Monetary Explanations of the Great Depression: A Selective Survey of Empirical Evidence

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The Great Depression (1929–33) was the most severe economic contraction in the United States during the twentieth century (see Figures 1–3). During the contraction industrial production fell nearly 50 percent from its prior peak. The unemployment rate reached 24 percent in 1933: About one in four people in the workforce was without a job.[1] By 1933, the price level was more than 25 percent below its 1929 level. During the Great Depression a few contemporary analysts and economists were critical of Federal Reserve policies (see Currie 1934; Warburton 1945; Burgess 1946). But the prevailing view at that time held that there was little that Federal Reserve monetary policy could have done to moderate the severe contraction (see Box 1 on page 6).

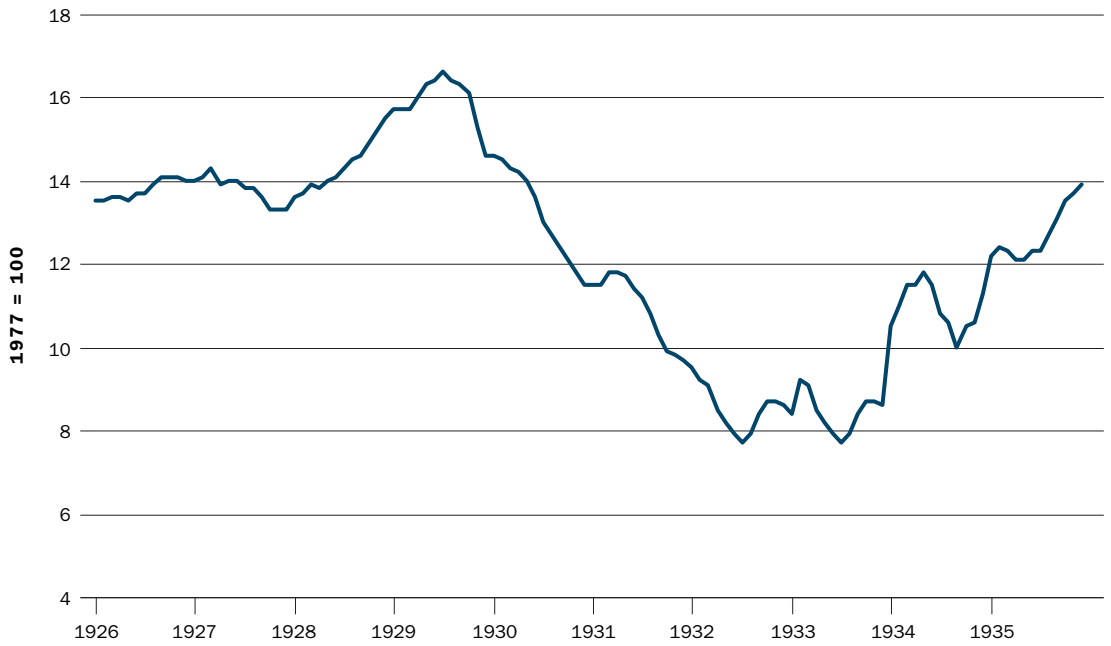
Economists continue to investigate the hypothetical causes of the Great Depression in empirical research, and the culpability of Federal Reserve policies remains an unsettled issue. Two leading aggregate explanations for the Great Depression are distinguished by whether or not they point to the Federal Reserve System and its monetary policies as mainly responsible for the propagation and magnification of the initial contraction into a depression.

This article is a selective survey of recent macroeconomic modeling efforts and empirical work that examine aggregate explanations for the Great Depression. The discussion maintains a sharp distinction between the evidence for each side—the case for a monetary cause of the Great Depression versus an alternative view in which monetary policy instead appears to respond to (rather than cause) a severe contraction. From the voluminous literature using vector autoregression (VAR) techniques, the empirical results offer no consensus that monetary policy was the main cause of the Great Depression. Empirical results from the more recent, sparser literature using dynamic stochastic general equilibrium (DSGE) modeling also reveal no consensus that monetary policy caused the Great Depression.[2]

Each empirical literature requires sufficient structure of the economic model to isolate monetary policy disturbances, and structure requires certain assumptions. Monetary policies, in general, are actions by the monetary authority associated with the adjustment of money supply as distinct from money demand responses (changes in monetary measures that take place in response to economic activity). A monetary policy disturbance arises from an action by the monetary authority that deviates from the model-specified monetary policy reaction function, which identifies and distinguishes between money supply and money demand. The empirical research differs on whether the identified measure of monetary policy initiates the economic contraction or, if the measure does not initiate the contraction, whether monetary policy measures play a crucial role in explaining the magnitude of the real output

FIGURE 1

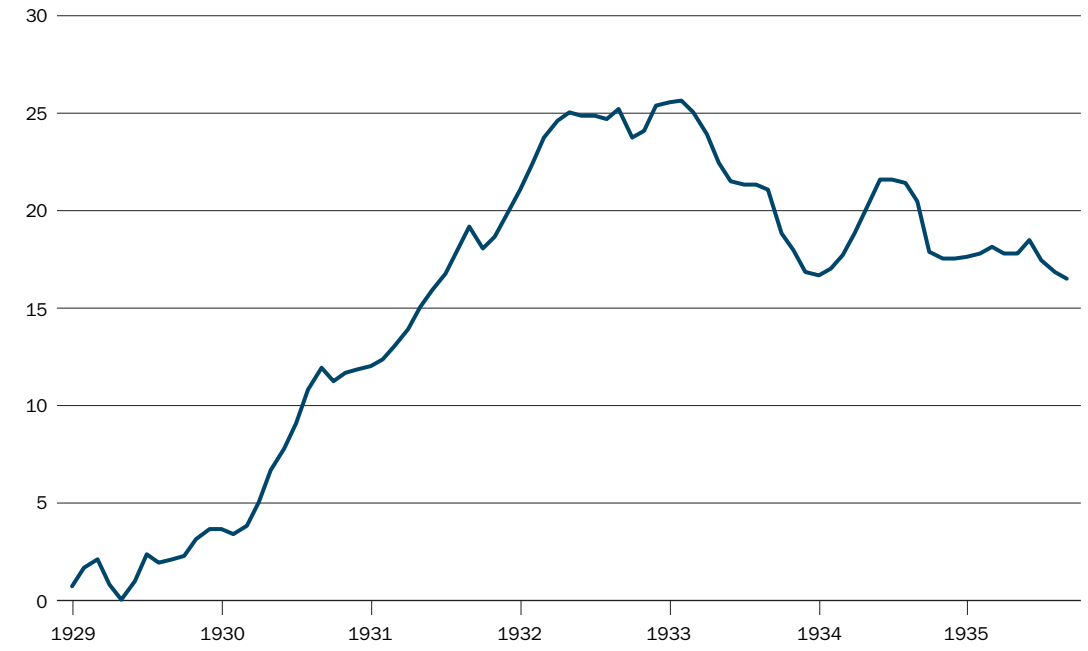
Industrial Production



Source: Board of Governors of the Federal Reserve System

FIGURE 2

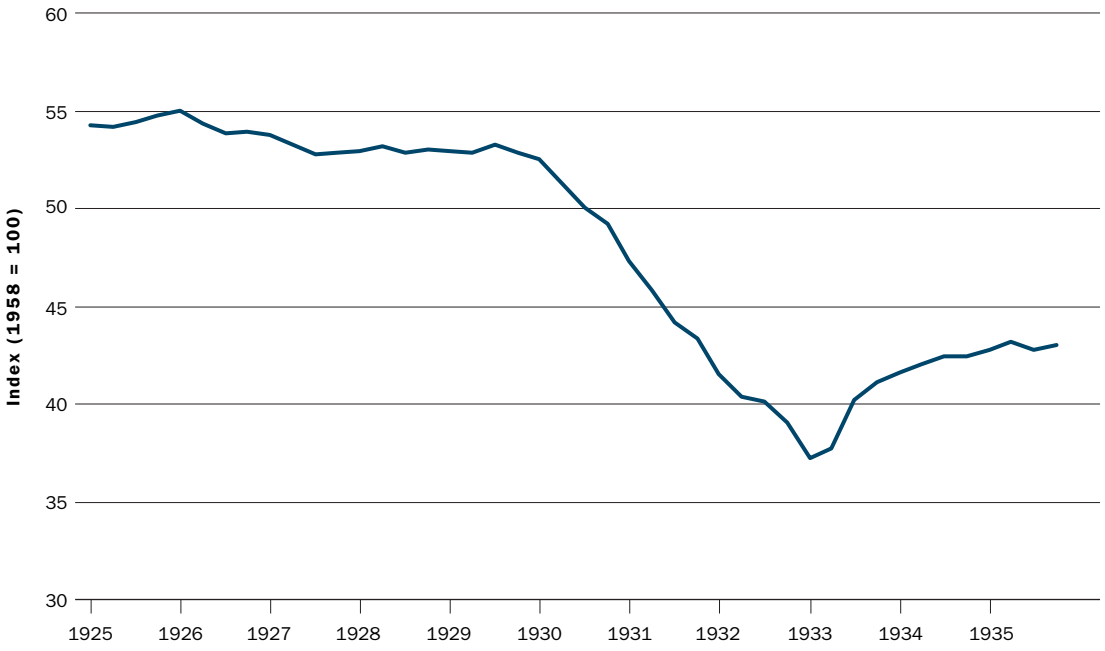
Unemployment Rate



Source: National Industrial Conference Board, *Business Cycle Indicators*, vol. 2 (April 1929–June 1942, pp. 35, 123), NBER series no. 08292, NBER Macrohistory Database

FIGURE 3

The Price Level Measured by the Implicit GNP Deflator



Source: Barger and Klein (1954), NBER series no. 8260, NBER Macrohistory Database

contraction. In each literature, identifications of monetary policy vary in their ability to capture important institutional features of the banking and financial system and how monetary policy, as practiced at that time, affected them. Further refining the propagation and transmission mechanism of monetary policy to the real economy and isolating the key initial shocks will deepen our understanding of how the Great Depression happened and how such catastrophes can be avoided.

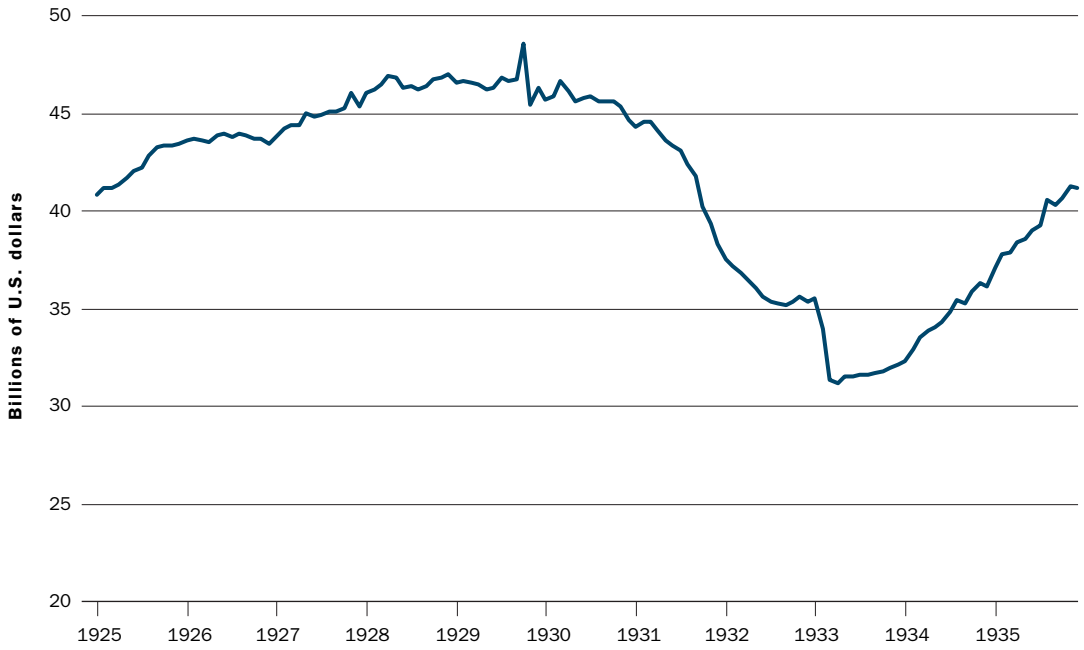
A Motivating Example: Data Speaking in Tongues

Difficulties in evaluating competing explanations of the Great Depression arise because data alone are insufficient to distinguish the importance of monetary policy during that period. Figure 4 displays the M2 monetary aggregate, the combination of currency and demand deposits, measured monthly over the 1926–35 period. The contraction in M2 occurs more than a year later than the downturn in either the industrial production index or in the price level (aside from the brief sharp vacillations in September and October 1929). By late 1930, depositors were making widespread withdrawals from bank demand deposit accounts—that is, demand deposits were converted into currency on a large scale. Figure 5 shows the ratio of M2 to the monetary base (currency plus bank reserves)—a ratio called the money multiplier—measured monthly over the 1926–35 period. The money multiplier indicates the level of bank intermediation activity.[3] As an indicator of bank intermediation between borrowers and savers (depositors), the multiplier fell dramatically during the Great Depression and fell at around the same time as the M2 aggregate.

1. In contrast, during the post–World War II period, the highest unemployment rate observed was about 11 percent (December 1982), and the average "peak" unemployment rate is 6.2 percent (one in sixteen people in the labor force out of work). Note that unemployment rates may continue to rise after the declared end of a recession.
2. VAR models are statistical time-series models that emphasize the correlations in the data to describe economic dynamics. DSGE models are theory-based models that rely on the behavior of households, firms, intermediaries, and the government, which restricts the dynamics of the economy. Robertson and Tallman (1999) and Del Negro and Schorfheide (2003) provide accessible introductions and reviews of these tools.
3. A bank intermediates between its depositors, who may leave relatively small balances on deposit at the bank, and its borrowers, to whom the bank issues loans from the proceeds of accepting deposits.

FIGURE 4

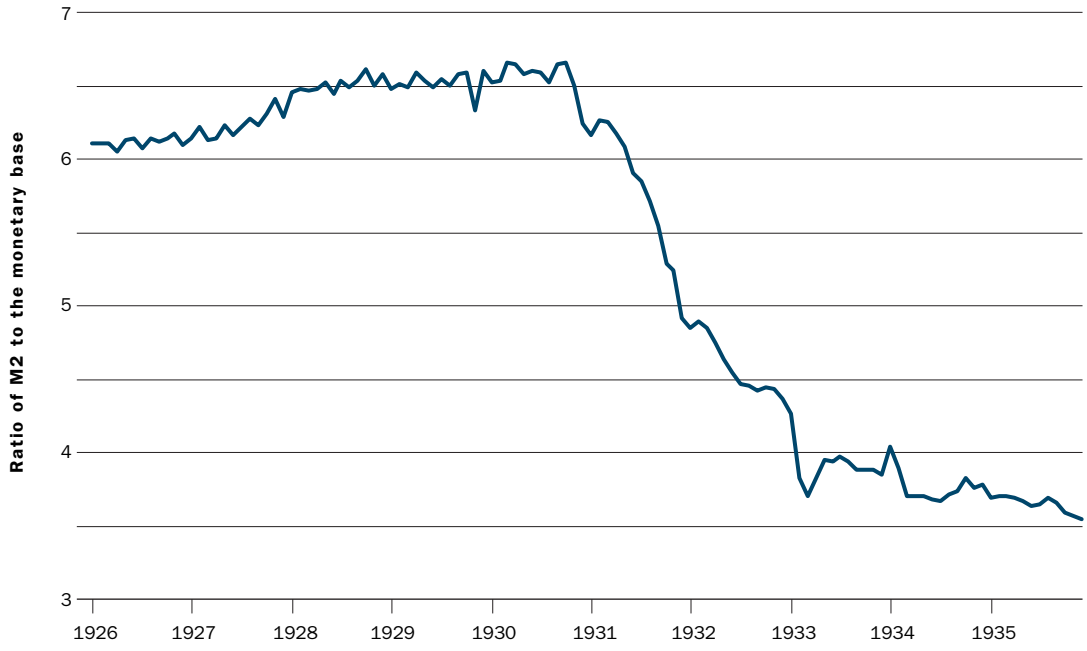
M2 Money Supply



Source: Friedman and Schwartz (1970)

FIGURE 5

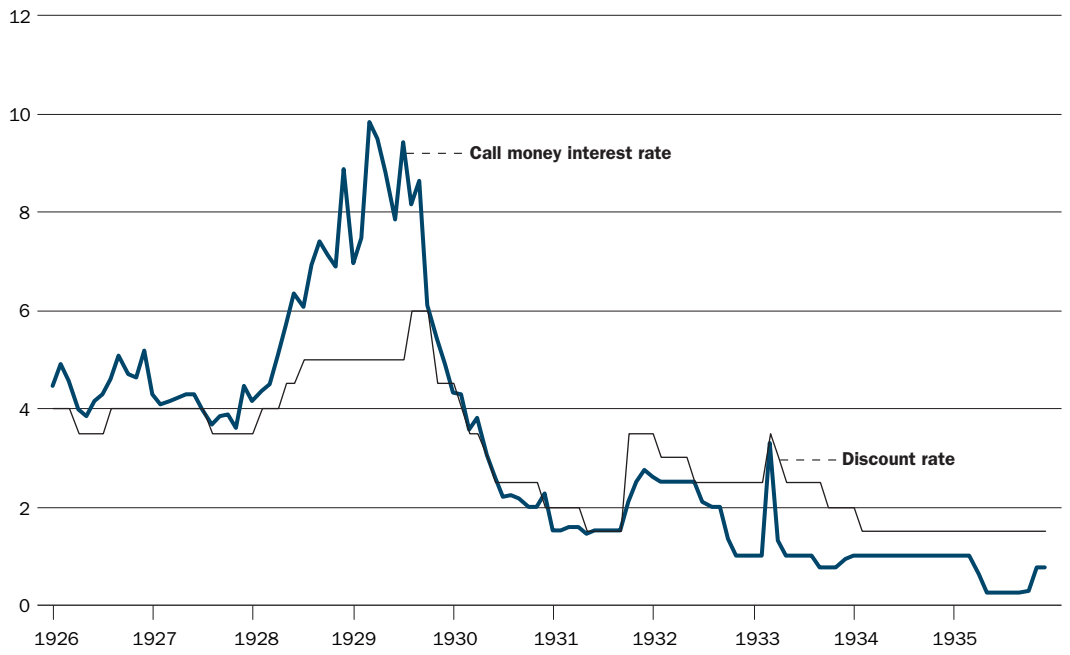
The Money Multiplier



Source: Friedman and Schwartz (1970)

FIGURE 6

Short-Term Nominal Interest Rates



Source: Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics, 1914–1941* (1943). The call money interest rate is the average rate on stock exchange call loans, new (Table 120, 450–51); the discount rate is the rate at the Federal Reserve Bank of New York (Table 115, 440–42).

From a cursory examination of Figures 4 and 5, one might conclude that the monetary authority is not responsible for the Great Depression because the contraction in the real economy (industrial production, the increase in unemployment) preceded any notable contraction in monetary aggregates. But the vindication of the Fed in this simplistic argument has flaws. Figure 6 compares two nominal interest rate series—the call money interest rate and the interest rate on discount window loans from the Federal Reserve Banks. If these interest rates indicate monetary policy actions, then discount rate increases between January 1928 and August 1929 suggest that Federal Reserve policies restricted conditions in the financial markets and the real economy prior to the October 1929 stock market crash. The interest rate on money borrowed on call at the New York Stock Exchange (the call money interest rate) was above the discount rate from January 1928 until October 1929. The Federal Reserve implemented policies in 1928 aimed at limiting loans for "speculative" purposes, of which call loans were the chief form (see Wicker 1966). These policies may have influenced the increase in the call rate, thereby helping to precipitate the real and financial contraction at the start of the Great Depression. The vindication is therefore not clear-cut.

Examinations of the data series alone are unable to distinguish unambiguously between competing models or theories. The graphical display of monetary and real economic data does not characterize monetary policy—that is, what the Fed had been doing systematically through the 1920s in response to its key operational objectives. These ambiguities highlight the problems surrounding the identification of monetary policy and the identification problem more generally (see Box 2 on page 8).[4]

It is perhaps too much to ask that a single source by itself explains the economic contraction. Recent work by Eichengreen (2004) and Meltzer (2004) offers several sources, both real and nominal, of negative economic shocks and institutional rigidities contributing to the economic collapse.[5] Bernanke (in Rolnick 2004) offers a similar perspective on the

4. Bernanke (2002) discusses identification generally and in the context of the Great Depression.
5. The shocks included the residual financial effects of World War 1 on sovereign nations, the restrictions of the gold standard, misapplication of the real bills doctrine at the Federal Reserve, agricultural problems in the United States, reparations indebtedness of the war's losing forces, and others.

BOX 1

What Did They Know, and When Did They Know It?

In the 1920s and 1930s, Federal Reserve System monetary policies reflected then-popular monetary theories—mainly, a misapplication of the real bills doctrine to monetary policy. The real bills doctrine implied that the nominal quantity of credit outstanding (namely, bank loans or the liability counterpart, bank deposits) responded endogenously to the "needs of business and industry."[1] Prevailing wisdom in the 1930s argued that the Great Depression reflected mainly real economic phenomena and that rapid liquidation of failed businesses would speed recovery. Textbook descriptions of that economic consensus were less concerned with monetary factors. Robertson (1964) refers to a Schumpeterian perspective—that innovation and the movement toward mass production increased the productivity of the economy so rapidly that the economy could not absorb the additional output. Separately, banking issues were offered as a secondary effect of—an endogenous response to—the weakened economy. In addition, Robertson suggests that Fed policy had little to do with inducing the contraction although the Fed exacerbated the Great Depression through "idiotic" monetary policies.

Wheelock (1991) examines Fed monetary policy during the Great Depression and suggests that it was more restrictive than policy in the 1920s. At the same time, he shows that the 1930s' monetary policy was consistent with an inadequate operating policy—that is, the Fed was inferring the degree of tightness in monetary conditions from the level of reserve borrowings at the discount window without sufficient regard to the level of the discount rate relative to other short-term interest rates. When demand for discount window loans fell dramatically during 1930, the alarms should have gone off at the Fed. Instead, the existing policy framework led to an improper inference—given no demand for discount window loans, then the reserves market must have been flush—without regard to the price (the discount rate).

Some researchers have argued that the quantity theory of money was not developed sufficiently to inform Fed policymakers at the time of the Great Depression—that analysis as found in Friedman and Schwartz (1963) would have been too revolutionary (see Steindl 1995 and Wicker 1999, countered by Humphrey 2001). Although in the minority at the time, Currie (1934) argues that the lack of explicit attention to the behavior of the aggregate money supply was a key failure in Fed deliberations at that time. Although the reasons behind their respective policy recommendations may differ, Wicker (1996), Wheelock (1992), Bordo, Choudhri, and Schwartz (2002), and many others join in support of earlier critics (Currie 1934; Warburton 1945; Friedman and Schwartz 1963) that Fed monetary policy should have aggressively expanded the monetary base to support economic stability. Whether or not that policy could have affected the money supply (implicitly, demand deposit) growth rate to a significant degree remains uncertain. Empirical research often imposed strong assumptions about how base money growth would affect the money multiplier, implicitly assuming that base money growth would stem widespread withdrawals of deposits from banks and the observed bank failures. Still, the money supply and its apparent lack of growth during the Great Depression should have alarmed Federal Reserve officials and prompted more drastic monetary base expansion, and it is unlikely that Fed provision of additional reserves would have worsened bank runs. There are limits, however, to the Federal Reserve System balance sheet, especially at that time given the short existence of the institution and the lack of explicitly legislated procedures to recapitalize the Fed—the system or individual district banks—if the system became insolvent. Sims (1998) (discussed on page 16) may be referring to the fiscal implications of Federal Reserve monetary actions that could have put their balance sheet at risk of insolvency, or at least illiquidity. Addressing the fiscal ramifications of these monetary policy choices in an economic model remains a challenging research topic.

1. Some modern economic theories of business cycles have similar implications. For example, the idea that the credit needs of the real economy will be satisfied passively by financial intermediaries is consistent with an early real business cycle model (King and Plosser 1984).

Great Depression as "a complicated event" that came out of the complex economic and political aftermath of World War I. But even in a research environment evolving toward consensus, the notable differences of opinion motivate a relentless search for more concrete evidence. The research appears focused on finding the key underlying sources and understanding with greater clarity the propagation mechanism (or how the Great Depression snowballed from mild recession to calamitous contraction). Ongoing empirical efforts keep the debates lively among economic historians as well as macroeconomists. Sharper characterization of the propagation mechanism likely will center on the specification of the banking and financial sectors of a macroeconomic model.

Background Empirical Evidence

The debate over whether the depth and length of the Great Depression was largely due to monetary policy errors took center stage long after the subsequent economic recovery.

The contrasting views were brought to the forefront by Friedman and Schwartz (1963), who argued that monetary forces magnified the Great Depression, and Temin (1976), who proposed that unfavorable real economic shocks were mainly the cause. For most macroeconomists, these two leading aggregate explanations for the Great Depression differ largely with respect to whether Federal Reserve System monetary policies were mainly responsible for the severe economic contraction. The distinction drawn in the discussion that follows is sharp in order to make the separate explanations more distinguishable. So far, the empirical literature has been unable to settle this debate although proponents on either side likely consider such an ambiguous conclusion controversial.

Friedman and Schwartz (1963) propose a monetary explanation for the severity of the Great Depression, placing much responsibility upon the Federal Reserve's ineffective monetary policies. In this view, the monetary authority (the Fed) failed to supply sufficient liquidity in the form of bank reserves and currency during the initial contraction as well as throughout the Great Depression. Without that liquidity, banks were unable to maintain loan activity, thereby allowing the initial economic downturn to magnify by causing large-scale contraction of bank balance sheets and thus leading to sharp increases in observed bank failures and the precipitous drop in the price level. The assumption underlying this view is that the resulting credit contraction and the associated breakdown in the intermediation process magnified the initial downturn and turned it into a depression.[6]

The monetary explanation of the Great Depression was not new, but the data, rigorous scholarship, and exhaustive research presented by Friedman and Schwartz brought renewed vigor to the arguments and combined to challenge most other explanations.[7] The main alternative explanation, presented in Temin (1976), suggests that the Great Depression can be explained as a large negative shock to aggregate demand. Like Friedman and Schwartz, the aggregate demand view had antecedents and was consistent with an earlier, dominant view that monetary factors were not essential elements in explanations of the Great Depression. Temin argues that money supply growth and real output are largely jointly determined so that the observed decline in money growth may reflect underlying forces that affect both real output/income and money growth. Notably, Temin concentrates attention on interest rates for indications of monetary policy intervention.

Economists continue to investigate the hypothetical causes of the Great Depression in empirical research, and the culpability of Federal Reserve policies remains an unsettled issue.

Hamilton (1987) presents evidence suggesting that monetary authority actions in 1927 and 1928 especially led to the contraction in real output at the onset of the Great Depression.[8] The empirical evidence links monetary-influenced data (interest rates, bank reserves, "high-powered" money) with subsequent real output contractions. The research, using interest rates in addition to monetary aggregates as an indicator for monetary policy, provides

6. Schwartz (1981) argues that the Fed initiated the contraction; Gordon and Wilcox (1981) argue that Friedman and Schwartz (1963) were unsure of the Fed's role as initiator of the contraction but were convinced that inappropriate Fed monetary policies magnified the contraction.
7. See Currie (1934) and Warburton (1945) for comparable arguments.
8. See Romer (1993) for a contrary perspective; also see Romer (1992).

BOX 2

Identification Restrictions

Empirical research surveyed in this review shares a number of common elements, yet, despite common elements, the studies present divergent conclusions about the role of monetary factors in explaining the Great Depression. In the VAR-based research, the conflicting results and conclusions arise from the different restrictions, including differences in the included data series, lag length restrictions, Bayesian prior restrictions, and the imposition of exclusion restrictions that limit the contemporaneous interactions among the variables in the system. These latter restrictions are often described as identification restrictions that allow the modeler to isolate an association between what the model estimates to be unpredictable movements in the data series (reduced form errors) and what may be interpreted as the underlying source of uncertainty in the model—shocks that can be given a more economic interpretation.

Researchers want to use identification restrictions that arise from structural specifications motivated from economic theory and to determine whether underlying shocks to monetary policy generate economically plausible results. An economically rigorous conclusion requires that researchers design a structural economic model in which monetary policy actions have money supply–based interpretations as distinct from a money demand source. The model implies a monetary policy function and thereby isolates how monetary policy affects aggregate economic outcomes (for real output, prices, employment, and so on), both actions being crucial for making inferences about monetary policy's role in the Great Depression. Depending on the theoretical assumptions that underlie the research, sharp changes in monetary and banking aggregates may have been caused by monetary policy, or they may have been instead the symptoms of the real output contraction. The discipline of a structural model allows researchers to see explicitly the importance of concrete assumptions—such as, for example, the economic measures that the monetary authority is assumed to use in setting monetary policy (its policy reaction function).

These assumptions are often crucial for the interpretation of the results. Researchers can assess the econometric results and, by altering the assumptions, can determine whether the inferences change if these assumptions are changed. For example, economic theory suggests that any contractionary monetary policy shock would produce an increase in the nominal interest rate and a contraction in the monetary aggregate. Also, that shock would, other things being equal, reduce output. In this survey, the identification restrictions in the empirical VAR analyses typically employ just-identified models—that is, there are a variety of alternative specifications that are equally likely representations of the reduced-form model. Identifications that are overidentified provide testable hypotheses and help distinguish between identifications that fit the data from those that do not. There may be instances in which empirical models retain overidentifying restrictions that have been rejected by the data because of the strength of the researcher's belief in that assumption.

So far, few researchers have settled on one universally accepted specification of the monetary policy function, and the long-standing debate regarding the role of monetary factors in the Great Depression continues. Similarly, there is ongoing research in macroeconomic theory to characterize more realistically the role of financial intermediation for real economic decisions.

Eichengreen's synthetic consensus view (discussed on page 9) of the Great Depression may seem difficult to bring to the data within an empirical model. But several elements of that view appear amenable to a structural VAR model. In such a model, an economic structure with a meaningful real shock in a monetary propagation mechanism could suggest that real economic shocks weakened the solvency of the U.S. banking system, which then was weakened further by the restrictive international financial and monetary structure. The other unstated but ambiguous issue surrounds whether the real or monetary shocks determined the subsequent deflationary path or whether that path was an additional outcome arising from the international monetary standard. Identifying a mechanism in a VAR to uncover potentially informative effects from these paths remains a challenge for further research.

support for a monetary source for the economic contraction. These results make a credible, narrative case supporting the monetary source of the contraction, and Hamilton points to a variety of financial measures that indicate a notable change in monetary policies prior to the Great Depression. The research provides a simple model for a monetary policy reaction function, describes a mechanism for transmitting monetary policy changes to the real economy, and then makes inferences about how the changes in monetary policies affected key macroeconomic aggregate measures of real activity. The connection between monetary policy actions and the effects on the real economy does not arise from a precisely specified and estimated economic model.

Recent theoretical and empirical approaches to macroeconomics suggest a less central role for monetary and nominal quantities and have implications for the debate over the Great Depression that are similar to Temin's. Research continues to uncover more precise evidence of policy ineptness—in fiscal policy (particularly, regulatory restrictions) as well as monetary policy—and whether real economic phenomena are sufficient for explaining the severity of the real output contraction.[9] An example of this more recent research, Cole and Ohanian (2001) apply general equilibrium modeling tools to their analysis, in which banking and monetary shocks appear less important for explaining the severe contraction. The refreshing aspect of this research is that the economic model does not assume a central role for the monetary and banking sector as a source of real economic contraction. Using the same approach, Christiano, Motto, and Rostagno (2003) develop a model in which monetary and banking factors are central for explaining the outcomes observed during the Great Depression. Hence, even in a new literature, no consensus exists regarding whether monetary factors explain the interwar collapse.

In recent decades, both new empirical techniques and newly discovered (or created) data have led to notable advances in the examination of international data and the experiences of other countries during the Great Depression as well as the explicit investigation of the gold standard's role in transmitting the Great Depression (see Bernanke 1995; Eichengreen 1992, 2004; Eichengreen and Sachs 1985). This research provides insights into the worldwide conditions (some institutional, such as the effects of the gold standard, and some political, such as how key nations failed to follow the rules of the gold standard) that led to the Great Depression. This broadening literature has pointed out the shortcomings in our understanding and in the available data. By answering some questions and linking the answers together within a coherent international perspective, these studies contribute toward building a consensus. Eichengreen (2004) concludes that there may be a growing "synthetic" consensus view that considers both monetary policy errors and existing institutional structures—the international monetary and financial system—as generating and transmitting destabilizing impulses around the world. In the Eichengreen (2002, 2004) synthetic view, monetary policy mistakes in the United States provided the initial international disturbance that then propagated across nations through the gold standard.[10]

Difficulties in evaluating competing explanations of the Great Depression arise because data alone are insufficient to distinguish the importance of monetary policy during that period.

International evidence helps explain the Great Depression, and additional cross-country research should continue to influence empirical research for some time. But Eichengreen's "anything approaching consensus" view may not yet be the last word on the topic. Introducing advances from international evidence into economic models remains a challenge. In its current form, the synthetic explanation appears too inclusive to allow empirical modelers to estimate and test the predictions in standard economic and econometric methods.

In both Hamilton and Eichengreen, the research provides well-reasoned analysis, but only indirect evidence identifies monetary factors as the source of the dislocation. More compelling answers to this question require isolating prospective measures for the monetary policy disturbance and the relationship

9. Ohanian (1999) suggests that analysis of the Great Depression should help economists understand why bad policy choices are implemented in crisis situations and thereby help prevent such choices in future. See also Bordo, Erceg, and Evans (2000).
10. In the final line of the abstract Eichengreen writes, "For the United States, there is no denying the role of monetary policy mistakes in the onset of the Depression, whereas for other countries international monetary instability played the most important part" (2002).

of these measures to key economic aggregates (that is, a structural economic model) that jointly initiated the economic contraction. Further refining our understanding of the Great Depression will help us answer key questions more concretely.[11] Our hunch is that the careful specification of monetary and banking sectors of the era in a fully specified economic model will be an important element in answering these questions.

Evidence That Monetary Policy Mattered

The VAR-based studies of the Great Depression begin with Sims (1980); the paper compares the interwar and post–World War II business cycles with particular focus on the explanatory power of monetary aggregates for real output movements. Sims examines two models: a three-variable model of the monetary aggregate (M1), industrial production (IP), and the wholesale price index (WPI) and a four-variable model of *R* (a short-term interest rate, here the four–six month commercial paper rate), M1, WPI, and IP. The VAR is estimated in logarithms of the series (except for the interest rate) over the interwar period (from 1920 to 1941) using twelve lags of monthly data and a constant term. The empirical results for both models indicate that innovations to the monetary aggregate explain over 50 percent of the forecast error variance of industrial production at the four-year horizon whether or not the interest rate variable is included in the VAR. The result refers to empirical model estimation that uses the entire data sample, and the empirical evidence supports a monetary explanation of the Great Depression.[12]

Recent theoretical and empirical approaches to macroeconomics suggest a less central role for monetary and nominal quantities and have implications for the debate over the Great Depression.

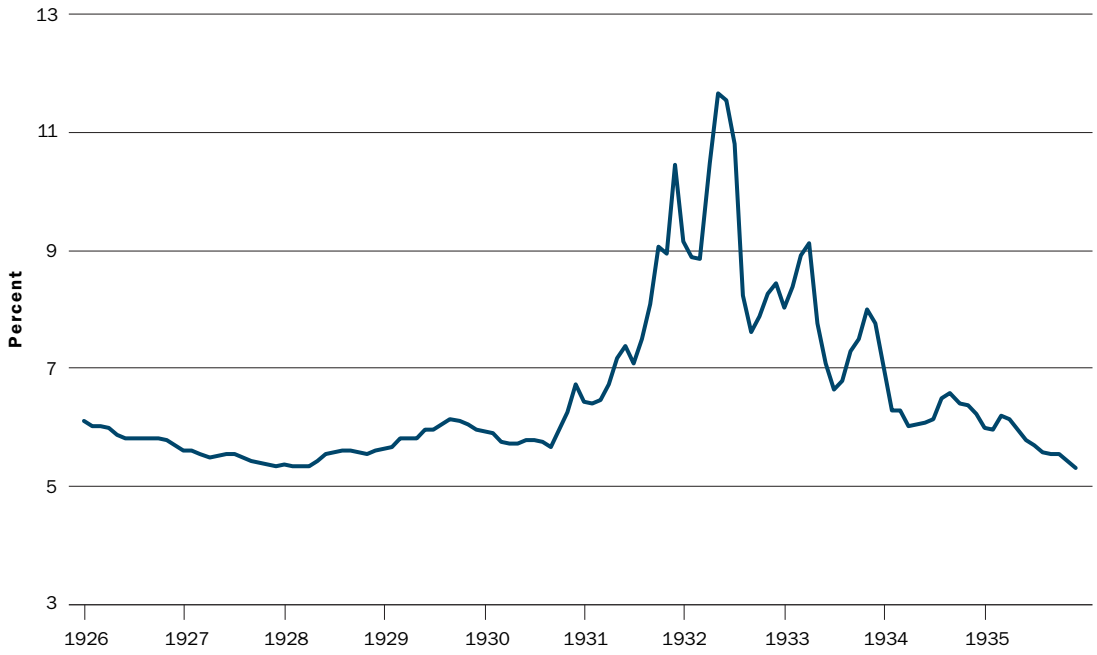
In his conclusion, Sims questions whether, for the interwar period, monetary innovations would continue to explain so much of real output movements in a larger model that encompasses additional financial surprises. Such a model would likely isolate a different estimate of monetary innovations, accounting for financial data series like risk spreads, deposits of suspended banks, and other indicators of intermediary crisis. Although the Great Depression was not the central focus of his paper, Sims's work initiated what has become a common method of examining the notorious contraction. Figure 7 presents the long-term yield on the lowest-rated commercial bonds from 1926 to 1935. The path highlights the dramatic increase in the interest rate in 1931, indicating a perception of the rising costs of intermediation at that time. The pattern of perceived risk hints at the additional information that the yield data convey about the Great Depression.[13]

Burbidge and Harrison (1985) estimate a VAR of the same four variables as in Sims; their research aims directly at uncovering how monetary disturbances affected real output during the Great Depression. In raw form, a VAR model estimates a time series model in which a variable like IP is a linear function of past observations of IP as well as past observations of all other variables in the system. To interpret the results as "structural," the researchers must impose restrictions on the model, and it is helpful if these restrictions have economic implications. Specifically, one can restrict contemporaneous correlations of the data, that is, how IP movements affect (or are affected by) movements in other series (like monetary aggregates) within the same time period. In most VAR analyses, restrictions on the contemporaneous correlations provide the key ingredients for interpretation of the results. In a model that reflects Temin's view, contemporaneous movements in monetary aggregates would respond to contemporaneous real output movements, but not vice versa; the economic interpretation is that real output movements do not respond contemporaneously to unpredicted monetary movements. In contrast, a monetarist model might restrict monetary aggregate movements to be unresponsive to real output movements and allow real output to respond to contemporaneous monetary aggregate movements, thus allowing monetary disturbances to have a real output effect contemporaneously.

In both Sims (1980) and Burbidge and Harrison (1985), the identification restrictions impose a recursive ordering as the structure. In this setting, movements in a data series that is first in an ordering are insensitive to contemporaneous movements in the variables that follow it in the ordering. The recursive structure implies an economic intuition; the isolation of money supply versus money demand hinges on the inclusion or exclusion of contemporaneous variables in the monetary policy–related equations. The empirical results examine a selection of potential orderings. One ordering implies that innovations in M1 precede innovations in the short-term interest rate (*R*), the price level

FIGURE 7

Long-Term Bond Yield, Lowest-Rated



Source: Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics, 1914–1941* (1943, Table 128, 468–71)

(WPI), and then real output (IP). In this structure, the shock to the monetary aggregate is equivalent to the residual error from the reduced-form equation. The innovation in the monetary aggregate incorporates responses to other variables only through lags. The innovation in the interest rate reflects that the interest rate responds contemporaneously to monetary aggregate movements. Similarly, the price level innovation reflects that the price level responds to contemporaneous movements in both the monetary aggregate and the interest rate. Finally, the real output innovation reflects that the real output responds to contemporaneous movements in the monetary aggregate, the interest rate, and the price level. A second ordering reverses *R* and M1. A third ordering simply moves M1 to the last position so that no other shock variables respond contemporaneously to shocks in the monetary aggregate.[14] The recursive VAR identifications do not generate strong structural interpretations for the money demand and money supply functions from the first ordering or the other orderings.

11. Examples of such questions are, If monetary policy mistakes were important, then did monetary policy err more by failing to increase bank reserves through open market purchases, by failing to provide reserves through the discount window, by reducing the discount rate too slowly, or all of the above? Of course, the central question is then, What monetary policies could have avoided the Great Depression?
12. Sims contrasts the implications of the interwar period results with the post–World War II sample; in the more recent sample, innovations in the monetary aggregate explain a lower percentage of real output variance when the VAR includes the interest rate.
13. It is notable that the yield spread between the Moody's Baa bond (in Figure 7) and the long-term Treasury bond (not shown) follows the pattern in the risky commercial bond.
14. Typically, the innovation in a data series (M1) will have greater power for explaining the variance in other data series in the model when it (M1) is first in the ordering. The ordering implies identification restrictions, and the identification is "just identified," which means that the identification restrictions allow a unique mapping between the "reduced-form" or unrestricted parameter estimates and the structural model. However, the just-identified system is indistinguishable from all other just-identified structures because there are no restrictions implied by the structure on the reduced-form parameters. In this case, the chosen ordering is as likely to occur as alternative orderings or, more generally, just-identified models. Hence, the theoretical justification that explains and supports the identification is important, but it is notable that there are few theoretical models that motivate the choice of a recursive structure.

The empirical evidence uses historical decompositions, a procedure that uses model parameter estimates from the entire data sample and makes an unconditional forecast (for a given forecast horizon) using only data up to the period prior to the first forecast period.[15] Then, the researcher can estimate how much of the forecast error can be explained by each identified shock.[16] Burbidge and Harrison suggest that the identification restrictions (that is, the orderings) have a substantial influence on the estimated role of money in explaining the behavior of real output and prices over the Great Depression. When the monetary aggregate is first in the recursive ordering, the addition of the monetary aggregate improves the forecast for the WPI price level and the IP output measure more than if the monetary aggregate is placed last in the ordering. In other words, if the innovation in the monetary aggregate (the model forecast error) is assumed to reflect best the money supply disturbance, then the VAR model suggests that monetary disturbances explain much of the subsequent decline in real output.

International evidence helps explain the Great Depression, and additional cross-country research should continue to influence empirical research for some time.

The overall conclusions favor a measurable role for monetary disturbances in the explanation of the declines in both real output and the price level during the Great Depression in general. For the initial contraction (1929 to 1931), the authors find that the baseline model forecast improves little when errors associated with the monetary aggregate are added. Hence, the results suggest that monetary factors in this model cannot help explain the decline in real output from 1929 to 1931 (see Burbidge and Harrison 1985, 52). Still, the evidence supports the idea that monetary mistakes magnified the real output contraction in 1932 and after.

Bordo, Choudhri, and Schwartz (1995) estimate a vector error correction model (VECM) using quarterly data from 1921:Q1 to 1941:Q4 for three variables—real gross domestic product (GDP), the implicit GDP deflator, and the M2 monetary aggregate.[17] A VECM is a time-series model similar to a VAR that explicitly accounts for cointegration among the data series—that is, a persistent, long-run relationship between the data series. In that story, the cointegrating relationship is a standard money demand function that includes both an interest rate term and a real output term.

$$m_t - p_t = \alpha_0 + \alpha_1 y_t + \alpha_2 r_t + v_t,$$

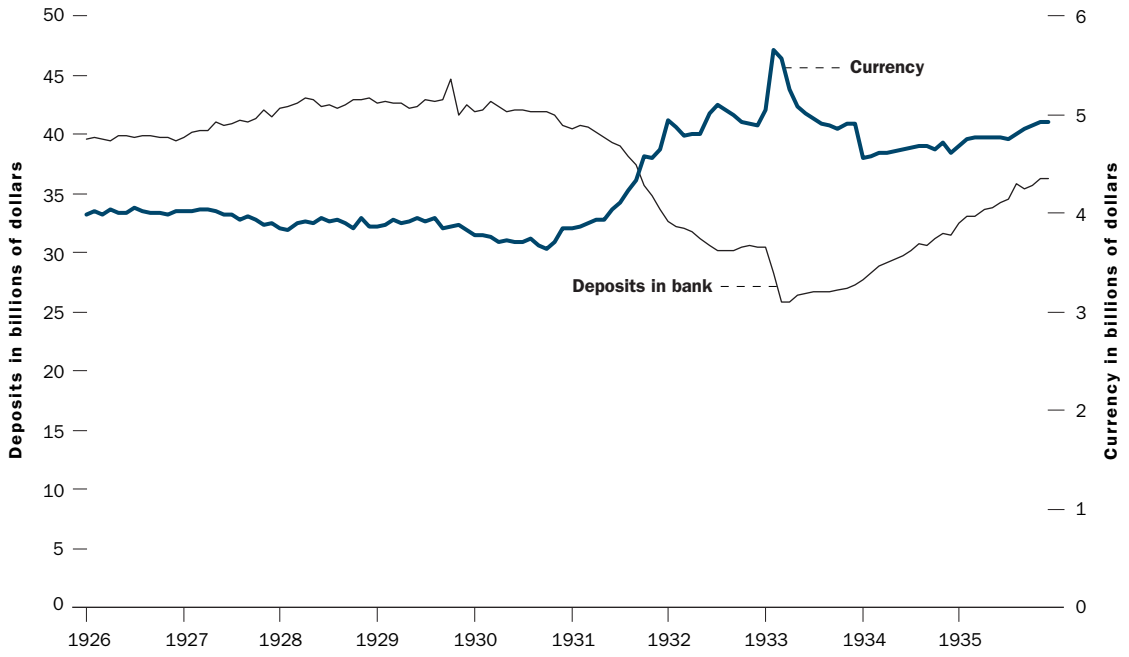
where α represents a parameter, m is the log of money, p is the log of the price level, y is the log of output, r is the nominal interest rate, and v is the error term.

Bordo, Choudhri, and Schwartz (1995) examine the counterfactual question, "Could stable money growth have averted the Great Depression?" The authors display counterfactual simulations of this small econometric model estimated over the sample period that includes the Great Depression. One simulation assumes a stable money demand function throughout the full estimation sample and enforces only that the money growth rate is a mean growth rate and a monetary shock insensitive to past variations in the other series. The results indicate that holding the money growth rate to an average estimated from 1929 to 1933 moderates the loss in real economic activity by about one-third, which is still a contraction of Great Depression magnitude. Further restricting the money growth process by shutting off the monetary shock reduces the contraction notably. Under the assumption that M2 money growth is fully determined by Fed policy, their empirical model suggests that, had the Fed maintained a stable growth rate of money, then the contraction in real output and the fall in the price level would have been muted during the Great Depression.[18] The researchers find strongest support that a money growth rule would alleviate the huge real output contraction when they estimate separately the basic model over two subperiods and use reduced-form errors from two separate estimations for the model simulations for the whole period. These results rely on strong restrictions that are not imposed in the baseline specification and limit the generality of the inferences.

Several identifying assumptions seem crucial for generating the findings in Bordo, Choudhri, and Schwartz, and these key assumptions are not tested. One critical assumption is the one underlying the simulations—namely, that money growth can be controlled directly by Fed policy. The model specification does not have a banking sector in which bank deposits may be partly determined by the pri-

FIGURE 8

Demand Deposits versus Currency



Source: Friedman and Schwartz (1970)

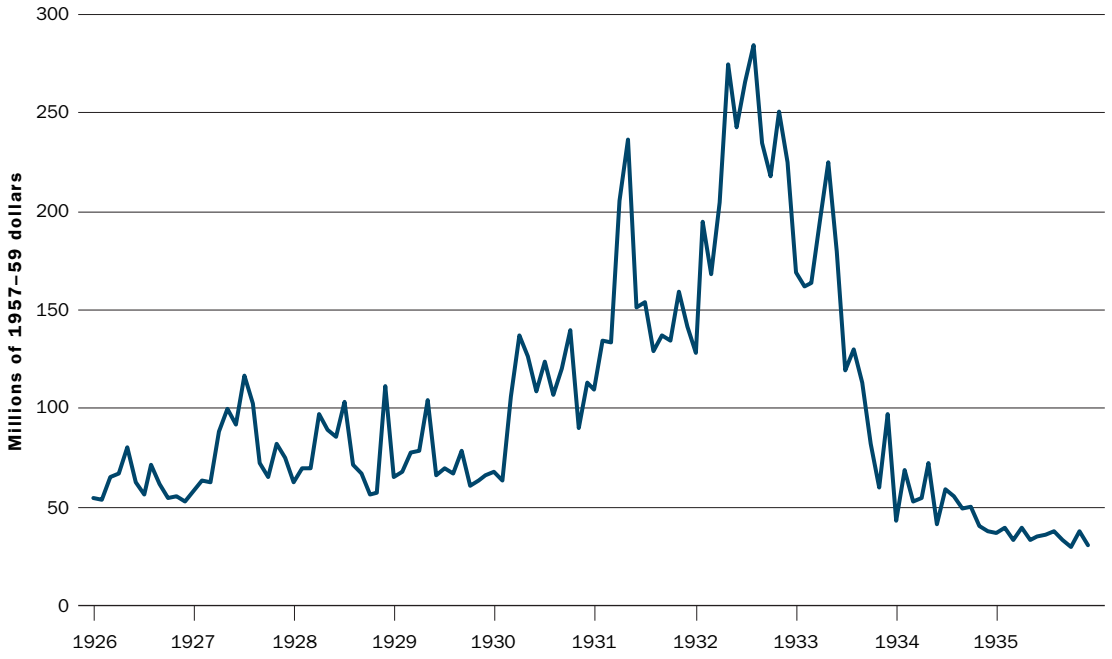
vate sector. Federal Reserve notes (currency) and bank reserves are liabilities of the Federal Reserve System. Currency, specie, and bank deposits make up the M2 monetary aggregate. A major portion of M2 is "inside" money (time and demand deposits in the banking system) that is not ultimately a claim on the Federal Reserve System and instead reflects debt and loan contracts between private sector entities. Observed movements in deposit aggregates may have more to do with disturbances in private sector activity and could have been largely responding to price level and real output movements on the quarterly frequency.

During the Great Depression, movements in bank deposits were the dominant source of monetary aggregate movements. Figure 8 shows that the currency component of M2 behaves differently from bank deposits over this period. The deposit component may respond to changes in the currency stock, bank reserves, and the amount of currency that the private market demands. However, monetary policy controlled only the supply of the sum of currency and bank reserves; market forces determined the relative proportions. As bank runs persisted throughout the early 1930s, the composition of M2 reflected the public's growing aversion to holding bank deposits. It remains unclear how Federal Reserve policies would have alleviated this aversion unequivocally.[19] In addition, bank failures and the correspondent loss of access to deposits may need

15. Note that the forecasting model employs coefficient values estimated from the full-estimation sample, an inherent tension with the goal of the forecast experiment. However, the procedure allows the model to assign explanatory power to the subsequent forecast error associated with each variable in the system.
16. The procedure sequentially adds observed, in-sample forecast errors for each variable in the system until the forecast matches the actual data series.
17. The researchers also introduce a rate of interest measure and a proxy measure for financial fragility by introducing the difference in the logarithm of the ratio of deposits in suspended banks to total deposits. These measures are offered in variations of the basic specification.
18. Evans (1997) finds evidence that supports the claim that consistent money growth through the Great Depression would have alleviated much of the real contraction during that period.
19. Calomiris (1993, 73–75) explains this point in detail, providing a comprehensive summary of the key debates about the role of financial and intermediation shocks in explaining the Great Depression.

FIGURE 9

Real Liabilities of Failed Nonfinancial Businesses



Source: Dun's Liabilities of Failed Nonfinancial Businesses deflated with the wholesale price index, 1957–59 = 1.0

special handling relative to withdrawal of deposits from the banking system. Further research on models with fully specified money demand functions that examine the stability of the functions over the entire interwar period appears warranted.

Fackler and Parker (1994) employ an eight-variable structural VAR that includes a variety of data series relatively underutilized in the empirical literature for the interwar period. For instance, the deposits of failed banks, the liabilities of failed nonfinancial businesses (Figure 9), and changes in the moving variance of the Standard and Poor's stock index are useful indicators of the degree of financial distress.[20] The authors emphasize financial fragility—the breakdown in the intermediation process facilitated by financial markets and the banking system—as an explanation for the Great Depression as distinct from the monetary policy mistakes view. Their results indicate that an autonomous demand shock likely initiated the real output contraction, that monetary disturbances exacerbated the contraction starting in 1931 or so, and that a nonmonetary financial intermediation shock explained some of the early contraction and most of the positive real output response to the bank holiday in March 1933.

Their model uses a number of simultaneous equation restrictions to identify monetary policy and the effects of shocks associated with it.[21] The empirical application may have overextended standard VAR procedures, using eight variables, estimating several simultaneous coefficients in the identification, and including a moving average variance of stock prices. Although the VAR introduces additional financial data to fortify the financial sector, the money demand and supply functions include unusual contemporaneous relationships with variables, such as real deposits in failing banks, stock price volatility, and real liabilities of failed nonfinancial businesses. The estimation and interpretation of these functions are debatable, thereby leaving research opportunities to reinforce and extend these findings. Still, the conclusions from the research anticipate and are consistent with later empirical research using additional econometric procedures.

Cecchetti and Karras (1994) investigate the key causes for the depth and the persistence of the Great Depression. The paper employs three different structural specifications, each using alternative identification methods in an attempt to isolate monetary sources of the real contraction from other sources. One identification method associated with Blanchard and Quah (1989) imposes restrictions on the long-run properties of a model that includes real output, prices, and the nominal interest rate. In this

setting, shocks associated with aggregate demand are assumed to be temporary, whereas supply shocks (for example, those that have durable effects on the factors of production) have permanent effects. Still, uncertainty exists about how well the identification can isolate monetary shocks because that sector is measured only by an interest rate. Shocks referred to as aggregate supply and aggregate demand may also reflect monetary-based shocks that are not captured by interest rate innovations. A separate specification attempts to isolate labor supply from technological shocks to specify further the aggregate supply. An alternative model attempts to isolate monetary shocks from the other shocks using an innovative identification scheme within a model of real output, the nominal interest rate, the real interest rate, and real M2.[22] The model tries to separate aggregate demand shocks from money supply shocks to account for the role of monetary policy errors. The paper concludes that monetary disturbances were important for explaining the severe and lengthy output contraction, but the initial downturn was mainly driven by a sharp contraction in aggregate demand less associated with monetary disturbances.

Cecchetti and Karras, like Fackler and Parker, also find that monetary shocks alone are insufficient to explain the Great Depression although monetary factors are important for magnifying the initial contraction. In both cases, however, the identification of monetary policy is relatively unusual. In Cecchetti and Karras, the variables in the money demand and money supply functions appear insufficient to isolate monetary policy shocks. In contrast, Fackler and Parker add to the money demand and supply functions variables that make it difficult to interpret the resulting shocks. More precise characterizations of monetary policy and analysis of the transmission mechanism of monetary shocks to real output contractions are opportunities for further research.

Bordo, Choudhri, and Schwartz (2002) specify an overidentified structural model in which simulations suggest that the gold standard would not have been threatened by expansionary open market monetary policies that the Fed failed to pursue. This paper and Hsieh and Romer (2001) offer evidence to refute the argument in Eichengreen (1992) that the Fed perceived its gold reserves position as a constraint on its monetary policy. In Bordo, Choudhri, and Schwartz (2002), the specification of the monetary process focuses on the determination of high-powered money (base money) rather than on the monetary aggregate. High-powered money is the quantity that the Fed influences directly, and the paper focuses on a central institutional question that likely influenced operational decisions during the Depression. However, the simulation results require explicit assumptions regarding a counterfactual path for the money multiplier (how high-powered money translates to the M2 aggregate) in order for the counterfactual base growth to affect the monetary aggregate.[23] It is possible that more appropriate Fed monetary policies might have kept the money multiplier from falling so precipitously in 1931, but it is far from certain. The determination of the money multiplier is a central issue in empirical research on the Great Depression and remains an opportunity for further research on the transmission mechanism as well as on the financial intermediation process more generally.

As bank runs persisted throughout the early 1930s, the composition of M2 reflected the public's growing aversion to holding bank deposits. It remains unclear how Federal Reserve policies would have alleviated this aversion unequivocally.

From a new literature, Bordo, Erceg, and Evans (2000) employ a DSGE model with sticky wages (that is, wages that adjust only slowly to market forces) to investigate the Great Depression. The specification of the real economy can account for such nominal frictions to evaluate the role of these frictions in the extent and duration of the contraction. Their findings suggest that the main explanation for the decline in output was ineffective and inappropriate monetary policy. Yet the model specifies a simple financial sector. There is no inside money creation, and the money shock measure is

20. See Coe (2002), described below. Notably, Coe's estimates suggest that the most sustained periods of financial distress occur after March 1931.
21. Fackler and Parker may face the concern of "weak instruments" for methods to estimate the parameters in simultaneous specifications of VAR structural error, noted by Pagan and Robertson (1998). See footnote 24 for a more extensive discussion.
22. See Galí (1992) for another example of an identification that combines long-run restrictions and contemporaneous restrictions.
23. Eichengreen (2004) notes that the authors rule out any concern for a speculative attack on the gold reserves in their model.

simple and stylized. The Federal Reserve System failed to offset the decline in the money multiplier, resulting in a loss of confidence in the financial system. However, the question is whether the Fed could have done anything about the money multiplier. This paper shows that the model results are consistent with a money shock story. But the model has no explicit transmission mechanism or monetary and financial sector, and, as a result, the evidence is only suggestive.

In summary, the evidence from these papers suggesting that inappropriate monetary policies were the key causes for the Great Depression still leaves some fertile area for research. For example, more detailed characterizations of financial intermediation may help isolate the precise mechanisms whereby Federal Reserve actions that increase the monetary base can then affect the behavior of the money multiplier. Further research on the transmission mechanism of monetary policy could help in understanding whether the counterfactual expansionary policy for the monetary base would have produced the desired effects on the growth in demand deposits and total M2 money supply. However, true believers in the monetary source of the Great Depression may view assumptions that Fed policies to increase the monetary base would thereby increase the money multiplier as well justified without empirical tests. Among all these papers, the results support a causative role of monetary factors, to varying degrees, in the Great Depression.

The determination of the money multiplier is a central issue in empirical research on the Great Depression and remains an opportunity for further research.

Evidence That Monetary Factors Were Not Important

Sims (1998) revisits the topic of his earlier paper that examines the difference in the relationships between economic performance and monetary policy in the postwar and interwar periods. In this paper, he exploits advances in identifying VAR models as well as in applying Bayesian techniques to estimation in pursuit of more accurate estimates of model structure and more precise estimates of model parameters. The estimated model employs data from 1919 to 1939 for six time-series—industrial production, the consumer price index, a commodity price index, currency, M1, and the discount rate. In contrast to several earlier VAR papers, Sims's paper focuses the identification to isolate the "structural" shocks of monetary policy by characterizing a policy reaction function using specifications of Federal Reserve operating policies in post–World War II data. The application of such a policy function to the interwar period is anachronistic, and ultimately unrealistic, yet it provides clearly defined estimates for the supply and demand functions for money.

The structural identification isolates monetary policy disturbances—that is, changes in monetary policy behavior that would not have been predictable—from money demand fluctuations. Notably, there are estimation complexities that arise from simultaneous coefficient estimation.[24] Other shocks in the system are less easy to interpret. Sims also uses a Bayesian prior in which the hyperparameters effectively smooth out the estimated coefficient values for the lags in the system.[25] The results suggest that innovations related to monetary policy do not explain much of the subsequent variation of real output or in the price level. Instead, real output and price fluctuations are explained mainly by their own innovations, consistent with the idea that the economy was subject to substantial shocks aside from monetary policy during the Depression.

Notably, Sims does not infer from these results that monetary policy had little effect on real output and the price level. Rather, he indicates that the measure of monetary policy included in his model may not be sufficient to capture monetary policy's effects on the solvency of the banking system or to measure the impact of bank solvency regardless of monetary policy influence.[26] In other words, some important effects of the banking system on real output and the price level are not addressed in his VAR. This conclusion hints at an intuition offered by Bernanke (1983) that nonmonetary factors, such as a breakdown in financial intermediation, of which bank intermediation is a crucial component, may underlie some of the evidence supporting monetary causes for the Great Depression.

Coe (2002) has investigated further the idea of a separate role for financial fragility. Coe isolates an estimate of the conditional probability of financial crisis from two indicators of disruptions in financial intermediation—the yield spread between the Baa bond and the comparable-term Treasury bond and the ratio of currency to deposits. Then the author

examines whether the estimated probability of financial crisis helps explain the behavior of real output in addition to lags of real output and lags of monetary aggregate growth. The results suggest that the probability of financial distress has significant explanatory power in addition to the other variables.[27] Further research may clarify the mechanisms that relate financial distress to real output contraction.

Among recent empirical work on the Great Depression, Ritschl and Woitek (2002) employ a VAR to uncover the explanatory power of money in the presence of previously untapped time-series data. The Great Depression in the United States was associated with a steep and substantial contraction in the manufacturing sector. The authors estimate a Bayesian VAR that examines whether the time-series behavior of monetary data is effective in predicting the sharpness of the real output contraction during the Great Depression. The model includes data on real output (IP), prices (CPI), wholesale prices (WPI), total reserves (TR), and nonborrowed reserves (NBR). An alternative model replaces the monetary measures with the discount rate (DR) to investigate a specification using the interest rate as the key mechanism for monetary transmission. The estimation imposes a Bayesian prior on the model and employs recursive estimation; that is, the model is estimated using only data measures dated prior to the forecast period in order to forecast the contraction in real output. The procedure is anachronistic, but the experiment uncovers an unusual finding that the monetary variables (or interest rate measures) are not very useful in forecasting real output out of sample.

Next, Ritschl and Woitek use data on residential building permits along with measures from the steel industry—shipments of machines, sheet steel production, steel ingot production, and the prices of metal products—to measure whether a VAR model of these variables can more accurately forecast the steepness of the real output contraction. The authors find that the VAR made up of these real indicators can forecast the degree of output contraction effectively even in the out-of-sample setting using a model estimated up to January 1929.[28] Figure 10 displays steel ingot production versus total IP and illustrates the significant comovements (sheet steel production offers similar insights).

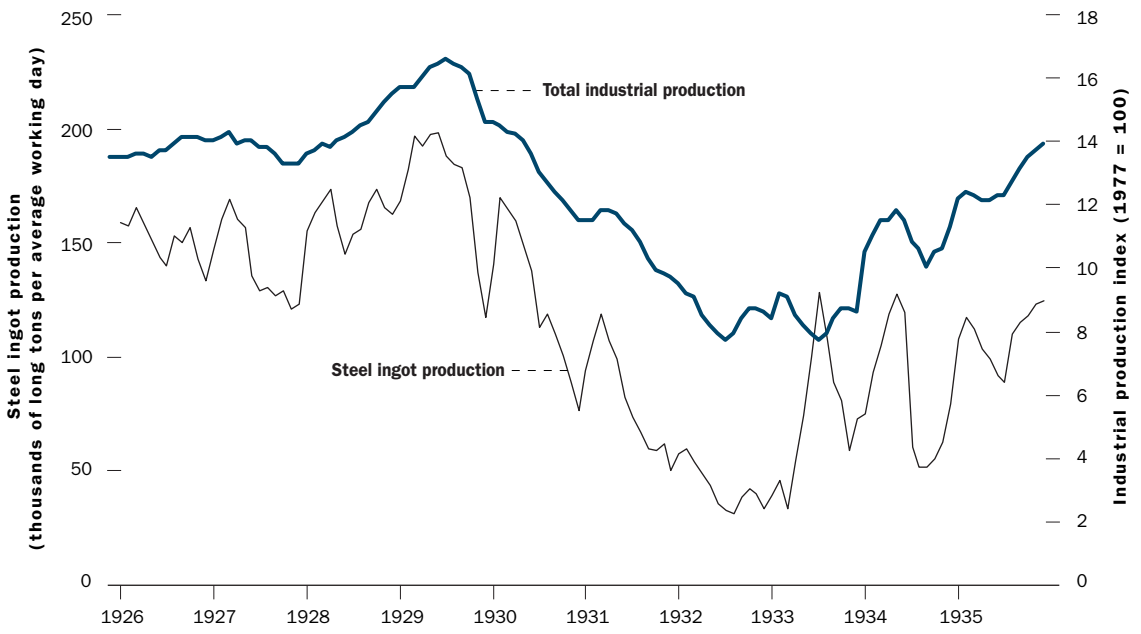
Ritschl and Woitek conclude that the real data can predict the steepness of the contraction and, therefore, that the Great Depression may have had at its core real phenomena driving the degree of contraction. In their paper, the main inference appears overextended. The VAR model forecast from January 1929 raises interesting issues regarding the initial shock responses, but prediction accuracy does not measure fully our understanding of the economic process. The paper presents a VAR that exploits a correlation between the aggregate output measure (IP) and key measures of sectoral output—steel. At that time, the U.S. automobile industry was a growth industry, and that industry was pummeled during the Great Depression. Ritschl and Woitek show that steel production indicators help predict a steep decline in output. Still, the forecast does not indicate the identity of the underlying sources of the shock that drives the real output contraction. By forecasting the path of the real output contraction from what might be called component data series, the paper uncovers an interesting statistical artifact that may stimulate further investigations into the ultimate source of the real shock.

Recently, Cole and Ohanian (2001) approached the enigma of the Great Depression with an alternative perspective—that of the real business cycle theory. The approach imposes the discipline of general equilibrium analysis applied to an aggregate model, often with minimal frictions. In empirical implementations, the approach must often find values or estimates of key model parameters from other economic studies and impose those parameter values on the general equilibrium model. The empirical strategy is to examine whether the observations in key data series are consistent with predictions

24. Simultaneity implies that the same contemporaneous variable appears in two equations or the dependent variable in one equation (M2) appears in the independent variable equation (the discount rate) and vice versa. See Sims (1986) and Bernanke (1986). See also Pagan and Robertson (1998) for some of the complications that arise.
25. See Sims and Zha (1998). For a less technical description of the prior, see Robertson and Tallman (1999). These priors tend to aid models in forecasting and limit the variability of coefficient estimates.
26. Sims may also have concerns that, as the Fed was near the zero bound on nominal interest rates, any activist monetary policy would have a fiscal dimension. That is, the Fed policies could place the balance sheet of the Fed at risk of substantial loss, a consideration that may have constrained monetary policy choices and brought a fiscal dimension to monetary policy.
27. Coe does not attempt to address the question of whether monetary factors explain the real contraction.
28. "Out-of-sample" implies estimating the statistical model using data available up to the date when the forecasts are to begin. Next, the researcher uses that model to forecast a given number of periods beyond the estimation sample. The technique approximates the real-time process of estimating a forecasting model and then forecasting several periods into the future.

FIGURE 10

Steel Ingot Production versus Total Industrial Production



Source: Steel ingot production from *1938 Statistical Report of the American Iron and Steel Institute*, NBER series no. 01135, NBER Macrohistory Database; industrial production from the Board of Governors of the Federal Reserve System

arising from model simulations. In many cases, the analysis amounts to assessing how closely simulated data from the model can replicate the statistical characteristics of observed data series. In their analysis, Cole and Ohanian find that, conditional on their modeling framework and their calibrated parameter values, the banking contraction observed during the Great Depression is not associated with such a severe contraction in output in their model as was experienced during the Great Depression. As a result, they conclude that other sources of shocks should be investigated to explain the Great Depression in a general equilibrium setting.

One view of their research is that the general equilibrium modeling framework is currently too restrictive and therefore does not mimic closely the economic mechanisms that the banking system provides in the actual economy. From this view, Cole and Ohanian's model is not close to explaining the Great Depression. For example, the assumption of a single representative agent framework may not allow the model to capture the complex facets of financial contracts across agents. As a result, when banking failures take place in the actual economy, the closure of a bank may produce an inability to enforce these contracts and may prevent the transfer of banking information to another bank. The fact that their model cannot explain the observation of the Great Depression through the contraction in their stylized banking sector has as much to say about the adequacy of their modeling framework as it does about the importance of the banking collapse as an explanation of the Great Depression. Both the modeling framework and the banking hypothesis may need additional features to constitute a satisfactory explanation. But the progress and attention in this general equilibrium modeling literature suggest that advances are likely to occur in our understanding of the interwar economic collapse.

The differences across the empirical results arise from selection of the set of variables used in the estimation, the identification (or overidentification) of the structure, and the restrictions that are imposed on the estimation (that is, Bayesian priors). For the Great Depression, money and other banking measures influence the estimation of monetary policy measures, but present specifications are insufficient to account for the monetary transmission process. As a result, the empirical results appear inconsistent: Sims (1998) and Ritschl and Woitek (2002) suggest that real sources were central causes for the Great Depression, whereas Bordo, Choudhri, and Schwartz (1995, 2002) show evidence that the Great Depression was mainly the result of huge

monetary mistakes. The modest conclusions of Sims (1998), along with the provocative findings in Cecchetti and Karras (1994) and Fackler and Parker (1994), suggest that detailed specification of the transmission mechanism may be a productive path for further research. Ultimately, the empirical research may lead toward more of a consensus that the flawed policies of the Fed were largely responsible for the depth and duration of the Great Depression. New evidence using an estimated VAR may continue to contribute to the literature, especially if it embodies more explicit modeling of the financial sector.

Introducing a Banking Sector into the Empirical Models

The inclusion of a banking sector into estimated models may help uncover whether the data are consistent with the assumed behavior of the money multiplier. For example, expansionary monetary policy may increase the growth in the monetary base (increasing both currency stock and bank reserves). To raise money supply growth effectively, the growth in the monetary base must affect the behavior of borrowers and lenders. Increased monetary base growth reduces the intermediation costs banks face so that banks increase their loans. Isolating the effects of Fed policy during the Great Depression still centers on what caused the contraction in bank deposits. The contraction could be rational banker responses to weakening loan demand, or it could be that the Fed failed to maintain sufficient growth in the monetary base and inadvertently increased banks' costs of intermediation. Research aimed at detecting the monetary elements of the Great Depression investigates whether the actions (or inaction) of the Fed in the reserves market failed to lower the costs of intermediation sufficiently to allow banks to maintain the levels of financial activity consistent with (or in support of) a recovering economy. Few empirical papers specifically address this issue, but some recent empirical papers incorporate a banking sector more completely.

Recently compiled banking data may help in the specification of the financial sector and the transmission mechanism. Anari, Kolari, and Mason (forthcoming) calculate a data series that accumulates the deposits of banks that remain in liquidation, essentially assessing the quantitative effects of illiquid deposits. The data are carefully constructed and offer insights that differ from those offered by the typical data series that aggregates the deposits of suspended banks. The authors note that the key contribution of their data series is to disentangle the deposits of failed banks (deposits that were inaccessible for long periods of time) from deposits in banks that were suspended for only a brief time. For example, all banks were suspended during the three-day bank holiday in March 1933, but relatively few were liquidated. Figure 11 displays total bank deposits versus the deposits-in-suspension series.

The paper employs this new data series in a four-variable VAR model composed of the industrial production index, the wholesale price index, M1, and the stock of bank deposits in suspension. In addition, the authors find that the model variables are cointegrated and so estimate both a VAR and a vector error correction specification that imposes the proposed restrictions. The empirical results from the restricted model (the vector error correction model) indicate that the stock of deposits in failed banks in liquidation explains an important portion of the fluctuations in industrial production, supporting the role for a credit availability indicator in explaining output dynamics during the Great Depression. These results suggest that intermediation frictions that arose from the inaccessibility of credit and liquidity were important.

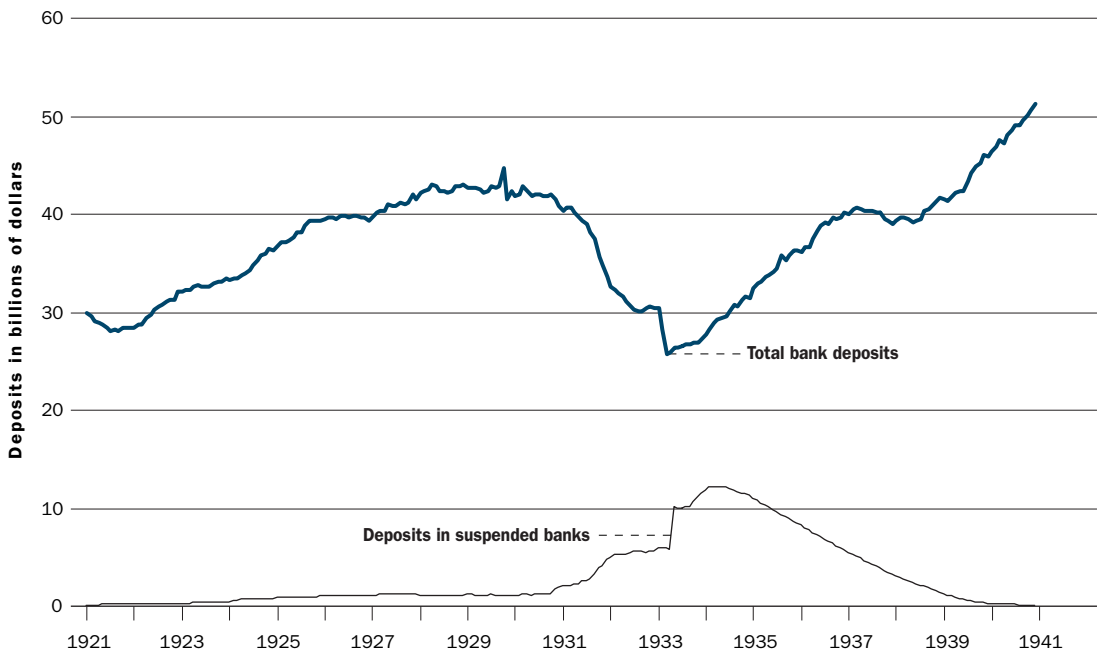
The search for one conclusive empirical study of the Great Depression is likely futile, akin to the search for a single source of the contraction.

In research by Calomiris and Mason (2003a, b), further investigations in detailed banking data exploit balance sheet data for individual Federal Reserve member national banks during the Great Depression. The authors attempt to uncover whether banking failures were explained by aggregate liquidity shortages or by insolvency due to the real economic characteristics of the bank balance sheets. The two papers find the key measurable characteristics that separate banks that fail from those that survive mainly in the items on individual bank balance sheets. That is, bank balance sheet data (individual bank financial conditions) explain bank failure; this finding is consistent with an explanation that adverse real economic shocks may have affected some banks more than others.

Despite this finding, Calomiris and Mason still conclude "there can be little doubt" that aggressive

FIGURE 11

Bank Deposit Contraction and Deposits in Suspended Banks



Source: Deposits in suspended banks from Anari, Kolari, and Mason (forthcoming); total bank deposits from Friedman and Schwartz (1970)

open market operations or the departure from the gold standard could have avoided the aggregate collapse in 1931–33. It is notable that their empirical results support the hypothesis that real economic shocks were the source of bank failure, which conflicts with the hypothesis of an aggregate liquidity source of bank failures in their sample. The strong conclusion that an alternative Fed policy may have avoided the aggregate economic collapse in 1931–33 appears to conflict with their own findings but is consistent with other empirical and historical research. The comment displays how the view that Fed policy mistakes were largely to blame for the magnified contraction in real output has become accepted among many economic historians.

From an alternative modeling perspective, Christiano, Motto, and Rostagno (2003) design a DSGE model with a sophisticated financial sector and a more complicated transmission mechanism for monetary policy along with labor market rigidities. The model incorporates a mechanism through which monetary policy can have substantially nonneutral effects on real output and the price level. The banks issue consumer deposit accounts from which the banks hold part as reserves and lend the rest of the funds to firms. The deposit accounts offer a fixed nominal return to the consumer, and that return is not contingent on the observation of current period shocks. This friction allows the model a mechanism to capture the credit risk faced by banks during the Great Depression.

The empirical results from this paper suggest that the monetary factors in the Great Depression were largely responsible for the depth and length of the contraction. It is notable that the empirical techniques have not yet become standard practice. A criticism of the empirical results is that a large proportion of the ability to explain the movements in the actual data series is due to exogenous shocks, most notably, a shock associated with liquidity preference. An increase in this shock indicates that households prefer to hold a higher proportion of liquid assets as currency as opposed to bank deposits. In this model, the liquidity preference shock leads to higher currency holdings, a lower volume of bank deposits, fewer bank loans, and less investment. The illustration of bank disintermediation effects in the model help identify how monetary-related shocks may affect real variables in a hypothetical transmission mechanism. In his comments on Christiano, Motto, and Rostagno, Ohanian (2003) notes that their paper offers advances to general equilibrium–based investigations of the Great Depression and expresses concerns about the substantial

variability and explanatory power of key exogenous shocks. More effort on deciphering the sources and refining estimates of the variability of these shocks will add to the influence of this new path in research. Despite criticisms, the modeling strategy brings a more realistic financial sector with implications that allow for reasonable monetary non-neutralities, and the empirical results are in line with the established "monetary causes" empirical literature. As a result, the paper demonstrates further that, like other empirical literatures, the real business cycle/DSGE model approach can generate results on both sides of the monetary versus real debate about the Great Depression.

Conclusions

The empirical literature on the Great Depression is far from consensus about the source of the contraction or the quantitative role of monetary shocks in the real output contraction. The VAR literature offers evidence both in favor of and in opposition to a central role for monetary policy among the causes for the Great Depression. Similarly, recent work using the real business cycle or DSGE modeling approach displays a similar lack of consensus regarding Fed culpability for the Great Depression. The search for one conclusive empirical study of the Great Depression is likely futile, akin to the search for a single source of the contraction. The "synthetic consensus" offered by Eichengreen (2002, 2004) may offer a coherent explanation of the Great Depression using the accumulation of empirical evidence to suggest that the Great Depression arose from circumstances and undesirable shocks too complex to capture in econometric models. Still, ongoing efforts to innovate in both economic theory and in VAR econometric statistical analysis, along with newly constructed data series, open up opportunities to suggest several fertile paths for uncovering useful elements of the monetary transmission process from that time period.

The purpose of further study on this most heavily researched period in our economic history is to clarify our understanding of the sequence of events—both the unforecastable and exogenous shocks and the policy errors that followed. A rigorous accounting of the effects on the economy from each source may help policymakers today evaluate the risks faced in our current financial structure. From our vantage point, the most promising path is a sharper focus on the financial sector and a more potent specification of the transmission mechanism of monetary policy along with methods to incorporate elements of the labor market frictions noted in other research.

Our view is that the monetary history and analysis of the Great Depression (separate from the VAR empirical literature) suggest strongly that monetary factors played an important role in magnifying and extending the painful economic contraction. The inability of the VAR literature to reliably verify this insight suggests that the identification of monetary policy during this period remains elusive. Other research using aggregate economic models along with in-depth analysis of banking and other financial intermediaries suggests that models need to account explicitly for the disruptions in the banking and financial sectors. Further work to isolate sources of the monetary disturbance in identifications with more detailed formulation of the financial and banking sectors in the monetary transmission mechanism may contribute to our understanding of interactions between monetary and real economic factors.

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