Perils of Price Deflations: An Analysis of the Great Depression

by Charles T. Carlstrom and Timothy S. Fuerst

In the last two decades, central banks within the industrialized world have been remarkably successful at lowering inflation rates. For example, in 1980 the U.S. rate of inflation was 9.3 percent, while in 2000 it was 2.3 percent.[1] This success has led to a new concern—could deflation be a problem?

A deflation is a decline in the level of prices, that is, a negative inflation rate. Two decades ago, worrying about deflation was like worrying about a shortage of pigeons in Trafalgar Square. But now that inflation rates are near zero, periodic deflations are much more plausible. Some think that a policy of price stability requires that the monetary authority walk a tight rope between the danger of letting inflation reignite and the threat of allowing possible deflation. In this *Economic Commentary,* we review some of the potential perils of price deflations. We do this by examining how price deflation contributed to the worst economic calamity of the twentieth century—the Great Depression.

Deflations make central bankers nervous, and history tells us why. In their monumental *A Monetary History of the U.S., 1867–1960*, Milton Friedman and Anna Schwartz note that every example of significant real output decline in the United States was associated with a decline in nominal prices.[2] The most famous episode is the Great Depression. Nominal prices fell 24 percent while real GDP fell nearly 40 percent during 1929–33 (see

table 1 for the figures used throughout). Furthermore, both output and prices stayed below their 1929 levels for the rest of the decade. Did the deflation contribute to the decline in output?

Economic theory suggests that deflations potentially pose three main dangers. First, because nominal interest rates cannot fall below zero percent, deflations can increase real interest rates. High real rates tend to discourage investment spending and decrease real economic activity. Second, if employers are unable to reduce nominal wages, price deflations will increase the real wage, which tends to discourage employment growth. Finally, price deflations can lead to large redistributions of wealth from borrowers to lenders. To the extent that firms are net borrowers, this reallocation of wealth will have additional indirect effects. As their balance sheets deteriorate, firms have more trouble acquiring external financing.

Would periodic deflations that may be experienced by a central bank pursuing a zero inflation target likely wreak such economic havoc? To what extent? To answer these questions, we consider how significant a factor massive price declines were in contributing to the severity of the Great Depression. We find that deflations do indeed cause problems for the reasons outlined above, but they must be quite large to do so. We find no evidence to suggest that small periodic deflations associated with zero inflation targeting are likely to be a serious problem.

If a central bank adopts a zero inflation target, it would, in practice, occasionally deviate from that rate up and down, and the economy would experience episodes of mild inflation and deflation. Is deflation—a decrease in the level of prices—a cause for concern? Deflation can cause output to decline, but to what extent? This *Economic Commentary* explores how much of a problem deflation might be for modern economies by estimating the effect that massive price declines had on output during the Great Depression. We find that while deflation can cause output to decline, mild episodes of deflation are unlikely to be a problem.

■ **Deflation and Zero Nominal Interest Rates**

The first of the three principal dangers posed by price deflations is that they can increase the cost of capital, thereby discouraging investment and causing output to fall. Sustained anticipated inflation does not affect real interest rates (that is, the cost of capital) because the nominal interest rate rises one-for-one with inflation. Yet things don't necessarily work in reverse. Large deflations must increase real interest rates simply because the nominal interest rate cannot fall below zero. If it did, no one would save money in a bank, preferring instead

the zero nominal return one could get by simply saving money under the mattress. Capital accumulation must offer at least a real return that is higher than that earned by hoarding currency.

Consider the price declines during the Great Depression. The average rate of price deflation between 1929 and 1933 was 6.4 percent. Suppose the average real interest rate before the onset of the deflation was 3 percent. If prices fell 6.4 percent per year and if the decline had been anticipated, then the average real interest rate between 1929 and 1933 must have increased to at least 6.4 percent. This is simply the annual real return on currency between 1929 and 1933 since one dollar in 1933 purchased 23.5 percent more goods (or 6.4 percent more per year) than it did in 1929.

These high real rates of interest discouraged investment, ultimately decreasing the stock of capital. The resulting lower capital stock in turn reduced employment because capital and labor complement each other—less capital makes labor less productive. Lower employment and capital combine to cause output to fall. Back-of-the-envelope calculations suggest that a perfectly anticipated annual rate of deflation of 6.4 percent may have caused output to fall on average 2.6 percent per year during the Depression.[3] While that is a significant decline, it is nothing like the 12.4 percent average annual decline in real output that was actually experienced during this period.

■ Sticky Nominal Wages[4]
Nominal or money wages are simply a wage rate expressed in today's nominal dollars. The real wage adjusts for inflation and measures how many goods and services the nominal wage can buy. With perfect labor markets, nominal wages would adjust so that anticipated changes in inflation would have no effect on real wages. If prices fell 1 percent per year, nominal wages would fall by a similar amount, so that the real wage remained unchanged.

But employers might be unable to reduce the nominal wage if their employees are loathe to accept a decrease—even though their real wage is increasing with falling prices. Deflation, therefore, may lead to an increase in the real wage. The idea that nominal wages may be downwardly rigid has long been recognized in macroeconomic analysis. For example, Keynes includes it in his 1936 analysis of the

business cycle.[5] When real wages are higher, the cost of labor increases, and firms respond by reducing the number of employees—either by hiring fewer workers or laying some off. The decline in employment reduces output.

What does this analysis imply for the Great Depression? If nominal wages cannot decline, then an average annual 6.4 percent decline in prices implies that real wages must increase by the same percentage. If nominal wages did not decline at all during the Great Depression, then calculations suggest that the 6.4 percent annual rate of deflation experienced during this period caused real output to decline 12.8 percent per year.[6]

Yet some nominal wages do decline. Wages in some sectors are much more flexible than in others. For example, during the Depression, the nominal wage for farmers fell nearly 40 percent. Although not as dramatic, declines were reported in most nonmanufacturing, nonmining sectors. Manufacturing wages seemed to have been more sticky, although even here nominal wages fell 20.1 percent. A recent study suggests that during the Depression the aggregate real wage actually decreased 3 percent—a far cry from the 6.4 percent increase that would have been registered if no nominal wages had been able to decline.[7]

Economic theory predicts that if wages are sticky in one sector, like manufacturing, and flexible in the rest of the economy, a price deflation will cause employment to drop in the inflexible sector and rise in the flexible one. A recent study suggests that such inefficient shifting during the Depression caused output to drop a total of only 3 percent.[8] This implies that sticky wages themselves caused Depressionera output to decline less than 1 percent (approximately 0.7 percent) per year.

■ Debt Deflations and Wealth Redistributions
Firms typically rely on external funds to aid in financing current operations and investment spending. The cost of these funds is inversely related to a firm's position on its balance sheet. Firms with substantial positive net worth can obtain financing at a low cost, while the converse is true of firms in weak asset positions.

Shocks that redistribute wealth away from firms have a negative effect on

their ability to borrow and invest. The consequent drop in investment contributes to a decline in output.

How does such wealth redistribution take place? Suppose that a firm has borrowed funds from a lender, and that the loans are in nominal terms and not indexed to the price level. An unexpected decline in the price level increases the real debt burden of the firm and shifts part of its wealth to the lender. Irving Fisher famously posited such "debt-deflation" as the cause of the Great Depression.[9] His remedy is worth quoting today: "If the debt-deflation theory of great depressions is essentially correct, the question of controlling the price level assumes a new importance; and those in the drivers' seats—the Federal Reserve Board… will in the future be held to a new accountability."[10]

In a series of articles, we have tried to assess the magnitude of these debt-deflation wealth shocks.[11] We estimate that the wealth shock caused by a 1 percent price deflation leads to a 0.16 percent output decline. This is an upper bound that assumes no contracts are indexed to the price level. In the case of the Great Depression, where the price level declined 22.5 percent, our estimates imply that output declined 3.6 percent in response. While substantial, this amounts to output falling at an annual rate of only 0.9 percent, which is small compared to the actual annual decline in output of 12.4 percent during this period.

■ A Great Depression Summary
We now are in a position to take stock of the net effect on output of the price deflation that occurred during the Great Depression. Our analysis of the real interest rate suggests that this effect caused output to decline 2.6 percent per year. The real wage story implies a decline of 0.7 percent per year. Our calculations of the impact of debt deflation yield an annual output decline of 0.9 percent. Taken together, we have an annual output decline of 4.2 percent. The actual annual output decline during the Great Depression was 12.4 percent, so these three sources can explain at most about a third of it.

That these effects provide limited explanatory power is reinforced by noting that the estimates we cite above are

TABLE 1 PRICES, WAGES, AND OUTPUT DURING THE GREAT DEPRESSION

Year	Real GDP	GDP deflator	Manufacturing nominal wage	Manufacturing real wage	Non-manufacturing, nonmining real wage
1929	100	100	100	100	100
1930	86.9	97.5	99.1	102.1	98.6
1931	77.6	88.5	94.1	106.8	96.9
1932	64.0	79.5	83.5	106.5	92.4
1933	60.9	77.5	79.9	104.2	85.6

NOTE: Data are taken from Harold L. Cole and Lee E. Ohanian, "Re-Examining the Contributions of Money and Banking Shocks to the U.S. Great Depression," *NBER Macroeconomics Annual 2000,* edited by Ben Bernanke and Julio Rotemberg, Cambridge, Mass.: MIT Press: 2001. The data are indexed to values in 1929.

all upper bounds. Both the sticky-wage and debt-deflation stories relied on movements in the price level that were unanticipated when contracts were signed, while the interest-rate story is based on expected deflations. This implies that simply summing the three effects will overestimate the net effect.

There is a further difficulty with the argument that price deflation was the source of the economic decline. The timing of actual output and price-level declines is inconsistent with a story that pins the cause of the output decline on the fall in nominal prices. The sharp initial decline in output (13.1 percent) that occurred in 1929–30 was accompanied by essentially no price movement. If anything, the output data tend to lead the price data. In short, our brief review of Depression-era history suggests that the deflation may have been a contributor to the economic contraction but was far from a leading cause of it.

■ **Lessons for Today**

Our analysis does suggest that price deflations may cause modest output declines. Hence, central bankers have reason to express concern. However, the magnitude of these effects is very likely even smaller today than our analysis suggests.

First, the interest-rate channel becomes operative only with very large price declines. Deflations in the range of 1 percent to 2 percent are more likely today, so interest-rate concerns are less relevant.

Second, there are reasons to think that nominal wages are less rigid than they have been in the past. Nominal wage movements are increasingly indexed to nominal price movements, so that real wages are less affected by changes in nominal prices.

Third, capital markets are much better developed, so that firms' balance-sheet positions may be less significant than in the past. For example, the richness of financial derivatives suggests that firms protect themselves better against unexpected price-level movements than they did during the Depression.

Any attempt to move toward zero inflation necessarily implies episodes of small deviations both positive and negative. Although history suggests that large deflations are a cause for concern, this *Commentary* contends that occasional modest deflations (in the range of 1 percent to 2 percent annually) should little concern policymakers. Hence, the fear of deflation in and of itself does not present a serious argument against a zero inflation policy.[12]

■ **Footnotes:**

1. Calculated using a fourth-quarter-to-fourth-quarter GDP implicit price deflator.

2. Milton Friedman and Anna Schwartz, *A Monetary History of the U.S., 1867–1960*, Princeton, N.J.: Princeton University Press, 1963.

3. We calculate the total decline in output that would be associated with a deflation that was expected to last forever and then annualize that decline over the number of years it would take to reduce the capital stock to its new, lower level, assuming that net investment cannot be zero.

4. This section draws heavily from Harold L. Cole and Lee E. Ohanian's "Re-Examining the Contributions of Money and Banking Shocks to the U.S. Great Depression," *NBER Macroeconomics Annual 2000*, edited by Ben Bernanke and Julio Rotemberg, Cambridge, Mass.: MIT Press, 2001.

5. John Maynard Keynes, *The General Theory of Employment, Interest and Money*, New York: Harbinger, 1964, p. 232.

6. This calculation uses a production function of $Y = K^{\alpha} L^{1-\alpha}$ with $\alpha = 1/3$. Capital is assumed to be unaffected.

7. See Cole and Ohanian (footnote 4).

8. See Cole and Ohanian (footnote 4).

9. Irving Fisher, "The Debt-Deflation Theory of Great Depressions," *Econometrica*, vol. 1, no. 4 (October 1933), pp. 337–57.

10. See Fisher (footnote 9), p. 347.

11. See, for example, Charles T. Carlstrom and Timothy S. Fuerst, "Monetary Shocks, Agency Costs, and Business Cycles," forthcoming, *Carnegie–Rochester Conference Series on Public Policy*, June 2001.

12. There are other reasons why central banks may not want to pursue a policy of zero inflation. For example, if the nominal rate is close to zero, then the central bank cannot use interest-rate cuts to stimulate the economy. For a discussion of these issues, see the *Journal of Money, Credit, and Banking* (Proceedings from the conference, "Monetary Policy in a Low-Inflation Environment"), vol. 32, no. 4, (November 2000, part 2). Other reasons include the possibility that inflation is mismeasured.

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