Volume Title: Determinants and Effects of Changes in the Stock of Money, 1875–1960

Volume Author/Editor: Philip Cagan

Volume Publisher: NBER

Volume ISBN: 0-870-14097-3

Volume URL: http://www.nber.org/books/caga65-1

Publication Date: 1965

Chapter Title: Summary

Chapter Author: Philip Cagan

Chapter URL: http://www.nber.org/chapters/c1646

Chapter pages in book: (p. 279 - 298)

7

SUMMARY

THE GENERAL PROPOSITION that the stock of money depends on the behavior of the institutions that issue money and their interrelations with the rest of the economy would receive wide agreement. Beyond that, however, current theories treat monetary relationships with considerable variety, reflecting the paucity and ambiguity of the evidence. New data recently made available and supplemented here allow further examination of the record. This study has aimed at providing a broad historical analysis of monetary behavior as necessary background for further work. Many short periods have special features which such an analysis helps to place in perspective. Within this over-all objective the study was directed toward three specific tasks:

1. To describe the secular and cyclical movements in the money stock and identify the institutional channels through which they occurred.

2. To look beyond these channels, as far as is possible in a broad study, to analyze the underlying factors and relationships at work.

3. To use the findings of supply factors to clarify monetary effects on prices and output.

The analysis was facilitated by distinguishing the actions of the federal government, commercial banks, and the public. The government (including Federal Reserve Banks) is responsible for the issue of money that can serve as bank reserves, called high-powered money. During the period studied, high-powered money outstanding has consisted, at different times, of currency and gold outside the Treasury and Federal Reserve Banks, deposits of banks at Federal Reserve Banks, and national bank notes outside issuing banks. The amount outstanding is held by both the public and banks. Its division between them is jointly determined by two ratios: the fraction of total money balances the public holds in the form of currency instead of bank deposits—the currency-money ratio—and the quantity of high-powered reserves held by banks per dollar of total deposits held by the

public—the reserve ratio. A simple formula allocates changes in the money stock to the part contributed by each of the three proximate determinants—high-powered money outstanding, and the two ratios. The money stock increases with an increase in high-powered money or with a decline in either of the two ratios.

A change in the money stock may be attributed to the sum of the three contributions so long as they are largely independent. Lack of independence would mean there were causal connections between the determinants or constraints on movements in the total money stock. Evidence was found of a partial dependence of high-powered money on the two ratios, attributable partly to the common effects of business cycles and partly to a constraint on the money stock produced by the gold-standard mechanism in the long run and Federal Reserve operations in the short run. Such interdependence was confined to effects on high-powered money and does not preclude a general analysis of the factors affecting each determinant.

This summary chapter brings together the major findings on the above three topics. The evidence for long and short movements is discussed separately because the factors affecting the determinants differed according to the time span.

1. Secular Movements

CONTRIBUTIONS OF THREE DETERMINANTS TO GROWTH IN THE MONEY STOCK

The money stock as defined here—currency outside banks plus demand and time deposits at commercial banks—grew from 1875 to 1955 at an average annual rate of nearly 6 per cent, though with considerable variation. Nine-tenths of the secular growth of the money stock over the whole period was accounted for by the expansion of high-powered money, and the remaining one-tenth by declines in the currency and reserve ratios. These fractions were virtually the same after excluding the two world war periods. Most of the decline in the ratios occurred before World War I, so that high-powered money has been relatively more important in the period since then. Growth of this determinant has tended in the very long run to follow the growth of the total domestic gold stock. While the ratio of high-powered

money to the total domestic gold stock has varied considerably in the short run, it was about the same in 1955 as in the 1880's (after the large increase in the gold stock which followed the resumption of specie payments in 1879). The money stock grew somewhat faster than the gold stock over the period as a whole, which is attributable entirely to the substitution of checking accounts for currency and to a decline in the reserve ratio of the banking system.

FACTORS AFFECTING THE THREE DETERMINANTS

High-Powered Money. Movements in high-powered money may be traced (1) to changes in the gold stock, (2) to Federal Reserve System operations, as indicated by changes in its monetary liabilities or, equivalently, in its credit outstanding, (3) to Treasury operations, and (4) to issues of national bank notes. This classification has the advantage of centering attention on the principal sources of change in high-powered money rather than on the particular kinds of money issued. An increase in the gold stock, for example, if not offset by Treasury or Federal Reserve operations, expands high-powered money through an addition to bank reserves or to currency in circulation, though gold itself no longer circulates and is not today a part of high-powered money outstanding.

Secular changes in high-powered money can be attributed largely to the gold stock and, after 1914, in about equal measure also to Federal Reserve operations. The latter played a conspicuous role chiefly in the rapid expansion of the money stock during the two world wars. A greater rate of growth of the money stock after 1896 reflected increased growth of the gold stock, stemming in turn from a gradual expansion of world gold production beginning in the late 1880's. Treasury operations and issues of national bank notes have been of minor importance as sources of change in high-powered money, particularly since World War I.

The Currency-Money Ratio. Currency in circulation exceeds amounts needed for retail transactions, and apparently serves also as a store of wealth. The amount demanded therefore depends not only on transaction uses affected by the volume of consumer expenditures and the cost of a checking account but also on wealth holdings affected by total private wealth and interest rates paid on substitutes—mainly savings deposits. The ratio of currency to total money holdings depends

upon how the relevant demand factors affect currency and commercial bank deposits differently.

There was a secular decline in the currency-money ratio from at least the 1870's to 1930, which reflected decreasing relative demands for currency and rising relative demands for commercial bank deposits. Savings deposit rates generally fell during this period and so do not explain these demand changes, though the rates began to rise after the turn of the century and so may account for an accelerated decline in currency demand after about 1904. A variety of institutional developments in payment and saving practices accompanied the secular shift in demand from currency to deposits, for which the growth in real income and of urban centers provides a satisfactory summary explanation.

None of the aforementioned factors explains the wartime increase in currency demand, attributed here to changes of residence by workers, hoarding of U.S. currency abroad, and income-tax evasion. Since income-tax rates remained high after the war, currency holdings used for evading taxes have also remained high. The decline in currency demand since 1945 must therefore be attributed to the disappearance of the other wartime factors and to rising savings deposit rates during the 1950's. By 1960 the ratio of currency to consumer expenditures stood at about the same level as in 1939, but still considerably higher than in 1929. The explanation appears to involve a combination of partly offsetting factors. Tax evasion has added to currency demand since the early 1940's, and service charges on checking accounts, first imposed in the 1930's, have been increasing slowly since the mid-1940's. Rising savings deposit rates since the war have reduced currency demand, however, though they were still lower in 1960 than in the 1920's.

The increasing demand for commercial bank deposits (relative to national income) during the 1930's and 1940's and declining demand during the 1950's partly offset the movements in currency demand. Hence the currency-money ratio follows the movements in the currency-expenditures ratio since the 1930's, but with less amplitude.

The Reserve Ratio. The reserve ratio can be analyzed in terms of the required and the usable reserve ratios. The former shows changes in reserve requirements, which have been important mainly in certain short-run periods. The usable ratio represents reserves in excess of

requirements and appears normally to be independent of the required ratio; that is, changes in the latter are usually fully transmitted to the total ratio, though the adjustment occurs with varying speeds. Over all, the required ratio has not changed greatly. Nor have shifts in the distribution of deposits among banks and between time and demand accounts affected the ratio greatly. The secular decline in the total reserve ratio reflects mainly a decline in the usable ratio. Most of the decline came before the founding of the Federal Reserve Banks and can be attributed to actions taken by the Treasury after about 1900 to assist banks and stabilize the money market. The Federal Reserve Act of a decade later formalized the government's role in these activities and induced a further, though much smaller, decline in the usable ratio. It rose temporarily in the 1930's but during World War II it came down again and by 1955 had fallen low enough almost to preclude further decline.

Since long-term interest rates started to rise shortly before 1900, it is tempting to explain the concurrent secular decline in the ratio by the inverse effect of interest-rate movements. But long-term rates were falling in the 1870's and 1880's, when the trend of the ratio was certainly not upward. Consequently, a long-run effect of this kind appears inconsistent with the behavior of the ratio.

To sum up, the long-run growth of the money stock reflects primarily growth of the world and domestic gold stocks and, since 1914, also of Federal Reserve credit outstanding. Secondarily, it reflects a decline in the reserve ratio since about 1900, owing to a more stable money market; and a decline in the currency ratio from at least the 1870's until 1930, owing to the gradual substitution of checking accounts for currency with the rise in real income.

EFFECTS OF CHANGES IN THE MONEY STOCK ON PRICES AND OUTPUT

Secular movements in money and prices, measured by their rates of change between average reference cycle standings centered at reference peaks, have a very high positive covariation, higher than can be reconciled with the view that these movements are largely unrelated. Traditional theories of monetary disturbances can be interpreted as indicating that an important line of influence runs from money, on the one side, to prices and output, on the other. Another

view is that the high covariation reflects a direction of influence running primarily the other way, from prices and output to money. This study's examination of the determinants of the money stock helps to clarify the main direction of influence by showing to what extent prices and output affect the money stock and so can account for the high covariation observed. Since we find that secular variations in the rate of change in the money stock are largely due to high-powered money, effects of prices on money can account for the covariation only insofar as they occur through this determinant. Yet price changes have little effect on the nongold components of high-powered money, and the effect of prices on the gold stock is inverse. Hence, the positive covariation between money and prices cannot reflect the second direction of influence and must reflect the first, the effect of money on prices.

The evidence can be summarized in terms of correlation coefficients. The secular rate of change in prices for 18 intercyclical subperiods from 1877 to 1954 was correlated more closely with the rate of growth of the money stock than with the contributions to that growth of any of the three determinants. This supports the hypothesis that money-stock changes produced the changes in prices. Moreover, the implications of the alternative hypothesis, that the direction of influence ran from prices to money, are contradicted in two ways: (1) The secular rates of change in prices and in the gold stock were, in fact, correlated positively, not negatively, as the alternative hypothesis requires. (2) Price movements had a substantially lower correlation with all the nongold sources of change in the money stock, singly or in combination, than with changes in the total money stock.

These results do not mean that prices had no effects on the determinants, but only that the effects were not in the right direction or of sufficient importance to account for the high positive correlation with the money stock. The effect on the gold stock, as noted, should be inverse: inflation in gold-standard countries, which lowers the commodity value of gold, discourages its production and so reduces the rate of growth of the world gold stock; in addition, inflation in one country makes its prices higher relative to prices in other countries and leads to outflow of gold. Deflation has the converse effects. These adjustments, of course, take time. If they occurred immediately, price changes would set up countermovements at once in the gold and

money stocks, and could not go far. Though the data show the lags to be quite long, the relationship accords with the traditional theory of a commodity standard: a rise in the money stock, for example, raises prices; this, in turn, tends eventually to reduce gold production and the annual growth of the world gold stock, thereby holding back the growth of money stocks of countries on the gold standard and counteracting the initial rise. The relatively more rapid effect of money-stock changes on prices, compared with the lagged effect of prices on the gold stock, accounts for the observed positive correlation of concurrent movements in prices and gold.

Apart from gold, the components of high-powered money are not greatly affected by price changes. Government actions have to some extent produced a weak inverse effect, because silver purchases and Federal Reserve credit outstanding have been used to offset some price movements. That these components nevertheless tend to have a positive secular correlation with prices may be attributed to their effect on prices through the money stock. Price effects on the two ratios also appear negligible; since high-powered money is by far the most important determinant of secular movements, however, the two ratios can be ignored.

Notwithstanding these results for the period as a whole, the results for the subperiod 1919–54 are not on the surface inconsistent with the alternative hypothesis that price changes produced the secular movements in the money series. For that period, prices had just as close a correlation with the nongold components of high-powered money as they had with the money stock, and also had a slight negative correlation with the gold stock. The latter result reflects primarily the large rise in the gold stock in the 1920's, when prices were relatively constant, and the large rise in the 1930's following the devaluation of the dollar, when prices barely made up for ground lost in the early 1930's and, by our measure of the secular rate of change, did not advance. Federal Reserve credit outstanding, rather than gold, has largely determined the secular movements in the money stock since 1914. That is why prices were correlated highly, not only with the money stock but also with an important source of change in high-powered money, Federal Reserve credit outstanding. These results do not, however, establish the alternative hypothesis for that subperiod. To do that would also require evidence that the effects of

money on prices found for the pre-1914 period somehow no longer occurred thereafter, and that price changes had a strong positive effect on Federal Reserve credit outstanding. Neither proposition is credible. Federal Reserve policies were often intended to counteract price movements, not to reinforce them. The correlation coefficients for 1919–54 are also consistent with the first hypothesis and can be interpreted as reflecting the new importance of Federal Reserve credit on money-stock changes, and thence on prices.

The present findings suggest that long-run changes in the money stock produce corresponding, very likely proportional, changes in prices relative to what they would otherwise be. Recent theoretical work also supports these suggested links, but many writers have not been persuaded because of doubts about the empirical evidence. Our data dispel the basis for most of these doubts, at least for the period covered. Nonmonetary factors also affect prices, of course, through changes in the velocity of money. Prices do not remain in fixed ratio to the money stock, as a "crude" quantity theory is supposed to assert. Nevertheless, changes in the velocity of money were relatively unimportant in secular movements, as indicated by the high correlation found between the rates of change of money and prices. To explain secular movements in prices, therefore, we should look primarily to the money stock, and then secondarily to nonmonetary factors that may also have important influence. Changes in the money stock may, of course, reflect many different factors which, in these days of thoroughly managed monetary systems, have widely different origins. We have come a long way from a primitive commodity currency; this study indicates how varied the sources of change in the money stock have become.

Secular price movements may be related to long cycles in aggregate output and productivity, as suggested by similar movements in such series and in price indexes. Insofar as these movements are in fact related, our findings suggest that the direction of influence runs primarily from money to prices, then to output, because no evidence was found that prices and output systematically affect the money stock and come first in the chain of influence. The further question presents itself: how money and prices affect output in the long run. Some leading possibilities were reviewed, but tests of their validity are still to be made.

2. *Cyclical Movements*

CONTRIBUTIONS OF THREE DETERMINANTS TO CYCLES IN MONETARY GROWTH

There were 18 short-run cycles corresponding to business cycles in the rate of monetary growth from 1877 to 1954. (The few non-corresponding movements are noted in Chapter 1.) The currency ratio was the proximate source of half the variation in the rate of monetary growth during those 18 cycles. High-powered money and the reserve ratio were each responsible for about a quarter of the over-all variation. The relative contributions to the two war cycles were different, but excluding them does not affect the general picture. The important role of the currency ratio reflects two factors: the comparatively large amplitude of its fluctuations, and the regularity of its cyclical pattern. High-powered money showed fluctuations nearly as large, but they were erratic and frequently contrary to movements in the ratios; hence, the average relative contribution of this determinant was quite low. The reserve ratio over the period as a whole had the greatest cyclical regularity in absolute terms, but, since it also had a small amplitude, its net influence on cycles in the rate of monetary growth was lower than that of the currency ratio.

While displaying considerable diversity, the individual cycles reveal common patterns. The peak in the monetary growth rate typically comes during the first part of business expansions. The ensuing decline in the rate during this phase reflects decreasing contributions from the currency and reserve ratios, primarily the former. (Since the two ratios each contribute *inversely* to the rate of change in the money stock, our description of their contribution takes account of this. The ratios themselves move in the opposite direction to the way their contributions are described. During business expansions, for example, the ratios generally decline at a gradually diminishing rate. This means that they make a diminishing positive contribution to the rate of change in the money stock as the expansion proceeds, and hence account for the decline in the rate.)

High-powered money behaves irregularly during business expansions, but, more often than not, its growth rate at first expands and then subsides during this phase. On net, the rate of change in the money stock falls steadily until there is a peak in business activity, or

somewhat later. Then monetary growth begins to rise, reflecting an upturn in the contribution of the currency ratio and irregular contributions by the other two determinants that tend to cancel each other. Although the growth rate of high-powered money has often declined substantially during the last part of business contractions, sometimes the decline merely offset large changes in reserve requirements. Apart from such changes, the reserve ratio has no consistent pattern over business contractions. These divergent movements of the three determinants have nearly always raised the growth rate of the money stock during business contractions as a whole, but not steadily. Sometimes the rise in the rate has faltered in the final stages of business contractions, and sometimes it has accelerated. The cycles in money can be attributed to all three determinants, though most consistently for the entire period to the currency ratio, and for the later period more so to high-powered money than to the reserve ratio.

In a comparison of the periods before and after World War I, the relative contribution of the currency ratio to cycles in monetary growth was about the same. The relative contribution of the reserve ratio was much lower in the later period, chiefly because of a reduction in its amplitude of fluctuation. The reduction began earlier than World War I—around 1900—in response to a new willingness and ability of the Treasury to alleviate financial stringencies in the money market. The Federal Reserve took over this function and, except for the 1930's, has made it possible for banks to operate at all stages of the cycle with reserves barely above minimum requirements. The amplitude of cycles in monetary growth was still larger in the later period, however, owing to the increased amplitude of fluctuations in high-powered money produced by Federal Reserve credit outstanding, which more than compensated for the smaller fluctuations in the reserve ratio.

Although there was a striking difference between the sources of monetary change in business cycles before and after World War I, there was little difference between mild and severe cycles. When the cycles in monetary growth were classified according to the amplitude of the corresponding contractions in business activity, the relative contributions of the determinants were roughly the same. The contributions fluctuated with larger amplitude in those cycles

corresponding to the six most severe business contractions, but with about the same relative importance and essentially the same patterns as in mild cycles. Apparently, financial panics, which have accompanied most of the six severe cycles, intensify but do not alter the pattern of cycles in monetary variables.

These findings need qualification insofar as the relative contributions of the determinants offset each other. Occasional offsets will occur by accident, but, if persistent, they suggest that the determinants are behaviorally related. To that extent the determinants are not independent, and changes in the money stock cannot be meaningfully attributed to the sum of their three contributions. It makes more sense, then, to count as contributions just those movements in each determinant that are not offset by related movements in the other two. The extent to which the determinants are related to each other is not easy to establish, but intercorrelations of their cyclical movements provide some evidence.

There is no correlation between cycles in the currency and reserve ratios. High-powered money, however, has considerable correlation with the combined contribution of the two ratios. The correlation is highest in the post-World War I cycles, from mid-expansion to the first stage of contraction of those cycles. For each of these stages separately, correlating among cycles, the contribution of high-powered money tends to be lower when that of the two ratios is higher, and conversely. The correlation reflects either unrelated parallel responses to business cycles, or a direct relation produced by Federal Reserve operations on high-powered money to offset certain movements in the two ratios.

The offsetting movements generally worked to lower the relative contribution of high-powered money, by the measure used, and to raise that of the two ratios. The measure can be adjusted to remove the main influence of offsetting movements. For the earlier cycles, the adjustment raises the relative contribution of high-powered money, though the two ratios still appear to be the major contributors by a small margin. In the later cycles, high-powered money becomes the major contributor. The adjustment is imprecise and probably overstates the relative contribution of high-powered money, but it indicates in a general way how a correction for intercorrelation affects the findings.

FACTORS AFFECTING THE THREE DETERMINANTS

High-Powered Money. Few of the findings of this study concerning secular movements help to identify the sources of short-run cycles in the money series. Cyclical movements are not only more erratic than the secular but also seem to depend on a separate set of factors, which for the most part are of little significance over long periods. The difficulties are most severe for high-powered money, partly because of our inability to disentangle foreign and domestic influences on gold flows, partly because Treasury and Federal Reserve operations reflect a hard-to-separate mixture of deliberate policy and passive response to market developments.

For the pre-1914 period, cyclical changes in high-powered money reflected gold flows and the nongold sources about equally. One of the important elements in gold flows, the balance of foreign commodity trade, generally moved inversely to domestic business activity, contributing to like fluctuations in gold flows. This reflected conforming behavior of U.S. commodity imports to business activity and in part also inverse behavior of U.S. exports. Exports usually had a trough about the time general business reached a peak, though their pattern in other stages shows considerable diversity among cycles. Business activity in foreign countries affected the demand for U.S. exports irregularly relative to the timing of U.S. business cycles.

In general, cyclical changes in high-powered money before 1914 followed the inverse pattern of the trade balance in part only, because the other sources of change in the gold stock—changes in domestic gold production, in the service balance, and in capital movements —offset the trade balance. Presumably, short-term capital movements provided most of the offset; the other items would not ordinarily respond much to cyclical developments. On this evidence, therefore, capital movements had a stabilizing influence on gold flows in the period, thus apparently reducing—though not eliminating—the domestic monetary effects of foreign trade. The question remains open whether those effects moderated or reinforced U.S. business cycles.

After 1914, cyclical changes in high-powered money reflected primarily the nongold sources—mainly Treasury and Federal Reserve operations—despite the large gold inflows during the first half of the 1920's and throughout the 1930's. The nongold sources were largely

responsible for the irregular cyclical behavior of this determinant. Treasury operations had a cyclical impact—generally slight—through silver-purchase programs mainly in the 1890's, through temporary relief to banks in tight-money periods of the early 1900's, and through gold sterilization in the 1930's. Federal Reserve loans to banks and open-market operations were important in all the post-1914 cycles except the second half of the 1930's. Their loans to banks had a positive conformity to reference cycles, presumably because the incentive of banks to borrow varied with market interest rates. These loans have diminished in relative amount and no longer introduce, as they did in the 1920's, a slight direct dependence of the money stock on market credit demands and interest rates. Notwithstanding the declining importance of those loans, total Federal Reserve credit outstanding materially altered the cyclical pattern of high-powered money from what it had been before 1914.

So far as can be judged from the post-World War I business cycle patterns of the nongold sources, the Reserve Banks did not follow a uniform cyclical policy. This is true even if we exclude their loans to banks. Their behavior was governed rather by a variety of policies. Sometimes their actions supported inflation, as in the First World War, and sometimes deflation, as in 1921, or imposed restraint in a buoyant business climate, as in 1928–29, or sometimes were not motivated by cyclical developments, as in the bond-support program during and after World War II. The objectives of policy preclude simple classification at other times, as when open-market operations were countercyclical in over-all pattern but insufficient to reverse the forces carrying the money stock the other way; the 1929–33 contraction is an example. The variety of cyclical patterns discourages generalizing about Federal Reserve actions as simply "active" or "passive," responsive to the needs of trade or countercyclical.

In general, of course, the Federal Reserve has not viewed a particular growth rate of the money stock as the sole, or even the most important, goal of its actions. We should not expect to find a perfect or uniform offset. The period examined was colored by three particularly severe cycles in the interwar period which, together with the two world wars, account for the largest fluctuations in the series during the post-1914 period. Since World War II, the money stock has been unusually stable, by past standards, even allowing for the absence of severe cycles.

The Reserve Ratio. Most cyclical fluctuations in the reserve ratio may be traced to the usable reserve ratio and so reveal bank preferences with respect to their cash balances. We have seen how government actions to stabilize the money market have reduced the average level of the usable reserve ratio since about 1900; at the same time, the amplitude of its fluctuations has also declined. There has always been, and still is, a tendency for the usable ratio to rise when general business contracts and to fall when business improves, though in mild contractions the amount of rise has been small, particularly since 1914. On the other hand, when panics developed, as in most severe cycles, the reserve ratio rose steeply and continued rising for some time thereafter. Following such episodes, banks naturally sought safety in plentiful reserves until all traces of panic disappeared.

In mild cycles, fluctuations in the ratio have been widely attributed to the effect of interest rates, but the evidence justifies skepticism. Our analysis reveals no consistent relation between the size of changes in interest rates and in the total reserve ratio. Often the timing of movements in the two differed appreciably. Apparently, reserves become uncomfortably low during business expansions and, when the demand for loans slackens after a business peak, banks take the first opportunity to augment their reserves. Although the effects of a decline in loan demand and in rates are difficult to separate empirically, the analysis here suggests that movements in the ratio conform in timing and amplitude more closely to general business activity than to interest rates, insofar as the two differ. The only discernible effect of interest rates on the reserve ratio occurs indirectly: they influence the relative proportion of time and demand deposits at banks and hence affect required reserves.

The rise in the ratio in the first half of the 1930's, often attributed to the decline in interest rates and fall in loan demand, is better explained by the strain on bank solvency. By 1936, the usable ratio had risen considerably, but not above levels common before 1914, when there was no Federal Reserve System and banks had to rely on their own reserves to weather financial storms. After the experience of 1931–33, member banks apparently chose to rely on adequate usable reserves as a first line of defense. Accordingly, when reserve requirements were raised in 1936–37, member banks took steps to restore the loss of usable reserves and increased the total reserve ratio between 1936 and 1938. This interpretation is supported by the concurrent

dissimilar behavior of other banking institutions and by the similar response of member banks to increases in requirements at other times. The common presumption that such increases have little effect on the total reserve ratio finds no support.

The Currency Ratio. Although the government and banks are usually the center of attention in monetary studies, the currency-money ratio has been a far more consistent source of cycles in monetary growth. It was as important as the reserve ratio before 1914, and has been more important since—contrary to the popular assumption that variations in bank reserves are the main source of monetary cycles. One long-standing theory of cyclical movements in the currency ratio relates the use of currency to the volume of retail trade. Cycles in retail trade coincide with business cycles, however, and so cannot explain the peculiar timing of movements in the currency ratio. Midway through business expansions, it levels off from a long-run downward trend. This behavior could be explained by a similar pattern of the distribution of money holdings between consumers and businesses, the currency ratio of each sector remaining the same: since the consumer sector has the higher ratio, a shift in relative money holdings to consumers would raise the aggregate currency ratio—and conversely. In recent cycles—the only ones for which data on ownership of the money stock are available—the distribution had the required cyclical pattern part of the time, but the amplitude of fluctuation was small enough to rule out this theory.

Another approach is to analyze cyclical movements in the currency-money ratio in terms of the ratio of currency to consumer expenditures, which the retail-trade theory implies is constant, but which apparently is largely responsible for the leading turn in the currency-money ratio. Use of currency per dollar of expenditures falls during reference expansions—that is, the velocity of currency rises just as the velocity of deposits does—but tends to level off midway through expansions. Deposit rates seem unable to account for this behavior. Currency demand apparently adjusts with a lag to changes in expenditures and wealth.

THE INTERRELATION OF CYCLES IN MONETARY GROWTH AND BUSINESS

If money-stock changes affect prices in the long run, they must do so in the short run as well, but not necessarily to the same relative

extent. Changes in the velocity of money are relatively more important in short-run cycles, and we do not know how much of the cyclical movements in prices and output, if any, would disappear if money-stock changes were somehow eliminated. The rate of monetary growth corresponds closely to cycles in business activity, but this might result solely from the effect of activity on money. Although this direction of influence was found unimportant for secular movements, it appears to be important for cyclical movements.

Short-run fluctuations in the three determinants appear to reflect cycles in business activity. The currency ratio seems to fluctuate because of differences in the cyclical behavior of the velocity of currency and of deposits, and the reserve ratio seems to fluctuate chiefly because of cyclical movements in credit demands. The gold component of high-powered money varies with both domestic and foreign business cycles through its dependence on the balance of payments. The nongold component—primarily Federal Reserve credit outstanding—seems to react to cycles in general economic activity, though not in any simple way which can be readily summarized. Interest rates, however, appear to have very minor effects on the money stock.

There could of course be other explanations for cycles in the determinants that would carry radically different implications. Some kind of interaction between financial institutions and capital markets might generate cycles in the two ratios, unrelated to concurrent cycles in commercial and industrial activity. For example, changes in the money stock might temporarily alter the distribution of money holdings and affect the currency ratio. But no evidence of such an interaction was found. If business activity is responsible for the cycles in the money series, it is difficult to assess the importance of the reverse effects of those cycles on the economy.

There is one aspect of cycles in money, however, that seems to originate in developments other than the fluctuations in business activity itself. Large declines in the rate of growth of the money stock have occurred sporadically and for a variety of reasons, each largely independent of the concurrent movement of business. Most of the declines reflected sharp increases in the currency and reserve ratios during and following panics. At such times the public rushed to withdraw bank deposits before payment was suspended, and the

heavy loss of reserves threatened banks with failure. To save themselves, banks sometimes had to suspend payments. The currency ratio as measured does not always exhibit the full effects of panics, sometimes because banks suspended and no more currency could then be withdrawn, often because currency flowed back to banks quickly after the panic subsided, and the annual data miss the point of high demand. Whether they suspended or not, banks contracted credit sharply and, for some time afterwards, sought to build up their reserves. The only exception to that response occurred in the panic of 1914, precipitated by the outbreak of war in Europe, when banks could issue unlimited amounts of emergency notes, thanks to the provisions of the Aldrich-Vreeland Act of 1908. With that effective defense, banks had no serious trouble handling the panic and did not contract credit. Two other large declines in monetary growth—in 1921 and 1937–38—reflected special factors. In both, high-powered money contracted sharply; and also, in 1937–38, the reserve ratio rose in response to the 1936–37 increases in reserve requirements.

The evidence indicates that a severe contraction in business alone will not produce extreme increases in the currency and reserve ratios—certainly not so large as occurred in panics. Panics as a rule do not reflect severe business contractions. Most panics have broken out during the first part of business downturns, following a series of dramatic bankruptcies, before general business activity declined to low depression levels. In the absence of a panic, business declines have produced only mild changes in the currency and reserve ratios, and that was true in one crucial instance, 1921, when the contraction in business became severe. There are no unexplained exceptions to this behavior. The two ratios did rise sharply well before the banking holiday in 1933, but that reflected the near-panic conditions of 1930–32, when banks were failing all over the country. The reserve ratio also rose sharply in 1937–38, and first rose and then declined in 1948–49, because of related changes in reserve requirements.

Severe depressions are, to be sure, relatively rare phenomena, and we must draw our conclusions from only a small number of cycles. Indeed, an important part of the evidence is the behavior of the two ratios when business contracts severely but no panic occurs, and 1921 provides the only clear-cut case. It may be that the two ratios are not normally so unresponsive to a severe business decline as they were in

1921. Even so, their response to panics seems exceptional. In mild cycles, business declines appear actually to increase monetary growth. In most severe cycles, the monetary upturn is considerably delayed because of other special influences and apparently only in small part because of the steepness of the business decline itself.

This evidence points to an important independent role of monetary factors in severe business contractions. The six largest declines in money were associated with severe depressions, and severe depressions have never occurred otherwise. In the six most severe business contractions since the 1880's, the declines in monetary growth became sharp generally before, and ended during, the contraction in business. Since severe contractions in business alone do not appear to produce an exceptionally large fall in monetary growth, the association of amplitudes can only be explained by an effect of money on business. Panics cannot be held solely responsible for the deep declines in both money and business. Two severe business contractions had no panic; in addition, some panics did not produce a large drop in monetary growth, and the accompanying declines in business did not become severe. The leading turning points of the money series also support the independence of its effects, since business activity can be expected to reflect and to recover from a drastic monetary deflation only after a lag.

Conceivably, one might attribute the entire decline in the money stock in 1929–33 to the contraction in activity (the two in that instance largely coincided) and argue that the suspension of payments by banks, which came at the end of the contraction, was not an independent development, as in other panics, but reflected the pressures of the prolonged deflation on the banking system. But we should not conclude even then that the monetary decline had little effect on business. If all severe cycles are considered together, the sharp declines in monetary growth occurred for a variety of reasons and cannot all be attributed to the severity of the accompanying business contractions. If the monetary decline was important in some, it was surely important in all. The consistent behavior of money in all severe depressions is too strong to be ignored. The widespread tendency, following the 1930's, to neglect the influence of money was too sweeping.

One can, of course, imagine various nonmonetary factors that might make a business decline severe and not at the same time produce a sharp drop in monetary growth. That has not happened in the

period examined, and there is considerable justification for the view that sharp declines in monetary growth are not only an important contributor to severe depressions but are also responsible for them. If that is true, such calamities can be avoided so long as large declines in monetary growth do not occur—which is within the realm of possibility through prevention of panics and sharp declines in high-powered money.

In relation to mild business cycles, the rate of change in the money stock may be viewed as having an inverted pattern with lagging turns, peaks in monetary growth corresponding to business troughs, and troughs corresponding to business peaks. An inverted pattern is not the only interpretation of the fluctuations in monetary growth, however. The fluctuations may also be viewed as conforming positively to business cycles with a high correlation of amplitudes and a timing lead at turning points, peaks in monetary growth corresponding to business peaks occurring a quarter or more of a cycle later, and similarly for troughs. The conformity appears strong on either a positive or inverted comparison, which suggests a two-way relationship between money and business. By this interpretation, the inverted conformity reflects the influence of business, acting through the three determinants, on money; and the positive leading conformity reflects the lagged effects of money on business. Indeed, the timing relations show less variability when the money series is viewed positively rather than invertedly, suggesting that the positive conformity is not simply a reflection of an inverted pattern.

If large changes in the money stock produce a substantial decline in business activity, they must also have some effect in mild business cycles; the only question is one of their relative importance. Dependence of the cycles in money on business activity does not rule out the reverse effects of money on business, but a high covariation between them is no proof of the importance of monetary effects. The analysis in this study provides some indirect evidence, however, that even moderate variations in the rate of change in the money stock are important. The evidence is the persistence of their correspondence to mild business cycles, particularly the largely unaltered timing, over a long period. Some alteration in timing would be expected if this relation ran solely from business to money, but not if it ran the opposite way. Since 1875, far-reaching developments have transformed our financial institutions and markets, as shown by differing relative

contributions over time of the reserve ratio and high-powered money to cycles in the money stock, and by changes in the degree of interdependence among the determinants. Yet, in the face of these developments, the relation between the rate of monetary growth and business cycles has remained the same. We are apparently dealing not with many unrelated periods since 1875 but basically with one, differentiated by changes in monetary institutions which affected mainly the sources of variation.

Casual impressions may be a particularly poor guide to the over-all importance of money in business cycles, because its effects apparently occur with lags. Both theoretical and empirical studies point to lags, though exactly how long they are remains in dispute. It is easy to overlook factors that take hold slowly and without fanfare, and to overstress those that have a quick and dramatic impact, though the cumulative effect of the former may be vastly more important. The widely raised objections to the effectiveness of monetary policies—based in part on the alleged insensitivity of investment expenditures to changes in the supply of loanable funds and interest rates—really argue that monetary effects involve lags, not that they never occur. Lags do not necessarily or typically make an effect, once it occurs, weaker. Our analysis does not establish clearly whether or not monetary effects are important in mild cycles; but if they are, a lag, together with the reciprocal dependence of money on business activity, supplies all the necessary ingredients for a self-generating cyclical process.

The reduction of all business cycles to one process is obviously unrealistic, since it omits the interplay of many other economic variables that are involved in actual cycles. Other related processes undoubtedly occur and, so far as the limited evidence presented goes, may do so with more or less relative importance. Although the variety of cyclical experience warns against preconceived and oversimplified formulations, much of the seeming complexity of cycles may reflect our failure to include all the vital parts. If one vital part is described even roughly by a monetary process, models of a "real" cycle, which try to explain aggregate expenditures without reference to monetary factors, lack an essential element. By our results, the transmission of fluctuations in spending and output to and from the banking system merits close attention in business cycle research.