Monetary Policy Frameworks and Indicators for the Federal Reserve in the 1920s

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Anyone who studies the early history of the Federal Reserve is bound to notice a singular curiosity. In the 1920s and early 1930s, when U.S. gold holdings were sufficiently large to relax the constraint of the international gold standard and permit domestic control of the money stock and price level, the Fed deliberately shunned the best empirical policy framework that mainstream monetary science had to offer.

Developed by Irving Fisher and other U.S. quantity theorists, this framework was the outcome of an evolution in numerical measurement that had been occurring in monetary economics since the early years of the 1900s. Although somewhat crude and unsophisticated by today's standards, the quantity theory framework had by the mid-1920s progressed to the point where, statistically and analytically, it was state of the art in policy analysis. Its constituent variables, all expressed in a form amenable to empirical measurement, had been fitted with relevant data series. It boasted the ability to establish empirical causality between certain variables at cyclical and secular frequencies. It had survived rigorous testing, by the standards of the time, for accuracy and usefulness. Most of all, as the basis of a coherent and well worked out monetary

The author owes a huge debt of gratitude to Bob Hetzel, Judy Klein, and Mary Morgan for their constant encouragement, constructive criticism, and expert help in correcting errors, omissions, and inconsistencies. He is also indebted to James Dorn, William Gavin, David Hammes, Roger Sandilands, Anna Schwartz, Ellis Tallman, and Richard Timberlake for helpful comments. This article, forthcoming in *Cato Journal,* vol. 21 (Fall 2001), and printed here with the kind permission of the *Cato Journal* and its editor, James Dorn, grew out of and overlaps a companion article, "Quantity Theory and Needs-of-Trade Measurements and Indicators for Monetary Policymakers in the 1920s," forthcoming in "The Age of Economic Measurement," supplement to *History of Political Economy* (vol. 33). This paper does not necessarily represent the views of the Federal Reserve System or the Federal Reserve Bank of Richmond.

theory of the cycle, it claimed to predict the effects of Fed monetary policy on output and prices in both the short run and the long. Here, ready-made, seemed to be the answer to a central banker's prayers. Here was a framework the Fed could use to conduct policy and to stabilize the economy.

Yet the Fed refused to have anything to do with this framework and its components. Instead of concentrating on the money stock, the price level, and other indicators featured in the quantity theory, the Fed focused on such measures as the level of market interest rates, the volume of member bank borrowing, and the type and amount of commercial paper eligible for rediscount at the central bank.

Why would the Fed, seemingly in need of reliable and accurate gauges of the quantity and value of money, eschew them and the framework featuring them? Why would it deny itself the opportunity to take advantage of the improved empirical knowledge—and potential policy advances stemming therefrom—embodied in the quantity theory and its associated monetary approach to the trade cycle?

The answer, of course, was that the quantity theory framework was incompatible with the type of institution created by the Federal Reserve Act of 1913. Far from being the activist, ambitious, price-level-stabilizing central bank envisioned in the quantity theory, the Fed was instead a passive, decentralized, noninterventionist system of 12 semi-autonomous but cooperating regional Reserve Banks designed to accommodate automatically all productive (nonspeculative) business demands for credit and money over the cycle. The 1913 Act expressly stated as much. Reserve Banks, it declared, exist for the purpose of "accommodating commerce and business," a purpose they fulfill by "furnishing an elastic currency" and "affording a means of rediscounting commercial paper." Accommodation and regional autonomy were the watchwords. The act said nothing about stabilization as a policy goal or about a single central agency charged with the duty of achieving that goal.

Nevertheless, by the mid-1920s there were voices—some within, but most without, the Federal Reserve System—claiming that the Fed should have learned that stabilization rather than accommodation was its overriding task and that certain statistical measures and indicators were available to help it accomplish that task. Accordingly, these same voices advocated that the original Federal Reserve Act be amended to make price stability the chief responsibility of the System and that power be given to a single central authority to unify, coordinate, and synchronize the policy actions of the individual Reserve Banks**.**

But the Fed rejected these suggestions and clung to the notions that accommodation was its duty and that the proffered quantity theoretic measures were irrelevant to the discharge of that duty. The result was that the Fed spurned the quantity theory or monetary-approach-to-the-business-cycle framework for an entirely different one instead. Composed of the real bills or needs-of-trade

doctrine (also known as the commercial loan theory of banking), that framework had nonmonetary forces driving the price level just as it had output and the needs of commerce determining the money stock.

Since the doctrine taught (1) that money created by loans to finance real production rather than speculation has no influence on prices, (2) that causality runs from prices and output to money rather than vice-versa as in the quantity theory, and (3) that Reserve Banks in no way possess control over money, there was no reason for the Fed to accept a theory asserting the opposite.[1] Indeed, as previously noted, throughout the 1920s officials and economists located at the Federal Reserve Board and certain regional Fed banks went out of their way to reject the quantity theory approach to the business cycle and its notion that the price level and real output could and should be stabilized through money stock control.

The initial phase of the Great Depression starkly revealed the consequences of the Fed's choice of policy frameworks. That episode put the rival frameworks to the test. The quantity theory framework passed the test with flying colors. Its indicators—money stock, price level, and real rates of interest—correctly signaled that monetary policy was extraordinarily restrictive and likely to precipitate a contraction.

The real bills doctrine, on the other hand, failed the test. Its indicators—member bank borrowing and nominal market rates of interest—signaled, wrongly, that policy was remarkably easy so that the Fed had already done all it could do to stop the slump. Guided by these indicators, the Fed did nothing to arrest and reverse the monetary contraction that was pushing the economy into depression.

Indeed, far from being alarmed by the monetary contraction, the Fed saw it as precisely what the real bills doctrine prescribed in an environment of falling output and employment. According to the doctrine, the slumping levels of those variables meant that less money and credit were required to finance them. Likewise, the price deflation accompanying the slump was interpreted as indicating not that money and credit were tight, but rather that the speculative excesses of the stock market boom of 1928–1929 were being purged from the economy.

In brief, real bills indicators were telling the Fed early in the depression that it was doing the right thing and that its policy was sound. In actuality, however, the opposite was true, and real bills indicators were leading the Fed astray. Those indicators, although accurate and precise, nevertheless wreaked

[1] Conversely, there was every reason for Fed officials to endorse a doctrine that implied that their policies, being passive and automatic, could never be the cause of inflation or deflation. Such a doctrine promised to exonerate the officials from blame for these phenomena and perhaps accounts for its appeal to them.

havoc because they were embodied in a framework instructing policymakers to let money and credit vary procyclically rather than countercyclically.

The story of the rival theories and their constituent policy indicators is instructive for at least four reasons. First, it illustrates how different statistical gauges can yield conflicting policy signals. Second, it indicates that theory necessarily precedes measurement in the sense that central bankers must have an analytical framework in place before they can determine the relevant indicator variables to measure. Third, it reveals the corollary proposition that policymakers observe only what they are predisposed to see; that is, it shows that their chosen analytical framework dictates the very indicators to which they will respond. Finally, it indicates that theories superficially similar in some respects can differ fundamentally in others. In the case of the quantity theory and the real bills doctrine, while both recognized that money stock growth in excess of output growth might be inflationary, they disagreed over the cause. The quantity theory attributed inflation to the resulting excess aggregate spending, but the real bills doctrine attributed it to the wrong kind of spending—namely, spending for speculative, as opposed to productive, purposes.

Likewise, the two theories yielded opposite predictions regarding the optimal cyclical behavior of the money stock. The real bills doctrine, stressing as it did that output generates the very money necessary to purchase it off the market, held that money should vary procyclically, rising with production in booms and falling with it in slumps. By contrast, the quantity theory, holding as it did that output is independent of money in long-run equilibrium but influenced strongly by it at cyclical frequencies, implied that money should vary countercyclically (or at the very least grow continually at the economy's trend rate of output growth) in the interest of economic stabilization.

The following paragraphs discuss the development and application of the two theories and their associated policy indicators in the 1920s and early 1930s. Three themes emerge. First, quantity theory indicators, although implied or foreseen as early as 1911, had to evolve through several stages of statistical work before emerging as serious candidates for use in policymaking in the mid-1920s. Second, much the same can be said for the real bills doctrine. It too had to undergo several modifications and applications in the period 1914–1928 before it could feature member bank borrowing and market interest rates as key policy guides. That the Fed was willing to countenance these modifications rather than switch to the quantity theory testifies to its allegiance to the doctrine. Third, the doctrine's failure to signal the onset of the Great Depression indicates that the Fed had allied itself with a causal framework inappropriate to the task of monetary stabilization.

1. QUANTITY THEORY–MONETARY CYCLE FRAMEWORK

The distinguishing characteristic of the framework that vied unsuccessfully for the Fed's acceptance is easily described. It consisted of a causal chain running from Fed policy to bank reserves to the money stock and thence to general prices and real output. It implied that the Fed could control the money stock and thereby stabilize prices and smooth the business cycle. By the mid-1920s a vigorous empirical tradition had developed in the United States around the framework. Indeed, this strong empirical orientation was a distinguishing feature of the work of American quantity theorists, whose use of statistical data to test and illustrate the theory went far beyond the efforts of their Cambridge and continental counterparts. Key figures in this tradition included Simon Newcomb, John Pease Norton, Edwin W. Kemmerer, Irving Fisher, Warren M. Persons, Carl Snyder, and Holbrook Working.

It was Newcomb, a renowned astronomer and part-time economist, who, in his 1885 *Principles of Political Economy*, suggested that David Ricardo's $P = MV/T$ equation of exchange, which expressed the price level P as the product of the stock of money M and its circulation velocity V per unit of real transactions T, might serve as an empirical framework to examine money's effects on the economy.[2] Newcomb also suggested an idea that Norton, in his *Statistical Studies in the New York Money Market*, would later incorporate into the most comprehensive and disaggregated version of the equation ever published, namely the notion that the total stock of circulating media could, in principle, be divided into its separate components—coin, paper currency, demand deposits—each with its own velocity coefficient.[3] Inspired by Newcomb, Kemmerer, in his 1907 *Money and Credit Instruments in Their Relation to General Prices*, and Fisher, in his 1911 *The Purchasing Power of Money*, elaborated on Newcomb's suggestions in at least five ways.

Kemmerer and Fisher incorporated variables representing checking deposits M' and their velocity V' into the equation to obtain $P = (MV + M'V')/T$, where M denotes coin and currency and V its turnover velocity. Then, constructing independent data series of index numbers for each of the equation's elements, they combined these individual series into a single series for the entire right-hand side of the equation.[4] The resulting magnitude,

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[2] Ricardo (1810–1811, p. 311) stated the $P = MV/T$ equation as follows: "Put the mass of commodities of all sorts [T] on one side of the line—and the amount of money [M] multiplied by the rapidity of its circulation [V] on the other. Is not this in all cases the regulator of prices [P]?"

[3] Norton 1902, pp. 1–12. Besides containing terms for each type of coin and currency in circulation and their velocities, Norton's equation included notation for bank reserves, the deposit expansion multiplier, proportion of maximum allowable deposits banks actually create, velocity of deposits, and the discounted and full maturity values of bank loans—all for the four different classes of banks existing in the United States in 1902.

[4] Kemmerer's and Fisher's pathbreaking time series estimates of the exchange equation's components constituted milestones in the statistical measurements of economic variables. Following

$(MV + M'V')/T$, gave them an estimated or predicted value of the price level P, which they then compared with an independent price index series representing the actual observed price level.[5] Here was their statistical test of the quantity theory proposition that velocity-augmented money (cash plus checking deposits) per unit of trade determines the price level.

Visually comparing graphed curves of the two price series over the period 1878–1901, Kemmerer concluded that the fit, or degree of correspondence between the curves, passed the ocular test closely enough to verify the quantity theory. When Warren Persons (1908, p. 289) questioned this conclusion by calculating the correlation coefficient for Kemmerer's series and reporting it as a meager 0.23 with a probable error of 0.13, Fisher ([1911] 1913, p. 294) demonstrated in response that the coefficient for the two series for the different period 1896–1909 was a whopping 0.97, indicating a very close fit.

Further support for Fisher came when he ([1911] 1913, p. 295) and Persons (1911, pp. 827–28) applied link-relative and proportional-first-difference techniques of trend removal to Fisher's original series. Doing so, they found that the correlation remained fairly high even when the series were cleansed of serial correlation. Fisher argued that these correlations, together with his finding that discrepancies between the actual and predicted price series forecasted the direction of movement of the former as it gravitated toward the latter, verified the quantity theory.

Nevertheless, critics such as Benjamin Anderson (1917) contended that Fisher's work (and Kemmerer's as well) consisted solely of attempts to confirm the equation of exchange rather than the quantity theory. They further maintained that because the equation is an accounting identity—and with its

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Fisher ([1911] 1913, pp. 430–88) but without going into detail, we can summarize these measurements as follows: For Kemmerer, M (defined as currency in the hands of the public) = currency outside the Treasury – vault cash of reporting national and nonnational banks; $V = MV/M$ = estimated money transactions in 1896 arrived at by taking one-third of estimated check transactions for that year/money stock for that year = 47, a fixed constant assumed to hold in all years; $M'V'$ = total check transactions estimated by the total value of checks passing through clearinghouses multiplied by a factor of 100/35 on the assumption that check clearings are a constant 35 percent of total check circulation, this figure being the ratio of check clearings to estimated check circulation for 1896; T = simple average of index numbers of population, merchandise exports and imports, freight carried by railroads, and twelve other indicators of trade; P = weighted average of the index numbers of wages, prices of railroad stocks, and wholesale commodity prices, with weights of 3, 8, and 89 percent, respectively. For Fisher, M = Kemmerer's measure – estimated vault cash of nonreporting banks – revisions of estimated gold stock; $V = MV/M$ = (cash deposited in banks + wage bill)/cash in circulation (the numerator representing Fisher's assumption that cash paid to depositors circulates once before being deposited while that paid to non-depositors, namely wage earners, circulates twice before being deposited), M' = individual deposits subject to check = reported individual deposits + estimated checking deposits of nonreporting banks – clearinghouse exchanges; $V' = M'V'/M'$ = volume of transactions settled by check/individual deposits subject to check; T = average of index numbers of quantities of trade in various lines including 44 articles of internal commerce and 25 of export, sales of stock, railroad freight carried, and letters through the post office; P = see next footnote.

[5] Fisher constructed his independent price index series as a weighted average of the wholesale prices of 258 commodities, hourly wage rates, and the prices of 40 stocks.

velocity term defined as $V = PT/M$ a tautological, or truistic, one at that—accurate measurement of its constituent variables could result in no disparity between the predicted and actual price levels that constituted the opposite sides of the equation. If so, then high correlation between the two price series indicates merely the absence of measurement error rather than the validity of the quantity theory.

To counter such criticism, Fisher ([1911] 1913, p. 157) argued that the accounting identity, together with his assumption that its constituent variables are conceptually and empirically independent of each other, allowed him to confirm statistically that the price level P was indeed determined by velocity-augmented money per unit of real output MV/T as the quantity theory held. That is, he claimed that with velocity defined independently of the other variables so that the equation becomes nontautological, the price level adjusts to equate the real or price-deflated money stock M/P to the real demand for it, this real demand being the fraction $1/V$ of real transactions T the public wishes to hold in the form of real cash balances.

With the empirical quantity equation in place, New York Fed statistician Carl Snyder (1924, pp. 699, 710)—that rarest of birds: a Fed quantity theorist—and University of Minnesota economist Holbrook Working (1923, 1926) applied it in an effort to establish the direction of causation between money (defined by them as demand deposits) and prices at secular and cyclical frequencies. Secularly, they found the long-run path of prices to be determined jointly by the trend rates of growth of money, velocity, and trade. Of these trend growth rates, velocity's appeared to be essentially 0 percent whereas trade's was approximately 4 percent. They concluded that the money stock must expand secularly at the 4-percent trend rate of trade growth to stabilize the price level.

In short, Snyder and Working had established that with velocity trendless, the price level evolved secularly at a percentage rate equal to the difference between the growth rates of money and trade. But when Snyder examined the cyclical or deviation-from-trend behavior of the quantity-theory variables, he claimed to have found that fluctuations in velocity entirely accommodated fluctuations in trade so that the ratio k of those two variables remained at its trend value. With k fixed at trend, he concluded that money caused prices at every point of the cycle.

Working, however, realized that things couldn't possibly be that simple. His data series told him that while money did indeed determine prices over the cycle, it did so with a time delay or lag rather than contemporaneously. In his interpretation, the resulting lagged adjustment of prices to changes in the money stock necessitated compensating cyclical changes in the velocity-to-trade ratio to keep the exchange equation in balance. In other words, the ratio, far from adhering continuously to its trend equilibrium level, exhibited transitory deviations from trend with momentarily sticky prices accounting for

the deviations. Due to temporarily inflexible prices, monetary shocks initially disturbed the ratio, driving it from equilibrium. With the inflexibility quickly vanishing, corrective price-level changes subsequently occurred to eliminate the deviation and restore the ratio to trend.

To estimate the lead-lag relationship between money and prices corresponding to this result, Working (1923, 1926) correlated detrended money with contemporaneous and lagged (that is, occurring later in time) measures of the price level. He found that such correlations, though high for all lag lengths up to a year, were highest at six to eight months. This result was consistent with his findings attained through another method, namely through direct comparison of the cyclical turning points of money and prices. There Working found that trend-adjusted money not only consistently led or preceded prices in all 19 pairs of turning points examined, but did so with an average lead time of 12 months at the lower turning points and 9 months at the upper turning points. Here seemed to be strong statistical evidence of money-to-price causality.

Fisher's Version of the Framework

To Working's analysis of money's cyclical price-level effects, Fisher added his seminal and incisive account of the output and employment effects. In essence, he equipped the framework with a relationship between output and surprise inflation to argue that unanticipated price changes caused by monetary shocks were responsible for fluctuations in real interest rates and, through those real rate movements, in output and employment as well. Towering above the rest, his empirical contributions to the monetary theory of the cycle are to be found in his three remarkable journal articles of 1923, 1925, and 1926. But he had already sketched out the underlying theory in his classic 1911 volume *The Purchasing Power of Money.*

There he argued that although money stock changes have no permanent, enduring effect on real output and employment, they do affect those variables temporarily over periods lasting perhaps as long as ten years. To account for these transitory real effects, Fisher appealed to two concepts first enunciated in his 1896 monograph *Appreciation and Interest*, namely the distinction between real and nominal interest rates and the notion of asymmetrical expectations between business borrowers and bank lenders. The first concept defines the real rate of interest as the difference between the nominal observed rate and the expected rate of price inflation or deflation. The second concept says that business borrowers, by virtue of being entrepreneurs, possess superior foresight and so anticipate and therefore adjust to actual inflation faster than do bank lenders. According to Fisher, inflation lowers the real rate as seen by business borrowers. Bankers, however, being slower than their customers to adjust their inflationary expectations, see a higher real rate of interest.

Deflation works analogously to raise the real rate seen by borrowers more than it does the real rate seen by bankers.

Fisher ([1911] 1913, pp. 55–73) attributed business cycles to such real rate movements. An increase in the money stock sets prices rising. Because nominal interest rates (reflecting the inferior foresight of bankers) adjust more slowly to inflation than do the expectations of entrepreneurs, real rates as seen by the latter group fall. (Similarly, real wage, rent, and raw material costs also fall as their nominal values fail to adjust to inflation as fast as do the expectations of entrepreneurs.) Such real rate falls, raising as they do the expected rate of profit on business projects financed by bank loans, spur corresponding rises in investment, output, and employment. As the expansion proceeds, banks run up against their reserve constraints. Moreover, they begin to lose reserves when depositors, who need additional coin and currency to mediate a rising volume of hand-to-hand payments, withdraw cash from their checking accounts (and so force, in a fractional Reserve banking system, a multiple contraction of deposits). To protect their reserves from such cash drains, banks raise their nominal loan rate until it catches up with and then surpasses the increased rate of inflation. Real rates rise, thereby precipitating the downturn. Causation runs from money to prices to real rates to output and employment.

Having sketched his theory, Fisher then sought its empirical verification. Citing Working's 1923 estimate that money stock changes over the period 1890–1921 had temporally preceded price level changes by about eight months, he took this finding as constituting strong evidence of money-to-price causality (Fisher 1925, p. 199). To establish corresponding price-to-output causality, he correlated distributed lags of rates of price-level change with an index of the physical volume of trade (Fisher 1925).[6] Likewise, to establish price-to-employment causality, he correlated distributed lags of rates of price change and employment (Fisher 1926). Finding a high correlation of 0.941 for the first set of series and 0.90 for the second, he concluded that "the ups and downs of [output and] employment are the effects. . . of the rises and falls of prices, due in turn to the inflation and deflation of money and credit" (Fisher 1926, p. 792).

Here was his statistical confirmation of the trade cycle as a monetary phenomenon receptive to a monetary cure. Cycles, in other words, stem from price-level movements caused by misbehavior of the money stock. It follows that monetary policy, properly conducted, could stabilize the price level and in so doing eliminate the business cycle as well. Policymakers had but to observe

[6] Fisher employed at least three weighting schemes to distribute the lag. The first used linearly declining monthly weights for eight-month intervals. The second used a unimodal sequence of lag coefficients to weight the past rates of price change. The third and most ambitious scheme distributed the lag according to the density function of a lognormal distribution (see Chipman [1999], pp. 192–94). All schemes yielded high correlation coefficients.

and react to the price level. Its deviations from target would trigger corrective monetary responses that would restore it to target. The price level itself was the main gauge of monetary policy. If the policymakers desired supplementary indicators of monetary tightness or ease, they could observe the money stock and real interest rates—the remaining chief variables of Fisher's analysis.

2. THE FED'S FRAMEWORK

Fisher's cycle model spotlighted the money stock, price level, and real interest rate as indicators. It linked these indicators through a causal chain running from the Fed to real activity, with the Fed actively initiating the causal sequence. The Fed determined the money stock. The money stock determined the price level. The price level, or rather its rate of change, temporarily moved the real rate of interest. Movements of the real rate influenced output and employment. The cycle admitted to both a monetary cause and a monetary cure. The Fed, by stabilizing the price level, could smooth the cycle as well.

By contrast, economists at the Federal Reserve Board in the 1920s adhered to the real bills doctrine in which causation ran in the opposite direction from prices and real activity to money, with the Fed occupying a passive, accommodative role (Laidler 1999, p. 18; Yohe 1990, p. 486). In the Fed's framework, seasonal and cyclical movements in real activity drive business demands for bank loans. Since banks supply loans in the form of check-deposit money subject to a fixed fractional reserve requirement, these same movements lead to corresponding changes in bank demands for reserves, reserves borrowed from the Fed. The Fed passively accommodates these demands by discounting bank paper. In so doing, it contributes seasonal and cyclical elasticity to the money stock.

The Fed's framework did not come ready-made, however. Like the quantity theory whose elements, though assembled or foreseen as early as 1911, only became fully coordinated into an empirical framework with Fisher's output-inflation correlations of the mid-1920s, the real bills doctrine had to go through at least five overlapping stages before it emerged in the form the Fed employed to conduct policy in the initial phase of the depression. First came the pure or pristine version of the doctrine itself, which Fed officials—Board economists Adolph Miller, Walter W. Stewart, and Emanuel Goldenweiser; Reserve Bank governors George W. Norris, James B. McDougal, George J. Seay, and John W. Calkins; Federal Reserve System founders and architects E. Carter Glass and H. Parker Willis—inherited from nineteenth-century Banking School economists (Laidler 1999, p. 18; Yohe 1990, p. 486). It was this version that the above-named officials, once freed of their World War I preoccupation with selling bonds for the Treasury, sought to reformulate in order to purge it of ambiguities and inconsistencies. Missing from the inherited version were the notions of legal reserve requirements and of central banks as

providers of reserves. Consequently, the second stage saw Fed officials in the period 1919–1922 correct those omissions by incorporating into the doctrine a representation of the central bank's rediscount function. Third and fourth, respectively, came the 1923 application of the doctrine to derive real bills guides to policy and its 1926–1927 and 1928 employment to reject quantity theory ones. Fifth came the attempt, starting in 1923, to reconcile the doctrine with the newly discovered technique of open market operations. Such operations, constituting as they did activist, discretionary policy intervention, conflicted with the doctrine's notion of policy as a passively accommodating and automatically self-correcting affair. The resulting reconciliation saw member bank borrowing and market interest rates emerge in the mid- to late 1920s as the doctrine's key policy indicators.

Original Doctrine

The first step of the Fed's development of the real bills doctrine came with the passage of the 1913 Federal Reserve Act directing the Federal Reserve System to enable trade to flourish by providing the necessary money and credit. Written into the act was the prototypal version of the doctrine inherited from nineteenth-century Banking School economists. This version consisted of a rule gearing money (and credit) to production via the short-term commercial bill of exchange, thereby ensuring that output generates its own means of purchase and that money adapts passively to the legitimate needs of trade (Mints 1945, pp. 206–07, 284). The rule implied that money could be neither excessive nor deficient when issued against short-term commercial paper arising from real transactions in goods and services. More precisely, the rule implied that as long as banks lend only against bona fide commercial paper, the money stock will be secured by and will automatically vary equiproportionally with real output such that the latter will be matched by just enough money to purchase it at existing prices.

Significantly, the rule also ensured that no monetary overhang could persist to spark inflation after the goods were sold. Instead, producers would use their sales proceeds to pay off their loans and the money would return to the banks to be retired from circulation. Here is the concept of the self-liquidating loan that constitutes the bedrock principle of the doctrine. Only if loans were made for speculative purposes would monetary overhang persist. Such loans, being unproductive, would finance no real output to generate the sales revenue leading to their retirement. Consequently, the loans and the money issued by way of them would remain outstanding to validate higher prices. The limitation of loans to self-liquidating uses rules out this pathological case. In short, inflationary overissue is impossible provided money is issued on loans made to finance real, rather than speculative, transactions.

Reformulating the Doctrine

During the six years following the end of World War I, System founders and architects Glass and Willis, together with Board economists Stewart, Miller, Goldenweiser, and others, sought to spell out the logic of the foregoing implications and give them an exact and systematic formulation (Laidler 1999, pp. 192–95; Yohe 1990, p. 486). They realized that doing so would remove ambiguities that clouded earlier statements of the doctrine, statements that Lloyd Mints, the leading expert on the doctrine's history, described as "invariably brief, incomplete, and frequently not consistent" (1945, p. 206). Correcting those statements and getting the doctrine right became the first order of business. It was absolutely essential to articulate precisely the framework that the Federal Reserve Act had mandated as a policy guide and to spotlight its indicator variables in sharp relief. In their reformulation, Fed officials presented no formal equations, not even rudimentary ones. Nevertheless, their statements can be expressed symbolically and condensed into a simple algebraic model without doing violence to their intentions. Their words, as contained in their speeches, writings, and testimony before congressional committees, resemble the following set of instructions for formalizing the doctrine:[7]

First, define the needs of trade N as the value of inventories of working capital, or goods-in-process G, the production and marketing of which is financed by bank loans. Symbolically,

$$N = G. \tag{1}$$

As shown below, Fed officials measured this needs-of-trade, or nominal output, variable by using the Board's index of industrial production to capture its physical product component and the Bureau of Labor Statistics' wholesale price index to represent its nominal dollar component.

Second, assume that each dollar's worth of goods-in-process G generates an equivalent quantity of paper claims in the form of commercial bills B, which business borrowers offer as collateral to back their loan demands L_d. That is, assume that

$$G = B, \tag{2}$$

and that

$$B = L_d. \tag{3}$$

[7] See, for example, Willis's statements quoted in Laidler (1999, p. 194) and West (1977, pp. 146–47) and Miller's statements quoted in Barger (1964, pp. 79–80, 88, 93).

Third, observe that these loan demands L_d pass the real bills test (that is, they are secured by claims to real goods) and therefore qualify for matching supplies of bank loans L_s as indicated by the expression

$$L_d = L_s. \tag{4}$$

Fourth, note that since banks supply loans in the form of bank notes and checking deposits the sum of which comprises the stock of bank money, the supply of loans L_s must equal that money stock M,

$$L_s = M. \tag{5}$$

Substituting equations (1) through (4) into (5) and solving for the money stock yields

$$M = N, \tag{6}$$

which says that as long as banks lend only against short-term commercial bills arising from transactions in real goods and services, the money stock M will conform to the needs of trade N. Since the needs of trade N are by definition the same as the value of goods-in-process G, one can also write

$$M = G, \tag{7}$$

which states that the supply of bank money is ultimately secured by goods-in-process such that when those goods reach the market they will be matched by just enough money to purchase them at existing prices. This result, namely that the money stock is just sufficient to buy the goods produced, can be shown by defining the value of goods-in-process G as the multiplicative product of the price P and quantity Q of those goods when they emerge as final output, that is,

$$G = PQ. \tag{8}$$

Here one avoids a stock-flow dimensionality problem by treating the inventory of goods in process (a stock) as turning over once per period in the production of output (a flow). In short, multiplying the G variable by its (implied) unit turnover coefficient converts it into a flow, thus rendering both sides of the equation dimensionally equivalent.

Substituting equations (8) and (5) into (7) yields

$$M = L_s = PQ, \tag{9}$$

which says that, taking prices P as given and determined by nonmonetary considerations, the money stock M and volume of bank credit L_s vary in step with real production Q.[8]

Here was the essence of the real bills doctrine. Its flaw, of course, is its treatment of prices and output as given exogenous variables when, as Fisher (and indeed quantity theorists extending back as far as David Hume) had shown, they move under the influence of changes in the money stock itself. Accordingly, when the Fed measured output and prices, it did so not with the Fisherian intention of attributing their movements to an excess or deficient money stock, but rather with the intention of estimating, or predicting, the supply of real bills it would be called upon to rediscount so member banks might obtain sufficient reserves to accommodate business demands for credit.

Augmenting the Doctrine

When the Federal Reserve Act authorized Reserve Banks to rediscount bank paper, it introduced a new element into the real bills version of the monetary transmission mechanism. Step two of the reformulation of the real bills framework saw Fed founders and economists in the late 1910s and early 1920s recognize this element by incorporating a representation of the rediscount function into the framework. The rediscount function was crucial to banks who, facing a mandatory legal reserve ratio r, had to obtain the necessary reserves R to back the money and credit required by the needs of trade. The Fed enabled banks to do so by rediscounting the commercial paper they had acquired from their customers. By limiting the type of paper eligible for rediscount, the Fed ensured that reserves were just sufficient to underwrite production without promoting speculation. Nonborrowed sources of reserves, including inflows of gold and currency, were dismissed as superfluous. Ideally, the discount window could supply all the reserves necessary to meet the needs of trade.[9] And it could do so at a discount rate normally aligned with or below short-term market interest rates so as to pose no barrier to accommodation. In short, the commercial banking system faced a reserve constraint $R = rM$, which it

[8] Expression (9), of course, is simply the equation of exchange $MV = PQ$ with the velocity term V assigned a value of one, or unity. The unit velocity term corresponds to the notion of the self-liquidating loan according to which output induces, via collateralized loans, money sufficient to purchase it and to retire the loans. Consumers spend the money once and once only on the final product. Recipient producers then use the resulting sales receipts to pay off their loans and the money returns to the banks who retire it from circulation. Quantity theorists, however, questioned such reasoning. They argued that money, once created, might be spent several times before loans were repaid. And even when loans were repaid, bankers might relend the proceeds so that the new money would remain in circulation with a velocity greater than unity.

[9] In Wheelock's words (1991, p. 13), "The Real Bills Doctrine implied that rediscounts alone would provide sufficient liquidity to accommodate commerce and meet financial emergencies. No [other sources of reserves] were necessary."

satisfied by borrowing from the Fed. With nonborrowed reserves ignored, all reserves were borrowed reserves R_B such that $R = R_B$.

The significance of the foregoing propositions cannot be overestimated. Here was the view, dominant at the Federal Reserve Board in the early 1920s, of the Fed as passive accommodator rather than active initiator of changes in economic activity. Here was the idea that causation runs from output and prices to loans to bank money, with the Fed supplying the necessary reserves. Standing at the end of the causal queue, the Fed could not force money on the economy; it merely supplied reserves on demand. Of course, it could influence this demand through changes in its rediscount rate, but even so it still would have to accept all real bills tendered it at the prevailing rate. The contrast with the quantity theory could hardly have been more pronounced.

Making the Model Operational

Step three of the development of the real bills doctrine saw Board economists—some newly hired when the Federal Reserve System's main research office, of which Walter Stewart had been appointed director in July 1922, was moved from New York to Washington—give the doctrine operational content by defining its variables so that they could be measured and serve as policy guides. Output Q was defined as aggregate physical product as measured by the Board's own monthly index of industrial production. Dating from December 1922 and constructed from data on output produced in manufacturing and mining, this index was principally the work of Walter Stewart and Woodlief Thomas. It had forerunners in the production indexes developed by Wesley Clair Mitchell for the War Production Board in 1917, by Carl Snyder for the New York Fed in 1918–1920, and by Stewart himself in 1921 before he left Amherst College to go to the Board. The Board gave this index pride of place in its collection of statistical measures for two reasons. The index quantified the needs-of-business criterion of the Federal Reserve Act. It also represented the strategic variable that according to the real bills doctrine drove all other variables—loans, bills, money stock—in the credit mechanism.

Likewise, the Board defined productive loans L as bank credit advanced solely to finance the production and marketing of goods in the agricultural, industrial, and commercial sectors of the economy. (The Board also published in its monthly *Bulletin* figures on what it regarded as speculative lending, notably loans to brokers and dealers, real estate loans, and long-term capital investment loans.) As for the assets securing, or backing, productive loans, the Board defined real bills B as paper pledged as collateral for such loans and eligible for rediscount at the Fed. The exact counterpart of productive loans, such bills constituted evidence of their soundness. Here was the Board's belief that the type of paper banks acquire in making loans describes and governs the particular use of the borrowed funds. Here was its conviction that real bills

signify and measure productive credit just as non-real bills denote speculative credit.

This belief—that the type of collateral corresponds to the use of borrowed funds—was not shared by all. As early as November 28, 1922, in a talk to the Graduate Economics Club at Harvard, Benjamin Strong of the New York Fed opposed the belief on the grounds that the very fluidity of credit across uses and instruments renders it fallacious (Chandler 1958, pp. 197–98). With credit fungible, banks and their customers could borrow on real bills to finance speculation. Conversely, they could borrow on speculative paper—stocks, bonds, and mortgages—to finance production. If so, then type of paper is independent of purpose of loan and there is no assurance that credit advanced on real bills will remain in productive channels. But many Fed officials, notably Miller and Reserve Bank governors Calkins, McDougal, Norris, and Seay, disagreed with Strong and throughout the 1920s continued to argue that the form of collateral denotes the particular use of the borrowed funds.

As for the money stock M, the Fed thought so little of it as a strategic variable that it published no series on it before 1941. True, the Board did collect data on the currency and demand deposit components of the money stock. And it even published information on these individual components, including (1) monthly figures on currency in circulation, (2) a series on weekly reporting member banks that contained substantial detail on deposits, and (3) a semiannual all-bank series that one could use to establish benchmarks for monthly deposit estimates based on those of reporting member banks. But the Board never assembled these components into a single comprehensive measure of the money stock. Indeed, it had little reason to do so. Guided as it was by the real bills doctrine, the Board saw money creation as simply a byproduct, or secondary side effect, of bankers' loan decisions. To the Board, loans, not money, were what mattered. Provided banks made the right kind of loans, the money stock would take care of itself.

The final step in the Board's effort to make the doctrine operational involved defining the price level P as measured by the wholesale price index. The Board attributed movements in this latter index either to the long-term operation of exogenous real forces, notably technological progress or resource scarcity, or to short-term speculation, that is, to nonproductive uses of money and credit. Accordingly, secular price changes were ascribed either to cost-reducing productivity growth or cost-enhancing capacity constraints. Likewise, short-term rises in the price level were seen as evidence of a speculative withholding of goods from the market in anticipation of the higher future prices they might bring. And short-term falls in the price level were seen as the inevitable consequence of the bursting of the speculative bubble as goods were dumped on the market at fire-sale prices. The Fed's inclination was to interfere little or not at all with these latter price falls. Indeed, it regarded them

as necessary to purge the economy of its preceding speculative excesses. The upshot was the Fed watched the price index for evidence of speculation and its aftermath rather than for evidence that money was plentiful or tight.

Policy Guides in the Board's *Tenth Annual Report*

With these definitions and interpretations in hand, Stewart, writing (with Miller's support) in the Board's famous *Tenth Annual Report* (1923) specified two policy guides designed to ensure that the volume of money and credit was neither excessive nor deficient.[10] These were the celebrated quantitative and qualitative tests, respectively.[11]

The quantitative test focused on the ratio of credit (or money) to trade. (Again, the Board's index of industrial production measured trade's real, or output, component and the wholesale price index its nominal, or price, component.) In the words of Friedman and Schwartz (1963, p. 253), the test consisted of a "marriage of the traditional real bills doctrine and an inventory theory of the business cycle." Of this pair, the real bills component stated that money M and credit L_s are optimally supplied when variations in their quantity match corresponding variations in nominal product or income PQ according to the equation $M = L_s = PQ$.[12] In other words, money and credit would exhibit desirable elasticity when they rose and fell in procyclical fashion with the dollar value of real output whose financing they supported.[13]

The inventory theory component added the proviso that money and credit should so behave only as long as they finance no speculative inventory accumulation.[14] Money and credit should not, that is, finance production destined

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[10] Here Board economists obviously departed from the prototypal Banking School version of the doctrine. According to that version, money and credit require no quantitative policy guides since their amounts will automatically adjust to the needs of trade with neither excess nor deficiency as long as banks, commercial and central, make short-term, self-liquidating loans to finance the production and marketing of real goods and services.

[11] For critical evaluation of these tests, see Friedman and Schwartz (1963, pp. 252–53) and Mints (1945, pp. 265–68). For more sympathetic treatments, see Hardy (1932, pp. 74–80), Reed (1930, pp. 59–64), West (1977, pp. 195–98), and Wicker (1966).

[12] Hardy (1932, p. 77) and Reed (1930, p. 62) go out of their way to emphasize this point. They note that the quantitative test called for the money stock to vary automatically with corresponding variations both in prices and output.

[13] That money and credit must vary procyclically rather than countercyclically according to the quantitative test was well understood. Hardy (1932, pp. 78–79) described how credit must, under the provisions of the test, adapt passively to the cycle, falling when business declines and expanding when business expands. The test, Hardy insisted, was not designed to ensure that money varies countercyclically so as to stimulate activity in slumps and damp it in booms. Rather the test was designed to ensure that money and credit adapt themselves passively to prevailing cyclical conditions.

[14] Hardy's account (1932, p. 77) of the inventory proviso is classic. The Fed's responsibility, he says, is "not to check price increases [associated with expanding production] but to supply a volume of credit appropriate to the higher prices, so long as the latter are not interpreted as the evidence of speculative accumulation of inventories."

for speculative stockpiling rather than for final sales. The danger is that such stocks of commodities eventually would be dumped on the market to depress prices and real activity. Evidently, the sharp boom-bust cycle of 1919–1921 had taught the Fed that such an outcome could happen. It had revealed that even legitimate credit expansion could, by financing inventory overinvestment instead of production for final consumption, lead to an inflationary shortage of consumers' goods followed by deflation when the excess stocks of those goods finally flooded the market. But this inventory cycle proviso, with its implication that credit is put to speculative uses when it finances production for inventory rather than for consumption, is inconsistent with the original or pristine version of the real bills doctrine. The latter, of course, equates all production, regardless of its purpose, with the proper use of credit.

Finally, the qualitative test stated that money is optimally supplied when it passes the real bills test, that is, when it is extended on loan for productive purposes as evidenced by eligible paper in bank portfolios. Whereas the quantitative test, sheared of its inventory proviso, stated that money and credit cannot be overissued when they move one-for-one with the value of real output, the qualitative test assures that this outcome is automatically achieved when banks lend only on real bills—in other words, when loan expansion goes 100 percent to finance working capital needs and 0 percent to finance fixed capital investment and stock market speculation. The latter test implied that quantitative control can be attained through qualitative means, and the Board took this implication seriously. It largely abandoned quantitative tests after the mid-1920s, when its concern shifted from accommodating production to stopping speculation in the stock market (see Reed [1930], pp. 60, 63; Yohe [1990], p. 482).

Rejection of Quantity Theory Indicators

After deploying their framework to champion real bills indicators, Board economists Miller, Stewart, and Goldenweiser put it through its fourth developmental stage when they applied it to reject rival quantity theory indicators, specifically those of the price level and the money supply. Their doctrine taught them that money was demand-determined, that real forces drive the price level, and that causation runs from prices (and real activity) to money rather than vice versa as in the quantity theory. Accordingly, when Congress held hearings in 1926–1927 and 1928 on Kansas Representative James G. Strong's proposed legislation to make price level stability an explicit goal of monetary policy, Fed economists who testified at the hearings expressed their opposition in no uncertain terms (see U.S. Congress [1926, 1928]).[15]

[15] On Fed testimony in the stabilization hearings, see Hetzel (1985), Hardy (1930, pp. 207–18), and Meltzer (1997, pp. 66–79).

Starting with an attack on the quantity theory's key price level indicator, Stewart, Miller, and Goldenweiser denied that it was a reliable or useful policy guide. First, they claimed that the Fed cannot control the price level because nonmonetary forces outside the Fed's sphere of influence determine that variable. New York Fed Governor Benjamin Strong, who adhered to some strands of the real bills doctrine while rejecting others, voiced a variant of this argument. Even if money can influence the price level, he declared, it is but one of many factors doing so. Other factors include a variety of real shocks plus the state of business confidence and the public's expectations of the future, none of which the Fed controls (U.S. Congress 1926, p. 482). Quantity theorists including John R. Commons readily agreed with this point but still contended that monetary policy was powerful enough to offset these forces and stabilize the price level (Hardy 1932, p. 207).

But Stewart and Miller countered that even if Commons were right and the Fed could indeed stabilize the price level, it nevertheless has no business doing so. In their view, the Fed has no right to interfere either with price falls caused by cost-reducing technological progress or with price rises caused by exhaustion of supplies of scarce natural resources. To this contention quantity theorists like Fisher replied that in the absence of changes in the stock of money per unit of real output, costs of production, whether lowered by technological progress or raised by increased scarcity, influence the relative prices of individual goods but not the absolute price level or general average of all prices. With the money stock and thereby aggregate spending held constant, cost-induced rises in the prices of some goods that required consumers to spend more on those items would leave them with less money to spend on other goods whose prices would accordingly fall. If so, then the rise in the first set of relative prices would be offset by compensating falls in the second set, leaving general prices unchanged. Only if cost shocks had an impact on the total volume of output or trade could they alter the price level associated with a given money stock. Fed economists offered no rebuttal to this argument. Instead, they advanced another reason why the general price level is a poor policy guide, namely that the public would confuse it with the prices of specific goods and assume that a policy of price-level stabilization required stabilization of the prices of individual commodities (Hardy 1930, p. 207).

Finally, Board economists condemned price-level indicators on purely technical grounds. Stewart used a chart showing the 1921–1926 behavior of the wholesale price index and its agricultural and nonagricultural components to dismiss aggregate indexes of the price level as meaningless averages masking diverse movements of their individual components (U.S. Congress [1926], pp. 741–47; see also U.S. Congress [1928], p. 40). And Adolph Miller, citing long lags in price adjustment, argued that the price level registers inflationary and deflationary pressures too late for policy to forestall them (U.S. Congress 1926, pp. 837–38). Longtime Fed Board member Charles S. Hamlin added

that there are many different measures of the price level, including wholesale price, retail price, and cost-of-living indexes, as well as Snyder's comprehensive composite index (which, in addition to wholesale and retail commodity prices, included wages, rents, and stock prices as well) (U.S. Congress 1928, p. 393). Each measure may behave differently—Hamlin noted the 12, 2, and 0 percent falls of the wholesale, cost-of-living, and Snyder indexes respectively for the period 1925–1927—and may call for a different stabilization action. What should the Fed do when confronted with alternative index numbers that are, say, simultaneously rising, falling, and remaining unchanged? Which index should it choose?

As for the money stock, Stewart, Miller, and company likewise gave it short shrift as an indicator. It was, they claimed, useless as a policy guide because the Fed exercised no control over it. Instead, the public determines the money stock through its demand for bank loans just as the needs-of-trade doctrine contended. The money stock was likewise useless as an indicator of inflationary or deflationary pressure because it did not determine the price level—or at least it did not do so if created by way of loans made to finance nonspeculative activity. In this case, the money stock adapted passively to the needs of trade valued at the prevailing price level, a price level whose path was determined by real considerations such as technological progress, productivity growth, and growing resource scarcity. Miller said it all when he insisted that neither assumption of the quantity theory—that Fed policy causes money stock changes and that the latter cause corresponding changes in the price level—is true (U.S. Congress 1928, p. 109).

The outcome was that Fed officials contended that the considerations described above rendered the quantity theory and its money stock and price level indicators unfit for policy use. The Fed might collect data on those indicators and report them in its publications. It might even monitor them as background information from time to time. In no case, however, would it use them for stabilization purposes. The Fed's arguments proved convincing to influential congressmen, economists, and bankers alike. Quantity theorists were unsuccessful in getting their price stability target enacted into law.

Incorporation of Open Market Operations

Ironically, the main challenge to the real bills doctrine came not from the quantity theory but rather from the Fed's own discovery in 1922–1923 of open market operations as a means of reserve control. In incorporating this new policy instrument into the real bills framework, Board economists evidently reconciled the irreconcilable. That is to say, they reconciled the instrument with a doctrine whose precepts it violated in at least three ways. First, open market operations, involving as they did purchases and sales of U.S. government securities, conflicted with the notion that the Fed should deal solely

in short-term, self-liquidating commercial paper. Government securities, according to the pristine version of the doctrine, represented speculative rather than productive use of credit. Second, when the Fed conducted open market operations, it did so at its own initiative. Such active intervention clashed with the principle of passive accommodation according to which the initiative for reserve provision should come not from the Fed but rather from member banks and their customers responding to the needs of trade. Finally, open market operations contradicted the idea that additional means of reserve provision were superfluous since banks could always obtain sufficient reserves at the discount window. How could the use of such an instrument be squared with the real bills doctrine?

The Fed's "great discovery" (Burgess 1964, p. 220) of the so-called scissors, or displacement, effect permitted the reconciliation.[16] The scissors effect referred to the tendency of compensating changes in discount-window borrowing to offset open market operations leaving total reserves unchanged (see Friedman and Schwartz [1963], pp. 251, 272, 296, Yohe [1990], p. 483, and U.S. Congress [1926], p. 749). W. Randolph Burgess and Benjamin Strong of the New York Fed and Adolph Miller, Walter Stewart, and Winfield Riefler at the Board discovered this phenomenon in 1922–1923. To their surprise, they found that open market sales, by removing reserves, induced member banks to come to the discount window to recoup the lost reserves. Conversely, open market purchases, by increasing reserves, enabled member banks to reduce their indebtedness to the Fed by the full amount of the purchases. In both cases, compensatory changes in member bank borrowing tended to counteract the reserve effects of open market operations. Borrowed reserves R_B varied inversely with open market operations *omo* (as measured by changes in the Fed's holdings of government securities) in a one-for-one relationship:[17]

$$R_B = -omo \tag{10}$$

or

$$R_B/omo = -1. \tag{11}$$

The scissors effect prompted two interpretations of open market operations consistent with the real bills doctrine. According to the first, voiced primarily by Miller and Stewart, such operations constituted a test of whether reserves and the deposit money they supported were in excess of the needs of trade (see Federal Reserve Board [1923], pp. 13–14). Open market operations were

[16] The appellation is due to Harold Reed (1930, p. 28), who coined it.

[17] On the one-for-one, or dollar-for-dollar, relationship between discount-window borrowing and open market operations, see Yohe (1990, p. 483) and Meltzer (1997, p. 184).

taken at the initiative of the Fed, but the initiative to borrow or repay at the discount window came from member banks seeking to accommodate the needs of trade. If so, then the extent to which banks borrowed to replace reserves lost through open market sales measured the true, or real bills, demand for such reserves. The open market operations themselves tested, or revealed, the extent of this demand.

Let the Fed apply the test by withdrawing, via open market sales, reserves from the banking system. If banks replenished all the lost reserves through increased borrowing at the discount window, this response would prove that reserves and deposits were not excessive. Reserves were not excessive because banks, in borrowing them, had to rediscount real bills equal to them in dollar value. That banks were willing to do so was proof positive that the reserves and deposits were not excessive to the needs of trade. Only if banks failed to recoup, via the rediscount of real bills, all the reserves lost through open market sales would such reserves be proved excessive.

The second interpretation, expounded by Burgess, Strong, and Riefler, was the more extreme of the two.[18] It held that open market operations could be employed to control the volume of discount-window borrowing. That is, if such borrowing varied in an inverse, dollar-for-dollar ratio with open market operations as the $R_B/omo = -1$ scissors effect implied, then the Fed could control the numerator by regulating the denominator. Via open market sales, the Fed could compel banks to borrow just as surely as it could, through open market purchases, spur them to repay their indebtedness. True, the very notion of the Fed controlling discount-window activity through open market operations clashed with the passive-accommodation principle of the real bills doctrine. Nevertheless, other strands of the doctrine were preserved. The Fed was still obliged to rediscount upon demand all the eligible paper offered it at any level of open market operations. Moreover, banks still eliminated their reserve deficiencies and excesses by rediscounting and repurchasing, respectively, real bills at the discount window. Finally, business loan demands still drove the generation of credit and money, with the Fed supplying the necessary borrowed reserves, albeit using open market operations to force banks to borrow. On these grounds, at least, the real bills doctrine was upheld.

Key Indicators Established

The result was to render member bank borrowing and market interest rates the chief indicators of policy. Burgess (1927) and Riefler (1930) saw both

[18] Karl Brunner and Allan Meltzer christened this interpretation the "Riefler-Burgess doctrine" after Winfield W. Riefler and W. Randolph Burgess, the two Fed economists who gave it its classic exposition. Governor Benjamin Strong of the New York Fed was a staunch proponent of the Riefler-Burgess doctrine.

indicators as measuring the degree of policy tightness or ease produced by open market sales and purchases, respectively. With respect to the borrowing indicator, the inverse one-for-one relationship between it and open market operations guaranteed that it would be an accurate indicator of the thrust, or pressure, exerted by the latter. Thus, when restrictive open market sales pressured banks to borrow, the magnitude of the borrowing (in excess of the Fed's desired target level of borrowed reserves, which Benjamin Strong in 1926 suggested was $500–$600 million) would capture the degree of restriction. Conversely, when expansionary open market purchases spurred banks to repay their indebtedness, the resulting reduction in borrowing (below the Fed's $500–$600 million borrowed reserve target) would indicate the extent of the ease. The inverse relation ensured as much.

As for market rates, they sent the same signal as member bank borrowing because borrowing was the chief influence determining them. When borrowing was high, banks, being reluctant to remain continually in debt with the Fed, would be under great pressure to reduce their indebtedness.[19] To obtain the funds to do so, they would call in outstanding loans and curtail further lending. The resulting reduction in loan supply would raise market interest rates. The greater the indebtedness and thus the urgency to repay it, the greater the upward pressure on rates and so the higher their level. Contrariwise, when borrowing was low and banks had repaid their indebtedness, they would be willing to expand their lending. The resulting expansion in loan supply relative to loan demand would put downward pressure on rates. In short, market interest rates, because they varied directly with the scale of member bank borrowing, supplemented the latter as an indicator of the degree of policy ease or tightness (see Meltzer [1976], pp. 464–65). The Fed looked to these indicators to reveal the stance of its credit and monetary policy in the late 1920s and early 1930s.

Signals Flashed by the Indicators Early in the Depression

Relying on member bank borrowing and market interest rates as indicators, the Fed judged its policy to be remarkably easy in the initial phase (October 1929–1931) of the Great Depression. By mid-1931, member bank borrowing and market rates had fallen respectively to one-fifth and one-third of their October 1929 levels (Wheelock 1998, pp. 130–31, 133). By all accounts

[19] Fed economists, notably Riefler (1930) and Burgess (1927), cited a so-called tradition against borrowing or reluctance to borrow that was supposed to make banks eager to repay their indebtedness. Allegedly, such reluctance held even when borrowing was profitable, that is, when a positive spread between bank loan rates and the discount rate indicated that the expected rate of return on the use of borrowed reserves exceeded the cost of such reserves. See Meltzer (1976, pp. 464–65) for a concise summary of the reluctance hypothesis.

both indicators were at extremely low levels—borrowing averaging but $243 million from January 1930 to September 1931, the Treasury bill rate averaging less than 2 percent over that same period—suggesting that the Fed had already done all it could do to arrest the depression. These were the indicators that the Fed used to justify its policy of inaction.

By contrast, the rival quantity theory indicators—money stock, price level, and real interest rates—were flashing the opposite signal. Thus Lauchlin Currie's pioneering series of the M1 money stock showed falls of 3.7 and 6.3 percent, respectively, in 1930 and 1931. Currie's figures, later confirmed by Clark Warburton (1945, 1946), Lloyd Mints (1950, p. 38; 1951, p. 193), and Milton Friedman and Anna Schwartz (1963), were reported both in his Harvard Ph.D. thesis, which he wrote in 1929–1930 and submitted in January 1931, and in his 1934 *The Supply and Control of Money in the United States*. Such figures were fully available to the Fed at the time and could have been computed from data it regularly collected from the banking system.

Likewise available to the Fed were measures of the price level, particularly indexes of wholesale commodity prices. They had, by 1931, fallen by more than a quarter of their 1929 level. As for the real interest rate, as measured by the short term government yield plus the percentage rate of change of the wholesale price index, it had risen by mid-1931 to a level of 10.5 percent, more than 6 percentage points above its 1929 level. Here was clear evidence that monetary policy was extremely tight, not easy, and that expansionary measures should be taken immediately to prevent further contraction in real activity. But the Fed either disregarded these signals or interpreted them as indicating that the money stock was behaving correctly. Indeed, it interpreted falls in the money stock as entirely appropriate given the fall in prices and output. Monetary contraction in response to the decline in nominal income was precisely what the $M = PQ$ equation of the real bills doctrine called for.

CONCLUSION

History would have been different had the Fed incorporated quantity theoretic insights into its analytical policy framework in the 1920s and early 1930s. The quantity theory model of the business cycle featured statistical indicators that would have signaled that monetary policy was too tight and needed easing in the early years of the Great Depression. Acting on those indicators, the Fed could have eased policy and so perhaps prevented the depression or at least mitigated its severity. Instead, Fed officials adhered to an entirely different framework whose indicators signaled that policy was remarkably easy and that the central bank had already done all it could do to arrest the slump. Accordingly, the Fed did nothing and let the economy slide further into the depression.

The Fed's failure to act shows that its adherence to the real bills doctrine had deleterious consequences. These consequences might have been avoided had the Fed selected at the outset the state-of-the-art quantity theory framework rather than the flawed real bills framework. The moral is clear: Accuracy and precision are not the only determinants of the usefulness of measurements in policymaking. The conceptual framework that defines and constrains what is measured and how it is measured establishes the effectiveness and usefulness of those measurements. In the early 1930s, the measurements emanating from the quantity theory framework might have accomplished what their real bills counterparts could not, namely help the Fed alleviate the Great Depression.

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