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MONETARY FACTORS IN THE GREAT DEPRESSION

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This paper examines the role of monetary policy in the early stages of the Great Depression and considers the mechanism whereby this policy may have affected real activity. I conclude that the depression was preceded by a dramatic shift towards a highly contractionary monetary policy. The economic impact of this policy seems unlikely to have come through the conventional Keynesian channels of a shortage of liquidity and high ex ante real interest rates, but instead may have operated through unanticipated deflation, and, after 1930, through the disruption of financial intermediation as a consequence of the banking panics.

1. Introduction

This paper surveys the literature and evidence on the role of monetary policy in the early stages of the Great Depression. The consensus view in the economics profession today holds that the severe monetary contraction begun in 1931 was a misguided policy that significantly worsened the subsequent course of the depression. My analysis reopens the case concerning the role of monetary policy in causing the initial phase of the depression in 1929–1930 and the mechanism whereby monetary policy may have affected real activity. I conclude that in terms of the magnitudes consciously controlled by the Federal Reserve, it would have been difficult to design a more contractionary policy than that adopted in January of 1928. I further argue that this change of regime shows up in virtually any macroeconomic or monetary aggregate that has been proposed for gauging the effects of monetary policy on the economy. Nevertheless, I conclude that the impact of monetary policy on real activity came not so much through the conventional Keynesian channels of a shortage of liquidity and attendant high ex ante real interest rates, but instead operated through unanticipated deflation, and, after 1930, through the disruption of the real services of intermediation on the part of the financial sector as a consequence of the banking panics.

Section 2 seeks to characterize the actual decisions of the monetary authorities in 1928–1929 – how was policy deliberately altered and what were these changes intended to accomplish? Section 3 goes on to summarize the economic

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effects of these policy actions as reflected in the behavior of key macroeconomic aggregates. Section 4 then explores the mechanism whereby monetary policy may have affected the course of the depression, focusing on the extent to which the tremendous deflation of 1927–1933 was anticipated by people at the time. Conclusions are summarized in section 5.

2. The development of monetary policy, 1928–1929

Between 1926 and 1931, the major economies of the world adhered to a gold standard with fixed exchange rates, under which the monetary policies of any one country are inextricably tied up with those of the others. For this reason, my account of the Great Depression begins in Paris. Raymond Poincaré was restored to power in France in July 1926. Sargent (1986) stressed the importance of Poincaré's resolve to eliminate the fiscal deficits which had spawned the rapid money growth and attendant inflation and currency depreciation in France during 1923–1926. Makinen and Woodward (1985) emphasized instead Poincaré's monetary reform of abandoning efforts to peg the nominal interest rate. All researchers have agreed, however, that the net effect of the change in regime was a dramatically successful reduction of expected rates of inflation in France.

Eichengreen (1986) emphasized that a policy that did successfully reduce inflationary expectations should promote an immediate increase in real money demand. Moreover, he noted, this increase in money demand, if not accompanied by a corresponding increase in money supply, would be expected to exert a contractionary effect on the economy. The evidence indeed shows the change in regime to have been quite deflationary; Sargent's data (p. 116) indicate that wholesale prices in France fell 20% between June 1926 and October 1927.

The changes in monetary and fiscal policy were only part of the explanation of an increased willingness to hold French francs. A number of other political reforms were instituted by the Poincaré government which made France a more attractive haven for international capital and thus increased the demand for transactions balances denominated in francs. The most important of these came in January of 1928 when France suspended a law prohibiting the export of capital from that country, allowing French and foreign securities to pass freely in and out of the country for the first time since 1918.[1] With increased money demand coming from both fiscal reform and an improving political climate for capital, the franc proved to be seriously undervalued; the Paris correspondent for the *Economist* estimated in April 1928 that the franc was undervalued by 25% on the basis of the purchasing power of the currency.[2]

[1] *Economist*, January 14, 1928, p. 63.

[2] *Economist*, April 7, 1928, p. 704.

The result of this excess demand for francs was a massive flow of gold from the rest of the world to France during this period, with gold holdings of the Bank of France increasing 76% between December 1926 and December 1928.[3] Gold flows from the United States alone totalled $307.8 M during 1928,[4] representing more than 4% of the total stock of high-powered money in the United States at the time. A policy of more rapid increase in French M1 to accommodate the increased demand for francs could have avoided these dislocations. Under the rules of the gold standard, the monetary policy actually adopted by France forced a policy of deflation on the United States and the rest of the world.

Even in the absence of any change in U.S. policy, these gold outflows would have been expected to result in a significant decrease in the U.S money supply. Unfortunately, partly in response to these gold outflows, the U.S. chose to embark on a highly contractionary monetary policy on its own beginning with the meeting of the Open Market Investment Committee on January 12, 1928.[5] Between December 1927 and July 1928, the Fed sold $393 M worth of securities[6] so that by August only $80 M remained in the Open Market account which could be sold.[7] Buying rates on acceptances were raised from 3% in January to $4\frac{1}{2}$% by July,[8] inducing a further $193 M reduction in Fed holdings of such bills, leaving only a total of $185 M in these balances remaining with the Fed.[9] Finally, the discount rate was raised from $3\frac{1}{2}$% to 5%, its highest value since the monetary contraction of 1921.[10] In short, in terms of the magnitudes consciously controlled by the Fed, it would be difficult to design a more contractionary policy than that initiated in January 1928; the Fed had virtually no more securities to sell nor balances of acceptances to be reduced.

The monetary base can be measured from the asset side of the Fed's balance sheet as roughly the sum of the government's gold stock, physical assets of the Treasury and Federal Reserve, and reserve bank credit outstanding, the latter consisting essentially of bills bought and discounted and United States securities held by the Fed.[11] Table 1 summarizes the potential effects on the monetary base of the policy changes described above under the assumption

[3] *Banking and Monetary Statistics*, p. 545.

[4] *Banking and Monetary Statistics*, p. 540.

[5] Chandler (1971) has an excellent discussion of this change in U.S. policy.

[6] Federal Reserve Board 1929 *Annual Report*, p. 47.

[7] The remaining $130 M in securities were held by individual Reserve Banks for purposes of generating earnings and were not part of the OMIC's portfolio. See Chandler (1971, p. 40).

[8] *Banking and Monetary Statistics*, p. 444.

[9] Federal Reserve Board 1929 *Annual Report*, p. 47.

[10] *Banking and Monetary Statistics*, p. 441.

[11] For a more detailed discussion, see Friedman and Schwartz (1963, app. B, pp. 776–798).

Table 1

Contribution of monetary policy to changes in U.S. monetary base, December 1927 to July 1928 (millions of current dollars).[a]

Policy	Measure	Level as of Dec. 1927	Level as of July 1928	Change
French deflation	Monetary gold stock	$4,416	$4,113	−$303
Open market sales	U.S. securities held by Fed	606	213	−393
Increased interest rate on acceptances	Bills held by Fed	378	185	−193
Total				−$889

[a]*Source*: Federal Reserve Board 1929 *Annual Report*, p. 47.

that no other components of the Fed's balance sheet changed (in the event other factors did change, as I note below). By these measures, the loss of gold to France during this period and U.S. monetary policies would have generated an $889 M reduction in the monetary base between December 1927 and July 1928, which would have amounted to a 12% reduction in the U.S. supply of high-powered money in the space of little over six months.

There should be no doubt that the United States adopted a policy of tight money at the beginning of 1928, nor should there be much dispute as to what motivated this policy. While one factor in the initial decision may well have been a desire to stem the gold outflows, this can not explain why the U.S. continued with this tight monetary policy even after higher interest rates were generating significant gold inflows by 1929. Instead, the major factor influencing monetary policy during 1928–1929 was surely the stock market. Despite repeated public assertions by Fed officials that the System did not regard itself as an arbiter of security prices, the consensus of most researchers who have studied Fed policy during this era is that the primary purpose of the monetary contraction was to curb the stock market boom.[12]

As events turned out, the U.S. did not experience the 12% reduction in the monetary base predicted in table 1. The principal reason is that borrowings at the Fed discount window increased by $561 M between December 1927 and July 1928;[13] with the huge drop in unborrowed reserves and simultaneous increase in borrowed reserves, the total monetary base was little changed.

[12] See for example Keynes (1930, p. 196), Friedman and Schwartz (1963, p. 290), Tobin (1965, p. 484), Chandler (1971, p. 26), or Temin (1976, p. 123).

[13] Federal Reserve Board 1929 *Annual Report*, pp. 46–47.

In part the replacement of lost reserves with discount borrowings was a manifestation of the 'scissors effect' discussed by Friedman and Schwartz (1963, p. 272). If banks are reluctant to change the total quantity of loans, then open market sales by the Federal Reserve would always be partly matched by increased borrowing even in the face of a rising discount rate. For monthly data during 1920:2–1929:12, an OLS regression of the change in bills discounted on the change in Fed holdings of government securities yields[14] (standard errors in parentheses)

$$B_t - B_{t-1} = \underset{(7.6)}{-10.6} - \underset{(0.16)}{0.56}(S_t - S_{t-1}).$$

That is, half of the reserves lost through open market sales were typically made up by borrowing over this period.

An additional important factor behind the increase in borrowings was the stock market boom, which had two effects on banks' demand for reserves. First, Field (1984) concluded that increased trading volume on the stock exchange led to an increase in the public's demand for M1, a factor that would have boosted interest rates generally (and thus banks' derived demand for reserves). Second, increased demand for brokers' loans led to higher rates on call money. As emphasized by Friedman and Schwartz (1963, p. 289), the result was that although the discount rate increased, banks' returns on alternative investments increased even more, so that banks were willing to borrow more from the Fed despite the higher cost of doing so. While the discount rate was rising from $3\frac{1}{2}\%$ to 5%, for example, call money rates for broker's loans on the New York Stock Exchange rose from 3.60% in November 1927 to 6.87% in August 1928.[15]

I thus conclude that the U.S. money market in 1928 was subject to two simultaneous shocks. First, a substantial drop in unborrowed reserves represented the outcome of deliberate changes in monetary policy. Second, a perceived increase in the marginal product of capital owing to new technological opportunities[16] led to an increased demand for loans, particularly brokers' call loans, so that banks found it profitable to replace unborrowed reserves with borrowed reserves despite the sharply higher cost of doing so.

[14] In OLS estimation of

$$B_t = \alpha_0 + \alpha_1 B_{t-1} + \gamma_0 S_t + \gamma_1 S_{t-1} + \varepsilon_t,$$

the null hypothesis $\alpha_1 = -1, \gamma_0 = -\gamma_1$ is accepted at the 0.05 level. Data are from the 1929 *Annual Report* of the Federal Reserve Board, pp. 46–47.

[15] Macaulay (1938, p. A159).

[16] This statement reflects Irving Fisher's (1930) views on the source of the stock market boom.

3. The impact of monetary policy on macroeconomic aggregates

This section reviews the effects of these changes in monetary policy on key U.S. monetary and macroeconomic aggregates. In table 2, I have standardized my summary of the data on the basis of the following criteria: (1) where monthly or daily data are available, the magnitude reported for a given year is that for the end of June (using data on such a yearly basis also relieves one of the difficult task of separating seasonal from cyclical factors, and choosing June helps highlight events prior to the cyclical peak in the summer of 1929), and (2) a given change in the series is to be regarded as 'contractionary' only when it is clearly more severe than in any year since the recession of 1921.

3.1. Deflation

The annual logarithmic change in the consumer price index is reported in column (1) of table 2. Prices began falling in 1927, two years prior to the onset of the depression itself. Prices did not fall at the dramatic rates of deflation seen in 1921, however, until after 1930. If we were to follow Schwartz's (1981) suggestion of relying on deflation as our gauge of monetary policy, we would thus identify a period of mildly contractionary monetary policy beginning in 1927 and strongly contractionary policy initiated in 1931.

3.2. Nominal monetary aggregates

Table 2 also details the behavior of three nominal monetary aggregates: the monetary base [column (2)], M1 [column (3)] and M2 [column (4)]. As in the case of the CPI, each of these indicators clearly points to a strong role for monetary policy in the 1921 recession. In comparing these indicators, however, it is important to recognize their different secular trends. Excluding the recession of 1921, the monetary base increased at an average annual rate of 3.1% between June 1919 and June 1926. M1 increased by 5.3% and M2 by 7.3%. Accordingly, in determining what constitutes 'contractionary' behavior in each series, the criteria described above led to a choice of a decrease in the monetary base, an annual increase in M1 of less than 2%, or an annual increase in M2 of less than 4%. All three measures confirm the inference drawn above on the basis of the CPI: a clear shift in regime towards a more contractionary monetary policy would be said to have been initiated in 1927 or 1928. In contrast to this unanimity about the late twenties, the three indexes give somewhat different impressions for the subsequent course of the depression; looking at M1 or M2, policy was more severe in 1931–1933 than in 1921, whereas on the basis of the monetary base we might have regarded monetary policy as actually expansionary during 1931–1933.

Table 2

Alternative measures of U.S. monetary policy.

Year	Rate of growth of prices (CPI) (1)[a]	Rate of growth of high-powered money (2)[b]	Rate of growth of nominal money (M1) (3)[c]	Rate of growth of nominal money (M2) (4)[d]	Rate of growth of real money (M1/CPI) (5)[e]
1919	+14.1%	+10.1%	+15.7%	+16.0%	+1.6%
1920	+14.7%	+10.2%	+9.8%	+13.5%	[−4.9%]
1921	[−11.5%]	[−9.7%]	[−11.9%]	[−7.5%]	[−0.4%]
1922	[−6.5%]	[−3.5%]	+3.1%	+4.4%	+9.6%
1923	+1.8%	+5.6%	+4.7%	+7.9%	+2.9%
1924	+0.3%	+2.5%	+2.5%	+4.3%	+2.2%
1925	+2.6%	+1.4%	+8.8%	+9.3%	+6.2%
1926	+0.8%	+2.5%	+2.8%	+4.3%	+2.0%
1927	[−1.9%]	+1.5%	[−1.1%]	[+1.9%]	[+0.8%]
1928	[−1.2%]	[−1.2%]	[−0.1%]	[+3.3%]	+1.1%
1929	[0.0%]	[−0.7%]	[+1.6%]	[+0.1%]	+1.6%
1930	[−2.6%]	[−2.8%]	[−3.5%]	[−1.3%]	[−0.9%]
1931	[−9.4%]	+5.5%	[−5.7%]	[−6.2%]	+3.7%
1932	[−10.7%]	+6.4%	[−15.5%]	[−21.1%]	[−4.8%]
1933	[−5.5%]	+2.0%	[−6.1%]	[−13.6%]	[−0.6%]
1934	+3.4%	+15.3%	+9.1%	+9.5%	+5.7%
1935	+2.6%	+14.4%	+17.9%	+14.0%	+15.3%
1936	+1.0%	+9.0%	+16.2%	+13.0%	+15.2%
1937	+3.5%	+14.2%	+3.2%	+4.2%	[−0.3%]
1938	[−1.8%]	+8.0%	[−4.7%]	[−2.5%]	[−2.9%]
1939	[−1.5%]	+16.9%	+11.1%	+7.8%	+12.6%

[a] Bureau of Labor statistics annual Consumer Price Index, from *Historical Statistics of the United States*, 1960, Series E-113, pp. 125–126. Column entry is change in the logarithm of the CPI for listed year over that for preceding year. Note that, apart from rounding error, the raw data are identical to those for series E-135, pp. 210–211, in *Historical Statistics of the United States*, 1976. Since the latter are expressed in 1967 relatives and the former in 1947–1949 relatives, the rounding error associated with the 1960 edition figures is smaller and so this is the preferred series. Bracketed magnitudes are those less than or equal to 0.0%.

[b] Change in logarithm of high-powered money for June of listed year over that of preceding year, from Friedman and Schwartz (1963, table B-3, col. 1). Bracketed magnitudes are those less than or equal to 0.0%.

[c] M1 = sum of currency held by public plus demand deposits of commercial banks, from Friedman and Schwartz (1963, table A-1, col. 7). Column entry is change in logarithm for June of listed year over June of preceding year. Bracketed magnitudes are those less than or equal to 2.0%.

[d] M2 = sum of M1 plus time deposits at commercial banks, from Friedman and Schwartz (1963, table A-1, col. 8). Column entry is change in logarithm for June of listed year over June of preceding year. Bracketed magnitudes are those less than or equal to 4.0%.

[e] Column (3) minus column (1). Bracketed magnitudes are those less than or equal to 1.0%.

Table 2 (continued)

Year	Rate of growth of real money (M2/CPI) (6)[a]	Discount rate (7)[b]	Short-term government bonds (8)[c]	Long-term government bonds (9)[d]	Baa-rated corporate bonds (10)[e]
1919	[+1.9%]	4.00	–	4.69	7.04
1920	[−1.2%]	[7.00]	[5.75]	[5.54]	[8.39]
1921	+4.0%	[6.00]	[4.99]	[5.27]	[8.56]
1922	+10.9%	4.00	3.25	4.24	6.97
1923	+6.1%	4.50	3.84	4.34	7.21
1924	+4.0%	3.50	2.44	3.98	6.82
1925	+6.7%	3.50	2.86	3.79	6.18
1926	+3.5%	3.50	2.93	3.67	5.80
1927	+3.8%	4.00	3.07	3.34	5.55
1928	+4.5%	4.50	3.92	3.29	5.55
1929	[+0.1%]	[5.00]	[4.80]	3.69	5.94
1930	[+1.3%]	2.50	1.89	3.25	5.78
1931	+3.2%	1.50	0.55	3.13	7.36
1932	[−10.4%]	2.50	0.34	3.76	[11.52]
1933	[−8.1%]	2.50	0.07	3.21	7.07
1934	+6.1%	1.50	0.07	2.98	6.06
1935	+11.4%	1.50	0.13	2.72	5.77
1936	+12.0%	1.50	0.23	2.66	4.90
1937	[+0.7%]	1.50	0.56	2.76	4.93
1938	[−0.7%]	1.00	0.02	2.52	6.25
1939	+9.3%	1.00	0.01	2.13	4.91

[a] Column (4) minus column (1). Bracketed magnitudes are those less than or equal to 3.0%.

[b] Discount rate at end of June at the Federal Reserve Bank of New York, from *Banking and Monetary Statistics*, p. 439. Bracketed magnitudes are those greater than or equal to 5.0%.

[c] 1920–1933: yield on 3–6 month Treasury notes and certificates during June. 1934–1939: yield on Treasury bills during June. From *Banking and Monetary Statistics*, p. 460. Bracketed magnitudes are those greater than or equal to 4.0%.

[d] Yield on long-term U.S. government bonds during June, from *Banking and Monetary Statistics*, pp. 468–471. Bracketed magnitudes are those greater than or equal to 5.0%.

[e] Yield on Baa-rated corporate bonds during June, from *Banking and Monetary Statistics*, pp. 468–471. Bracketed magnitudes are those greater than or equal to 8.0%

Accounting for this disparity in the behavior of the different monetary aggregates during 1931–1933 was of course one of the key insights of Friedman and Schwartz. They have argued in their *Monetary History* and subsequent work that, during normal times, the three indexes reported in columns (2)–(4) of table 2 give broadly similar measures of the course of monetary policy. As a consequence of the banking panics beginning in 1930, however, Friedman and Schwartz noted that the public was frightened away from checking accounts, just as banks felt forced to increase their holdings of reserves relative to deposits. These increases in the currency–deposit ratio and reserve–deposit ratio account for the simultaneous rise in the monetary base and drop in M1

Table 2 (continued)

Year	Ex post real interest rate (11)[a]	Risk premium (12)[b]	Deposits of suspended banks (13)[c]
1919	–	2.35	–
1920	[+17.3]	2.85	–
1921	[+11.5]	3.29	172.2
1922	+1.4	2.73	91.2
1923	+3.5	2.87	149.6
1924	−0.2	2.84	210.2
1925	+2.1	2.39	167.6
1926	[+4.8]	2.13	260.4
1927	[+4.3]	2.21	199.3
1928	+3.9	2.26	142.4
1929	[+7.4]	2.25	230.6
1930	[+11.3]	2.53	[837.1]
1931	[+11.3]	[4.23]	[1,690.2]
1932	[+5.8]	[7.76]	[706.2]
1933	−3.3	3.86	[3,596.7]
1934	−2.5	3.08	36.9
1935	−0.9	3.05	10.0
1936	−3.2	2.24	11.3
1937	+2.4	2.17	19.7
1938	+1.5	3.73	10.5
1939	−0.8	2.78	35.0

[a] Column (8) minus subsequent year's entry from column (1). Bracketed magnitudes are those greater than or equal to 4.0.

[b] Column (10) minus column (9). Bracketed magnitudes are those gretater than or equal to 4.0%.

[c] Deposits of all banks suspended during calendar year, in millions of current dollars, from *Banking and Monetary Statistics*, p. 283. Bracketed magnitudes are those greater than or equal to 400.

and M2 during 1931–1933. Far from giving an inconsistent picture of the status of monetary policy during 1931–1933, they argued, the monetary aggregates reported in table 2 reveal precisely the pattern expected when the Federal Reserve fails to supply sufficient reserves to prevent a severe collapse of credit. According to Friedman and Schwartz's interpretation of the behavior of the monetary aggregates, then, we might identify 1927–1930 as a typical monetary contraction, whereas 1931–1933 represents a distinct and much more severe contractionary regime.

3.3. The real money supply

Temin (1976, 1981) has argued strongly that it is not the nominal money supply but rather the real money supply that should matter for economic activity. In a standard IS–LM model with expected rates of inflation constant,

a leftward shift of the LM curve due to a contraction in liquidity (the so-called Keynes effect) or of the IS curve due to lower consumption spending (the Pigou or real balance effect) would only come about in the event that money fell faster than prices.

I shall have more to say about this suggestion in subsection 3.4 below. For now, however, I note that this argument first assumes a constant level of potential output. In a growing economy with constant inflation, an increase in real balances would be associated with neutral monetary policy in a Keynesian model, and a slower rate of growth rather than an outright decline in the level of the series would be the appropriate measure to consult. One clearly sees the need for such a correction when the data are put in historical perspective as in columns (5) and (6) of table 2. If we were to insist that M2 must fall relative to prices before concluding that monetary policy had been contractionary, then even the recession of 1921 almost fails to pass this test. Between 1920 and 1926, $M1/P$ grew at an average annual rate of 3.8%, while $M2/P$ grew at 5.9%. This motivates our criterion that a rate of growth of $M1/P$ of less than 1% or of $M2/P$ of less than 3% should be considered mildly contractionary. From the first measure, policy began to tighten in 1927, whereas according to the second not until after the summer of 1928. Again, however, the contractionary policies in effect prior to the downturn in June 1929 would have to be characterized as quite mild relative to those of 1921, and the serious crunch failed to come until after 1931.

3.4. Nominal interest rates

Temin has further looked to nominal interest rates as an important indicator of the posture of monetary policy. Columns (7) through (10) of table 2 record the behavior of four key interest rates during the twenties and thirties. The discount rate [column (7)] was raised from a low of 3.5% in January 1928 to a high of 6% on August 9, 1929, a height nearly commensurate with that reached in the monetary crunch of 1920. Short-term Treasury bills and notes exhibited similar behavior [column (8)], and while longer-term rates likewise rose between 1927 and 1929, they did not get back to the highs of 1925. Thus, by Temin's proposed measure (nominal interest rates on short-term, low-risk assets) the late 1920's would have to be identified as a period of tight money. Although not quite as severe as that of the recession of 1920–1921, policy in 1929 was clearly more contractionary than in any of the intervening years.

Temin's interpretation of these increases in interest rates is somewhat curious. In his later work (1981, p. 115), for example, he acknowledged that the Great Depression was preceded 'by deflationary shocks to the economy in which monetary conditions played a prominent part, as shown by the behavior of interest rates in mid-1929...'. By dismissing this as a potential explanation of the path followed by the economy during 1929–1930, however, he seems to

have implicitly rejected Friedman's contention that monetary policy affects real activity with a lag that is long and variable. It is therefore perhaps worth reviewing here some of the reasons why Friedman's position might be plausible. First, most investment commitments must be made well in advance of the final outlay of dollars, and effects of monetary policy on output through this avenue are accordingly necessarily delayed. For example, Jorgenson's (1963, p. 259) famous calculations suggested an average delay of $1\frac{1}{2}$ years between a change in the demand for capital and a change in investment spending. Second, unanticipated inventory accumulation often keeps output rising even after final sales have begun to fall; 10% of total gross private domestic investment during 1929 represented inventory accumulation.[17] Third, much of the effect of monetary policy may operate through the expectations of firms and consumers about the future course of income and prices. I will explore in section 4 below some of the particular historical reasons why the recognition of the shift in monetary policy was particularly slow in coming in 1929. As a theoretical matter, however, a significant delay between the date at which policy-makers changed their posture and the date at which the economic public is led to change its behavior should not be impossible to imagine. If one agrees that a contractionary monetary policy could still be exerting an effect on the economy several years after the policy was first adopted, much of the substance of Temin's objection disappears.

While Temin acknowledged this rise in nominal interest rates during 1927–1929, he concluded that monetary factors made a relatively minor contribution in the early stages of the Depression on the basis of the precipitous drop in interest rates during 1929–1931. Column (7) slightly overstates the rate of decrease in the discount rate, since the New York Federal Reserve bank was much more aggressive than any of the others in lowering rates once the recession was under way.[18] For example, while the New York discount rate was down to 2% by the end of 1930, at all the other banks in the Federal Reserve System it was over 3%, with most at $3\frac{1}{2}$%.[19] Even so, there is no denying that short-term nominal interest rates fell dramatically after the summer of 1929, and this might seem difficult to reconcile with Friedman and Schwartz's portrait of cripplingly tight money.

Others have disputed this interpretation of the evidence on the grounds that it is not short-term interest rates that one must consult. Friedman and Schwartz (1963, p. 312), Mayer (1978, p. 141) and Schwartz (1981, pp. 31–38)

[17] *National Income and Product Accounts of the United States, 1929–76: Statistical Tables*, 1981, U.S. Department of Commerce, p. 1. For purposes of comparison, the corresponding value averaged 6% during the 1950's and 7% during the 1960's.

[18] Friedman and Schwartz discussed extensively the disagreements between the New York Bank and the rest of the Federal Reserve System and the role this played in the mismanagement of monetary policy during this period.

[19] *Banking and Monetary Statistics*, p. 441.

have all observed that one of the effects of the bank panics would have been an increased demand for liquidity generally – the public held currency in favor of demand deposits and T-bills in favor of corporate bonds. They argued that contractionary monetary policy may thus have effected not a decrease in the demand for low-risk bonds, but instead may have translated into a decreased demand for commodities and higher risk bonds, manifest in falling prices and output and higher interest rates on riskier securities. Column (10) of table 2 documents that while short-term rates were falling after 1930, the nominal rate on Baa-rate corporate bonds was rising to unprecedented levels, and, as stressed by Bernanke (1983), such increases correlate very well with the timing of the banking panics noted by Friedman and Schwartz. One can certainly imagine constructing a 'composite' interest rate for the early 1930's whose behavior is much different from that of columns (7) and (8).

Moreover, suppose one agreed to focus on short-term, low-risk interest rates during 1929–1931 and further shared Temin's belief that *both* monetary policy *and* some other exogenous shock to the IS curve contributed to the depression. Even if one were unconcerned about the issues raised above, should one conclude that the IS curve shift was more important based on the observations that (1) the real money supply was unchanged and (2) nominal interest rates fell? Gordon and Wilcox (1981, p. 55) have argued convincingly that such an inference would be unwarranted, even if one accepted the Keynesian IS–LM paradigm. It is true in an accounting sense that when the real money supply and expected inflation are constant, all of the loss in output is 'due' to the IS-curve shift. However, this is not the same as the answer to the counterfactual question, 'suppose the monetary authorities had kept the nominal money supply from falling – how much of the depression could have been avoided?' With nominal money constant at M_1, there would still have been some decrease in prices (to P_2^*, say) corresponding to the deflationary effects of the IS curve shift. In the absence of a contractionary monetary policy, the real money supply should thus have risen to M_1/P_2^*, shifting the LM curve to the right, and much of the drop in output occasioned by the shift of the IS curve might have been avoided.

One can say a little more about this possibility on the basis of standard Keynesian IS, LM, and aggregate supply equations:

$$\text{(IS)} \quad Y = C(i - \bar{\pi}^e, Y) + I(i - \bar{\pi}^e, Y) + \bar{G} + \overline{NX},$$

$$\text{(LM)} \quad \bar{M}/P = L(i, Y),$$

$$\text{(AS)} \quad P = (1 + \bar{\pi}^e)\bar{P}_{-1} + \phi(Y - \bar{Y}_p).$$

Here $\overline{NX}$ denotes real net exports, i the nominal interest rate, $\bar{\pi}^e$ expected inflation, $\bar{P}_{-1}$ the previous period's price level, and $\bar{Y}_p$ potential output; the

functions $C(\cdot)$, $I(\cdot)$, and $L(\cdot)$ denote real consumption, investment, and money demand, respectively. The unbarred variables (Y, i, and P) are endogenous to the model; all other barred magnitudes are exogenous.

Totally differentiating we obtain

$$dY = \frac{L_i}{\{[1 - C_Y - I_Y]L_i + [C_i + I_i][\phi_Y(\overline{M}/P^2) + L_Y]\}} d\overline{NX} + \frac{[C_i + I_i]/P}{\{[1 - C_Y - I_Y]L_i + [C_i + I_i][\phi_Y(\overline{M}/P^2) + L_Y]\}} d\overline{M}. \quad (1)$$

The second term in (1) registers how much of the fall in output could have been avoided by keeping the nominal money supply constant. Now, suppose we are told that both $\overline{M}$ and $\overline{NX}$ decreased in such a way that the real money supply ($\overline{M}/P$) stayed the same. The magnitudes of the changes in $\overline{M}$ and $\overline{NX}$ would have to have been related in a particular way for this to have occurred. Solving for the change in $\overline{NX}$ that would keep $d\overline{M}/\overline{M} = dP/P$, we obtain

$$d\overline{NX} = \frac{\{[1 - C_Y - I_Y]L_i + [C_i + I_i]L_Y\}}{L_i\phi_Y/P} d\overline{M}/\overline{M}.$$

Substituting this expression into (1), we find

$$dY/Y = \underset{\{\text{due to lower } NX\}}{(1 - \theta)(1/\eta)\, d\overline{M}/\overline{M}} + \underset{\{\text{due to lower } M\}}{\theta(1/\eta)\, d\overline{M}/\overline{M}},$$

where

$$\theta \equiv \frac{[C_i + I_i]\phi_Y(\overline{M}/P^2)}{\{[1 - C_Y - I_Y]L_i + [C_i + I_i][\phi_Y(\overline{M}/P^2) + L_Y]\}},$$

and η is the elasticity of the aggregate supply curve ($\eta \equiv \phi_Y Y/P$). Note that under the usual assumptions about signs, $0 < \theta < 1$.

We see from eq. (2) that θ has the interpretation as the fraction of the fall in output that could have been avoided had the nominal money supply been held constant. It is also straightforward to see that for this same change in $\overline{NX}$ and $\overline{M}$, $di = [-L_Y/L_i]dY$. By choosing $|I_i|$ sufficiently large and $|L_i|$ and $|L_Y|$ sufficiently small, one can make θ arbitrarily close to one – i.e., one can attribute virtually all of the depression to monetary factors, even though the real money supply was historically constant and even though the fall in

interest rates may have been arbitrarily large.[20] This is of course precisely the same specification of parameter values – a high interest elasticity of investment demand and low interest elasticity of money demand – that implies monetary policy is most powerful and IS curve shifts less relevant in a standard IS–LM model. Any conclusion that Temin wants to draw about which development (monetary policy or the IS curve shift) was more important in 1929 thus seems to be little more than an a priori specification that the parameters are such that monetary policy was unlikely to exert much effect on the economy anyway; it is certainly not a conclusion warranted by the observed behavior of the real money supply and nominal interest rates.

Thus, the following could form a perfectly internally consistent interpretation of the Great Depression: (1) prices and the nominal money supply fell in such a way as to keep the real money supply constant; (2) nominal interest rates fell precipitously, though expectations of inflation were unchanged; and (3) both monetary factors and exogenous shocks to the IS curve contributed to the depression, though monetary factors were of overwhelmingly greater importance in the sense that if the Federal Reserve had held the nominal money supply constant, virtually no drop in output would have occurred.

The final interest rate reported in column (11) of table 2 is an ex-post real interest rate, measured as the nominal interest rate on treasury bills minus the subsequent year's realized inflation of the consumer price index. If realized rates of inflation had been largely anticipated before hand, then increases in this measure would correspond to decreased incentives for investment, the consequences of which for aggregate spending might be construed as the avenue whereby monetary policy influenced real activity. On the other hand, if the deflation associated with the depression was largely unanticipated, this series would summarize the unanticipated difficulty that debtors may have run into in being able to honor outstanding nominal commitments, a development that may have played a crucial role in the subsequent financial collapse. Whatever the interpretation one chooses to give to this series, it reinforces the conclusion based on the other measures considered above: the late 1920's must be identified as a period of tight money.

3.5. Banking failures

A central thesis of Friedman and Schwartz (1963) was that the key development that made the depression of 1929–1933 historically unique was the widespread panic that came to engulf the banking system. Since the Federal Reserve was established in part precisely to avert such panics, the depression in this sense represents an unambiguous failure of monetary policy. One can

[20] For example, let $I_i = -n$, $L_Y = 1/n^2$, and $L_i = -1/n^3$, and take the limit as $n \to \infty$.

argue whether the banking failures were important because of their effects on liquidity and the money supply, as suggested by Friedman and Schwartz, or instead because they undermined the ability of the financial sector as a whole to perform the real service of evaluating and providing loans for worthwhile investment projects, as argued persuasively in Bernanke's (1983) innovative research.

Columns (12) and (13) of table 2 present two measures of financial panic – the spread between the rates on Baa corporate and long-term government bonds [column (12)] and the deposits of suspended banks [column (13)]. Neither of the measures is perfect. Massive downgrading of individual bonds occurred in the 1930's, and which bonds retained a Baa rating represents in part an institutional feature of the rating system; one can imagine downgrading bonds in such a way that a Baa bond by *definition* had a constant yield. Bernanke (1983) nevertheless documented that this variable has a good deal of statistical explanatory power in accounting for the path of output during the depression and also responds sharply to each of the principal banking panics identified by Friedman and Schwartz. The second measure, deposits of suspended banks [column (13)], might likewise be criticized as a measure of Federal Reserve policy per se. For example, the failure of the Bank of United States, a single privately owned bank, accounted for one-fifth of the deposits of all failed banks in 1930. Temin (1976, pp. 90–93) and Lucia (1985) convincingly documented that, in addition to Reserve policy, unsound expansion and fraud were important factors contributing to its failure.

Though either of these series may provide an imperfect indication of monetary policy, for our purposes the important thing to note is that, in contrast to our earlier measures, neither of these indexes suggest anything amiss prior to the first banking panic of November–December 1930. A monetary contraction may have begun in 1927–1928, but both the quantitative significance and the qualitative dimension of the contraction clearly changed some time late in 1930.

3.6. International considerations

Theory teaches that under a gold standard with fixed exchange rates, a contractionary monetary policy in any one country should not be able to wreak too much damage. In principle, as the U.S. economy deflated, gold inflows to the U.S. are supposed to neutralize the effects on the U.S. money supply of Federal Reserve actions.

There are three key reasons why this price–specie flow mechanism failed to stabilize the U.S. economy during 1929–1931. First, the money supply was falling not just in the United States, but in the rest of the world as well. The United Kingdom saw a 2% drop in sterling M1 between 1929 and 1931 [Capie and Webber (1985, p. 119)], while Germany experienced a 6% decrease in its

money supply [Saint-Etienne (1984, p. 9)]. And although the nominal money supply increased in France, I argued in section 2 that with the increased demand for francs arising from the political reforms, the effect of this policy was quite contractionary as well. While monetary policy was thus restrictive in many other countries besides the United States, Friedman and Schwartz (1963, pp. 360–361) concluded that after 1929 the U.S. was leading the world deflation in light of the net gold inflows to the U.S from the rest of the world during 1929–1931.[21]

A second factor in the failure of the traditional price–specie flow mechanism was that even as the discount rate fell in 1929–1930, bills discounted fell even faster. Friedman and Schwartz sharply criticized the Federal Reserve for failing to increase unborrowed reserves correspondingly (see pp. 340–341). Thus despite the inflow of gold, high-powered money fell 5%, so that in effect, they argued, the Fed not only sterilized these flows, it went further and actually accelerated the contraction in high-powered money (p. 361).

Finally, Meltzer (1976) suggested that a third factor critical in the failure of the price–specie flow mechanism was the collapse of world trade which followed the rash of tariffs, quotas, and domestic content laws adopted worldwide in the 1920's and 1930's. Saint-Etienne carried this argument a step further, contending that these trade wars were further a precipitating factor in the collapse of Austria's Credit-Anstalt in 1931, which in turn led to Britain's departure from gold and the U.S. monetary contraction later in that year.

I conclude that focusing on the international implications of the fixed exchange rate regime followed at the time in no way alters the basic conclusion that monetary policy was an important precipitating factor in the Great Depression.

4. The mechanism whereby monetary policy affected real activity

A critical unresolved issue in understanding the mechanism whereby monetary policy may have influenced the Great Depression concerns the extent to which the general price deflation associated with the monetary contraction was

[21] Fremling (1985) has disputed Friedman and Schwartz's interpretation of this evidence on the grounds that the flow of gold into the United States came not from foreign central banks but rather from foreign private holdings. Her argument rests on the assumption that while loss of gold by the central government would be associated with a reduction in that country's money supply, loss of gold by the private sector would not be. She does not articulate an equilibrium model of central bank and public behavior in which this assumption holds. Other things being equal, an increase in a government's gold holdings relative to the private sector would be associated with a contractionary monetary policy in that country, the deflation of the price level and increase in the real cost of gold persuading households to hold fewer ounces of gold in equilibrium. The evidence thus may support her conclusion that contractionary policies adopted by other governments were significant factors in the worldwide depression, but the net flow of gold from other countries to the U.S. seems to identify the U.S. as leading the world into depression during 1929–1931 as Friedman and Schwartz claimed.

anticipated by people at the time. If, on the one hand, people correctly anticipated the tremendous deflation of 1927–1933, then this would have several important effects in a standard Keynesian IS–LM analysis. First, investment demand is usually written as a function of the ex ante real interest rate (the nominal interest rate minus expected inflation). With the IS curve drawn as a relation between nominal interest rates and real output, a decrease in expected inflation shifts the IS curve down. In this situation a purely monetary-induced recession with both lower nominal interest rates and an unchanged real money supply is a theoretical possibility. Second, monetarists have claimed that expenditures on commodities and real assets are equally or even more important than bond purchases as alternative uses to which excess cash balances might be put. If true, money demand is properly a function of both the nominal interest rate (which affects the choice between money and bonds) and expected inflation (which affects the choice between money and commodities). A perceived monetary contraction could thus shift the LM curve to the left solely because of lower expected rates of inflation without any change in the level of the money supply.

If, on the other hand, the deflation was largely unanticipated, then a somewhat different mechanism whereby monetary policy influenced real activity might be indicated which operates not through the effect of high ex ante rates on investment demand, but instead through the effect of high ex post rates on the ability of debtors to service their outstanding debts. The resulting wave of bankruptcies could have independent and significant effects on aggregate demand, as argued by Fisher (1932, 1933), or may have been important on both the demand and supply side through disrupting financial intermediation, as stressed by Bernanke (1983) and Bernanke and Gertler (1986). Other mechanisms whereby unanticipated deflation can have negative macroeconomic effects were explored by Lucas (1973) and Mishkin (1978).

Here I briefly consider three alternative approaches to determining to what extent deflation may have caught people by surprise. The first employs statements published by actors of the day, with which, despite their inherently slippery nature, one can nevertheless advance a few concrete claims. It is easy enough to suggest that the public underestimated the contractionary resolve of policy-makers. For example, while Hoover was perceived to be the pro-business, pro-market candidate, his memoirs reveal a personal antipathy toward the stock market boom,[22] and we have seen that it was precisely in order to curb this boom that monetary policy became so contractionary in 1928–1929. The public could likewise hardly be credited with the prescience that the Federal Reserve would continue with such a contractionary policy, when even the governors of the system seem to have been caught by surprise. The controversy and uncertainty within the Federal Reserve System itself is

[22] Galbraith (1954, p. 16).

documented at considerable length by Friedman and Schwartz (1963). For example, they noted that in the summer of 1930, James McDougal, governor of the Federal Reserve Bank of Chicago, expressed concern that Reserve policy could become too expansionary, citing 'an abundance of funds in the market' and noting that 'speculation might easily arise in some other direction' [Friedman and Schwartz (1963, p. 371)]. And in August 1931, George Harrison, governor of the Federal Reserve Bank of New York, offered the following post-mortem: 'if we had been asked last November whether we would favor, or even permit, the sterilization of $400,000,000 of gold, undoubtedly we would have argued in the negative' [Friedman and Schwartz (1963, p. 379)]. If the actual stance of monetary policy came as a surprise to the Federal Reserve System, it could have been no less so to the general public. And, sifting through 1930 newspapers, one finds no shortage of reassuring optimistic statements by illustrious leaders of business, samples of which have been compiled by Galbraith (1954) and Temin (1976). Thus, statements by policy-makers and business leaders suggest that much of the deflation could well have come as a surprise to people at the time.

A second methodology for ascertaining the extent to which the deflationary monetary policy may have been anticipated employs time-series regressions; if the historical path of money and prices does not surprise a naive statistical forecasting equation, it should not have surprised rational economic agents, either. Shiller and Siegel (1977) employed Box–Jenkins methods to conclude that the log of the U.K. price level followed a random walk prior to 1913 and an IMA(1) process afterwards; in other words, they found changes in inflation impossible to anticipate if one were looking any farther than one year into the future. Schwartz (1981) and Gordon and Wilcox (1981) observed that U.S. personal income failed to 'Granger-cause' money during 1919–1939. The Granger test is at its core a statistical statement about predictability, and for our purposes, a summary of the descriptive content of these tests will suffice: changes in the money supply were statistically difficult to forecast during this era. Meltzer (1977, pp. 188–191) regressed the rate of change in the GNP deflator on lagged M1 growth, previous three-years average M1 growth, and dummy variables for 1917–1922 and 1934. Using data from 1901–1940, the R^2 was 0.23, leading Meltzer to conclude that 'a considerable part of the observed rate of price change is unanticipated' (p. 190). The assertion that much of the historical deflation came as a surprise to economic agents is thus consistent with the time-series properties of the data.

My final source of evidence on the extent to which deflation was anticipated comes from commodity futures markets. Let S_t denote the current spot price of a commodity and $f_t(j)$ the j-period-ahead futures price. The latter is a contract under which no money changes hands until period $t+j$, but the price of such exchange $[f_t(j)]$ is settled at date t. If $f_t(j)$ were higher than speculators believed S_{t+j} would actually turn out to be, they would perceive a

profit opportunity from selling the commodity on today's futures market for future exchange at price $f_t(j)$, later buying on the spot market at S_{t+j} to fulfill the contract, and pocketing the difference. Wagers based on such beliefs would drive $f_t(j)$ to the value that best reflected a market consensus on the most plausible value for S_{t+j}.

A number of empirical studies have found post-war data largely consistent with this view of commodity futures markets.[23] It must be noted, however, that the commodity traded on the futures market is not quite the same as that traded on the spot market. For one thing, in the structure of actual futures contracts, the seller may *choose in month* $t+j$ the date within month $t+j$ at which delivery is to take place.[24] For another, the grade and location of delivery of published quotations may differ for spot and future contracts. One can get around these problems by using the one-month futures price $[f_t(1)]$ as the 'spot' price, that is, as the current price of a commodity that is to be delivered within one month at a date at the seller's discretion, and $f_t(7)$ as the '6-month futures' price of this commodity.

Table 3 records the actual (annualized logarithmic) rate of inflation of cotton prices $(= 200 * [\ln(f_{t+6}(1)) - \ln(f_t(1))])$ and compares this with the rate anticipated by futures markets $(= 200 * [\ln(f_t(7)) - \ln(f_t(1))])$. Note first that looking at just the record from January 1922 through July 1929, the numbers are quite consistent with the view that futures prices represented an efficient forecast of subsequent spot prices. The variance of the expected inflation series, 200, is much less than the actual inflation series, 1,969, as it should be under efficient markets.[25] The implicit forecast error has sample mean 10.4 with variance 1,569 – one accepts the null hypothesis that forecast errors had population mean zero.[26] The ratio $1{,}569/1{,}969 = 0.80$ implies that the futures price embodies a better forecast of cotton price inflation than would be obtained by just using the historical average rate of cotton inflation, though not a whole lot better; speculators were able to forecast only 20% of the variance in cotton price inflation rates during 1922–1929. Thus futures markets appear to have been doing the job predicted for them by theory, subject to the caveat that forecasting the future, then as now, is a difficult business to make a living at.

[23] See for example Dusak (1973).

[24] For terms of a typical futures contract, see Hoffman (1932, pp. 100–102).

[25] Let $\pi_t = \pi_t^e + e_t$ where under efficient markets the forecast error e_t is uncorrelated with π_t^e. Thus $\text{var}(\pi_t) = \text{var}(\pi_t^e) + \text{var}(e_t)$, from which $\text{var}(\pi_t) > \text{var}(\pi_t^e)$.

[26] Recall that unbiased estimates are given by

$$\widehat{\text{var}}(\pi_t) = \sum_{t=1}^{T} (\pi_t - \bar{\pi})^2/(T-1) = 1{,}969 \quad \text{and} \quad \widehat{\text{var}}(e_t) = \sum_{t=1}^{T} e_t^2/T = 1{,}569,$$

with a sample mean estimated for the former but not the latter.

Table 3

Expected and actual rates of inflation over six-month intervals (annualized rates) in cotton prices from futures market.[a]

Date	Expected inflation	Actual inflation
January 1922	+19.9	+97.2
July 1922	−11.9	+24.1
January 1923	−5.0	+40.6
July 1923	−0.2	+4.5
January 1924	−26.2	+51.6
July 1924	−1.9	−37.0
January 1925	−37.6	−35.2
July 1925	+6.8	−4.1
January 1926	−4.0	−36.3
July 1926	−10.6	−18.0
January 1927	−21.2	−72.8
July 1927	+8.8	+58.1
January 1928	+5.7	+29.4
July 1928	+0.9	+28.7
January 1929	−1.9	−22.4
July 1929	−3.1	−22.5
January 1930	+7.8	−10.9
July 1930	+8.2	−45.9
January 1931	−1.2	−68.5
July 1931	+15.2	+11.9
January 1932	+13.4	−95.9
July 1932	+13.1	−24.8
January 1933	+13.8	+12.1
July 1933	+9.8	+106.6
January 1934	+9.3	−1.0
July 1934	+9.3	+37.5
January 1935	+7.3	+6.5
July 1935	+3.8	−12.1
January 1936	−5.5	−6.0
July 1936	−10.0	+15.3
January 1937	−11.8	+0.5
July 1937	−3.9	−6.7
January 1938	−0.7	−70.6
July 1938	+4.5	+13.3
January 1939	+1.5	−13.5
July 1939	−10.5	+20.7
Average value, Jan. 1930 to July 1932	+9.4	−39.0

[a]Raw price data were taken from that issue of *Barron's* closest to the beginning of the listed month, i.e., the Monday falling on the first through fourth of the month or on one of the last three days of the preceding month. All differences were converted to annual percentage rates by multiplying by 200.

The entry for column (1) for January 1929 is based on the difference between the natural logarithms of (a) the futures price of January cotton quoted at the beginning of July 1928 and (b) the futures price of July cotton quoted at the beginning of July 1928. The entry for column (2) of January 1929 is based on the difference between the natural logarithms of (a) the futures price of January cotton quoted at the beginning of January 1929 and (b) the futures price of July cotton quoted at the beginning of July 1928.

Entries for July 1929 were likewise calculated from (1) the difference between (a) the January 1929 price of July cotton and (b) the January 1929 price of January cotton, and (2) the difference between (a) the July 1929 price of July cotton and (b) the January 1929 price of January cotton.

Table 4

Expected and actual rates of inflation over five-month intervals (annualized rates) in wheat, corn, and oats prices from futures market.[a]

Date	Wheat		Corn		Oats	
	Expected inflation	Actual inflation	Expected inflation	Actual inflation	Expected inflation	Actual inflation
May 1922	+7.1	+52.6	+27.2	+52.7	+35.1	+20.7
May 1923	−4.6	+9.7	−3.0	+27.3	−1.4	+7.6
May 1924	+12.6	−1.2	+4.9	+12.4	+10.9	+18.1
May 1925	+12.9	+8.4	+15.8	−16.9	+26.0	−52.1
May 1926	−6.9	+0.5	+19.4	−3.3	+28.8	+14.5
May 1927	+5.9	+0.2	+29.3	+2.1	+27.6	+25.7
May 1928	+12.0	+65.6	+16.7	+50.8	+14.2	+66.6
May 1929	+15.0	−9.2	+16.4	+13.8	+5.7	+0.6
May 1930	+19.9	−53.8	+20.5	−24.6	+21.5	−28.6
May 1931	+15.2	+21.5	+12.8	−72.8	+20.1	−65.9
May 1932	+13.8	+8.4	+29.0	−65.9	+20.3	−26.3
May 1933	+23.1	+117.7	+40.5	+87.3	+34.0	+105.5
May 1934	+8.3	−7.9	+36.2	+6.2	+19.1	−29.1
May 1935	−0.6	−0.9	−3.3	−9.3	−5.1	−19.1
May 1936	−1.2	0.0	+5.2	+20.5	+12.5	−1.2
May 1937	−4.3	+24.5	−13.9	+52.3	−3.3	+23.2
May 1938	−1.3	−31.9	+12.5	+20.9	−4.0	−15.3
May 1939	+13.3	+42.9	+18.8	−0.6	+11.4	+44.5
Average, 1930–1932	+16.3	−8.0	+20.8	−54.4	+20.6	−40.3

[a]Raw price data were taken from that issue of *Barron's* closest to the beginning of the listed month, i.e., the Monday falling on the first through fourth of the month or on one of the last three days of the preceding month. All differences were converted to annual percentage rates by multiplying by 1200/5.

The entry for the first column for May 1929 is based on the difference between the natural logarithms of (a) the futures price of May wheat quoted at the beginning of December 1928 and (b) the futures price of December wheat quoted at the beginning of December 1928. The entry for the second column for May 1929 is based on the difference between the natural logarithms of (a) the futures price of May wheat quoted at the beginning of May 1929 and (b) the futures price of December wheat quoted at the beginning of December 1928.

The question for purposes of the present study is, how much of the drastic deflation in cotton prices between 1929 and 1932 did the market anticipate? The answer is quite startling. For the period January 1930 through July 1932, the average annual rate of change of cotton prices that speculators expected was +9.4%, compared with an actual average annual rate of change of −39.0%! Although I have been unable to construct an equally comprehensive data series for other commodities traded on the futures markets, I have found data to construct forecasts made in December of each year for the price the following May for wheat, corn and oats. The results, reported in table 4, dramatically reinforce the inference from the cotton market. The *average* annualized inflation forecast error ($\pi_t - \pi_t^e$) during 1930–1932 was −24.3% in

the case of wheat, −75.2% in the case of corn, and −60.9% in the case of oats. Sizeable fortunes were evidently lost by people who were convinced that agricultural prices would rise, not fall, in the early 1930's.

Moreover, from the perspective of Fisher's debt–deflation theory, the critical issues are (1) the *cumulative* unanticipated deflation since the time loans were made, which registers the difficulties debtors have in being able to honor outstanding nominal commitments, and (2) how *widespread* the resulting bankruptcies are across different sectors. Certainly the data reveal significant unanticipated deflation in individual commodities a few years prior to the Depression, leading one to suspect that contemporary accounts of the poor financial health of American farmers during the mid-1920's were not overstated. Even so, for no commodity can one find a three-year period where the average unanticipated deflation amounts to more than half of that experienced for that commodity during 1930–1932.[27] And while the deflation during the severe recession of 1920–1921 was quite substantial, the rapid unanticipated commodity inflation during 1922 may have been an important factor in preventing that recession from developing into a full-blown depression.

Dramatic as this evidence is, I do not wish to claim more than the data warrant. While the depression seems to have been characterized by large and sustained unanticipated commodity price deflation, it is clear that big standard errors were associated with any commodity price forecast during the 1920's and 30's, with the depression appearing most dramatic partly because the raw commodity price changes were most spectacular then. For this reason, I do not mean to suggest that one can infer the ultimate causes of the Great Depression based on the data in tables 3 and 4 alone. But I am persuaded that one can convincingly rule out the hypothesis that the mechanism whereby monetary policy led to the depression in agriculture was that large anticipated deflation led to high ex ante real interest rates. If table 2 has persuaded us that monetary factors may have had a good deal to do with the depression, table 3 seems to cast considerable doubt on the traditional Keynesian interpretation of how monetary policy may have exerted that effect.

Certainly the deflation in individual commodity prices seems to have caught speculators by surprise. Would we be justified in generalizing this inference to claim that the drop in the aggregate price level was unanticipated as well? A regression of the log of the Bureau of Labor Statistics' Consumer Price Index during the summer of each year on its value at the beginning of the year and a constant has a standard error of 0.02655 for the period 1922 to 1939.[28] Adding

[27]Cotton saw an average annualized unanticipated deflation of −22.5% during July 1924 to January 1927, wheat −3.6% during May 1924 to May 1926, and corn and oats −27.5% and −31.5%, respectively, during May 1925 to May 1927.

[28]The BLS did not sample at standardized dates; typically the data are for June and December. See *Monthly Labor Review*, August 1940, p. 392.

the logs of the summer values for the actual commodity prices[29] reduces the standard error to 0.01453. Thus, knowledge of the actual course of commodity prices would have reduced the forecast variance for the CPI by 70% ($=1-[0.01453]^2/[0.02655]^2$). The F-statistic associated with the null hypothesis that the coefficients on the commodity prices are all zero in this regression is 10.35, compared with a 1% critical value for an $F(4,12)$ variate of 5.41. The correlation between commodity prices and the CPI is thus both quantitatively and statistically significant, and we would seem to have a solid basis for inferring that much of the overall deflation during 1929–1933 was unanticipated.[30]

Thus whether one chooses to look at the statements of policy-makers and business leaders of the time, forecasts from time-series regressions, or evidence on the kinds of financial wagers people actually made in the commodity futures markets, the overwhelming conclusion is that most of the dramatic deflation that characterized the Great Depression caught people of the day by surprise. I thus concur with Temin that while a leftward shift of the IS or LM curve from a decrease in inflationary expectations is a theoretical possibility, it is unlikely to have been the principal mechanism whereby monetary policy contributed to the Great Depression. One instead is led to focusing on the potential role of nominal debt contracts in an environment of unanticipated deflation stressed by Fisher and Bernanke.

5. Conclusions

No single index of the impact of monetary policy can escape well-grounded criticism from some theoretical quarters. But when one summarizes the behavior of the battery of potential indicators on a standardized basis as in table 2, the indicated conclusion is overwhelming. U.S. monetary policy began to tighten significantly in January of 1928. While not as severe as the credit crunch of 1920–1921, this contraction represented a readily identifiable break from the regime of 1922–1926. Monetary policy entered a second, more severe phase only after the first banking panic of late 1930.

Having said this, however, it is important to recognize that such monetary policies could not have been the *only* reason for the downturn in 1929–1930. For one thing, all of our measures indicated that while money was tight, policy

[29] That is, I added the log of the July price of July cotton and the logs of the May prices of May wheat, corn, and oats from the data used in construction of tables 3 and 4.

[30] With the New Deal price increases, the commodity market bulls were finally richly rewarded in 1933, and one can make a compelling case that it was the prospect of such government programs that speculators had been betting on earlier. This of course in no way mitigates my key claim that the consensus view was that prices would rise, not fall, during 1930–1932. Note further that the price increases associated with the New Deal were hardly unique to agriculture; if this is what accounts for the dramatic finding of tables 3 and 4, it still generalizes to a statement about expectations of the overall price level at this time.

was still significantly more expansionary than it had been in the recession of 1921; yet the magnitude of the stock market crash and the initial collapse of industrial production suggest that even before the first banking crisis of November–December 1930, the U.S. was facing a more serious recession than in 1921. Moreover, Temin's observation that short term risk-free rates fell like a rock after 1929 reinforces the view that something besides high interest rates was leading the economy ever deeper into depression in 1930, the partial (and anemic) recovery of industrial production in the summer of 1930 notwithstanding. Monetary factors were a reason that the economy turned down in June of 1929, but not the only reason.

The other principal conclusion that emerges from this survey is that the traditional Keynesian IS–LM apparatus is ill-equipped to describe the mechanism by which the monetary contraction affected the economy after the initial downturn. While the initial tightening of money in 1928–1929 resembles the textbook pattern of rising interest rates and falling real money relative to production, the subsequent record of events looks little like the pattern predicted by traditional Keynesian models; nominal interest rates were falling dramatically, while the deflation of 1927–1933 seems to have been largely unanticipated by people at the time. Moreover, Fisher (1933) emphasized that the U.S. recovery began quite dramatically and abruptly following the New Deal increases in prices, while Eichengreen and Sachs (1985) documented that the tendency of national recoveries to follow currency devaluations was worldwide. If the heart of the problem were thought to be a shortage of real money balances relative to production, such policy-induced increases in the domestic price level should have only aggravated matters further. For these reasons, a model that stresses the destabilizing consequences of unanticipated deflation, increased real service costs of outstanding nominal debts, and the real effects on the financial system of the banking panics seems needed to understand the contribution of monetary policy to events after 1930.

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