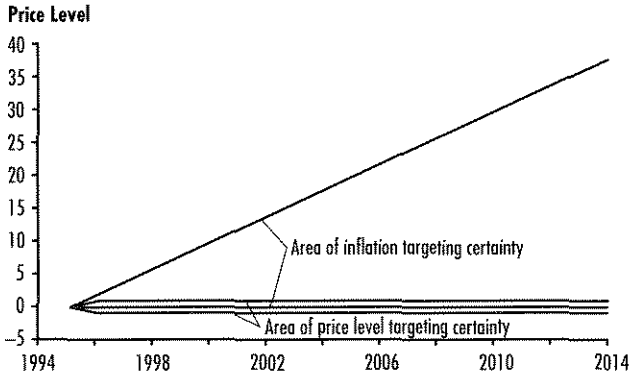
Previously, we showed that, under the gold standard, output growth tended to be lower than average during periods of deflation. Then we showed at least some evidence in favor of the hypothesis of an asymmetric dynamic relationship between price changes and output growth. Although we cannot test directly whether the deflation itself was the cause of lower growth, we can test whether the falling price level helped to forecast it. Such a test of linear forecasting ability is called a test of Granger causality. If price changes improve the forecasts of output growth, they are said to "Granger-cause" output growth. The idea is that if a falling price level causes lower growth, then it should precede output growth and be useful in forecasting it. Note, however, that if a third factor is causing both deflation and lower growth, this statistical procedure can find that deflation helps forecast lower growth, even when it is not the cause of lower growth.

[12] Because the Akaike and Schwarz criteria are non-nested model selection criteria, they are not formal statistical tests and do not have "significance levels." Instead, they informally test for statistical significance by penalizing more complex models.

growth and inflation. Because the public understands this incentive, it reacts in such a way that the authority inflates each period but fails to increase output.

A price level target solves the time-inconsistency problem by requiring the monetary authority to correct past errors. The authority has no incentive to stimulate the economy with a little inflation, because it would then have to reduce the price level back to the target level. Therefore, a price level target should be more credible than an inflation target.[2]

Price Level Vs. Inflation Targeting



A third major difference motivates the subject of this article. A static price level target requires the monetary authority to *reduce* the price level in response to surprise increases. While an inflation rate target may produce occasional reductions in the price level accidentally, they will be rare if the average inflation rate is high relative to the volatility in inflation. In contrast, under a static price level target, price changes will be negative roughly half the time.

A hybrid of targeting inflation and targeting a static price level is targeting a small upward trend in the price level. Such a system has the long-term predictability of a static price level target but does not require the monetary authority to correct past upward deviations in the price level with deflation.

[2] This argument assumes that even anticipated deflations will be as costly as the benefit gained from the initial inflation.

To test whether price changes improve the forecasts of output growth, we first forecast output growth using only its own lags. Then we add lagged price changes as another explanatory variable to see if their inclusion improves the forecasts. The second column of Table 4 displays the test statistic and p-value (significance level) from the tests that price changes do not Granger-cause (help forecast) output growth. For Australia, Canada and Germany, we reject the null hypothesis that lagged values of price changes do not improve the forecasts of output growth. In other words, the data suggest that price changes *do* help forecast output growth for three countries in this period. We should emphasize that rejections of Granger causality tests are a necessary but not sufficient condition to determine that output growth is not "caused" by price changes. Once again, the data provide us with mixed results on the idea that price changes have an asymmetric effect on output.

We can also investigate whether output growth helps forecast price changes in this system. Economic commentators commonly suggest that price pressures (or the lack thereof) are due to the level of output growth, employment, capacity utilization or some other real variable. The test statistics and p-values from the tests that output

growth does not help forecast future price changes are in the third column of Table 4. These statistics indicate that output growth does help forecast price changes for Australia, Canada, Denmark, Norway and Sweden. Although these results do not shed light directly on a possible asymmetric response of output to price changes, they are consistent with traditional Phillip's curve explanations of inflation.

Caveat Emptor

Because we have only a small sample, the predictive power of one variable on another must be very strong for tests for Granger causality to find a relation. Weaker but important relations may not be found at all. Statisticians would say that tests of Granger causality may have "low power." Another complication is that both price and output changes may result from some third factor, which has been left out of the analysis.

No matter how confident we are that we understand how these economies functioned 100 years ago, we must be cautious about using historical data to answer policy questions today. For example, economic structures such as the wage-setting mechanism, the degree of flexibility of the labor market and credit allocation mechanisms—all of which may influence how changes in the money supply translate to changes in the price level—have changed a great deal in the last century. Even methods of data collection are much different now.

Finally, we remind the reader that the economists who observed this episode first-hand believed that deflation was a disruptive factor causing lower output growth. Many recommended a price level target as a remedy for that problem.[13] Presumably, the finite sample variance of the price level would be much different under a price level targeting regime than it was under the gold standard. Some evidence in favor of this view can be found by comparing Sweden's experience with prices during the Great Depression with that of countries that stayed on the gold standard. Sweden left the gold standard in 1931 and began to target the consumer price index. From 1931 to the trough of the Depression, the price level fell by 20 percent to 30 percent in countries that stayed on the gold standard, while falling less than 2 percent in Sweden (from 100 in September 1931, when the Riksbank started targeting the price level, to 98.4 in October 1933). Unlike a gold standard, price level targeting permits control of the price level through the money supply.

CONCLUSION

A number of countries, including New Zealand, Canada and the United Kingdom, have recently announced explicit target ranges for inflation. Such a policy has also been suggested for the United States. Others have suggested that we target the price level instead of the rate of inflation. One potential reason to oppose this suggestion is that such a policy would necessitate that the monetary authority reduce the level of prices, that is, deflate the economy, to offset any transient, positive shocks to the price level. The historical association between deflation and bad economic performance has led some economists to reject price level targeting as bad policy.

We find that lower output growth was associated with periods of deflation in nearly all the countries examined. For a majority of the countries, the dynamic relationship between price changes and output growth appeared to be symmetric, and price changes did not help forecast output growth. There is more evidence, however, that output growth forecasts price changes.

Ultimately, a final conclusion about the desirability of a price level target requires more complete economic modeling than we have attempted. What we have presented are some simple facts about deflation and output that are touted as reasons to reject a particular type of price stability. Economists who support price level targeting must make the case that the temporary periods of deflation necessary to maintain long-term price stability would be fundamentally different than those observed under the gold standard.

[13] See *Stable Money: A History of the Movement* by Irving Fisher, 1934.

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