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

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Volume Publisher: NBER

Volume ISBN: 0-870-14097-3

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

Publication Date: 1965

Chapter Title: The Money Stock and Its Three Determinants

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Chapter URL: <http://www.nber.org/chapters/c1640>

Chapter pages in book: (p. 1 - 16)

I

THE MONEY STOCK AND ITS THREE DETERMINANTS

1. Nature and Scope of the Study

THE OBSERVATION that changes in the money stock are correlated with both secular and cyclical fluctuations in economic activity is of long standing. The covariation underlies many theories of economic disturbance and many proposals for monetary reform, though more so before the 1930's than since. It is documented and elaborated further in the recent work of Milton Friedman and Anna Jacobson Schwartz.¹ The phenomenon is too persistent to be dismissed as accidental, and it is plausible in terms of well-known economic relationships. Production and prices depend on monetary factors; and, conversely, fluctuations in general economic activity are transmitted by financial institutions to the money stock.

There are basically two ways to clarify the source of covariation between money and business activity. One is to examine the effects of changes in the money stock on business activity. These effects, though studied extensively, have proved difficult to trace. Even when large, they are likely to involve distributed lags and so to affect various parts of the economy at different times. Identifying cause and effect is then extremely difficult and hazardous. An alternative approach is to examine the factors affecting the amount of money supplied. The more they reflect fluctuations in business activity, the less reliance can be placed on the importance of money-stock effects in explaining the observed covariation—and conversely. The belief that this approach can shed light on the importance of the two directions of influence is the main motivation for the present study.

¹ *A Monetary History of the United States, 1867-1960*, Princeton University Press for NBER, 1963; and "Trends and Cycles in the Stock of Money in the United States, 1867-1960," their companion volume, also a National Bureau study, in preparation.

Aside from this specific purpose, a study of the factors affecting the money supply is useful to broaden our understanding of the monetary system. Most previous discussions of these factors have centered on this broader purpose and have described the institutional arrangements for issuing money. Previous studies have made only limited attempts at statistical measurement, however. The two main empirical studies for the United States—by Lauchlin Currie and James W. Angell² covered mainly the period from World War I to the mid-1930's, two decades of great contrasts but too short to confirm long-standing relationships. Clark Warburton has since published several articles on various aspects of the subject,³ using data of longer coverage. More recently a growing literature has appeared on econometric studies of the behavior of banks.⁴

One reason research on the supply of and demand for money has been limited was the absence until recently of good data covering a long time span. The publication of *A Monetary History of the United States, 1867-1960*, by Friedman and Schwartz, now provides estimates for a ninety-odd year period. The present study was largely completed before estimates for the years preceding 1875 became available. It begins with that year and terminates with 1960. Some of the analysis has an earlier cutoff, however, because later data were not available at the time various tables were prepared. The estimates are annual or semiannual before 1907 and monthly thereafter. Supplementary monthly data are also available for most of the period preceding 1907 on currency outside the Treasury and on various other items used in estimating the money stock. All these series are fairly accurate, as economic data go, and allow both a more extensive and a more intensive analysis of the factors affecting the amount supplied than previously possible.

² Currie, *The Supply and Control of Money in the United States*, Harvard University Press, 1934; and Angell, *The Behavior of Money*, New York, McGraw-Hill, 1936.

³ In particular, "The Theory of Turning Points in Business Fluctuations," *Quarterly Journal of Economics*, Nov. 1950, pp. 525-549; "The Mislplaced Emphasis in Contemporary Business-Fluctuation Theory," reprinted in *Readings in Monetary Theory*, F. A. Lutz and L. W. Mints, Eds., Philadelphia, Blakiston, for American Economic Association, 1951, pp. 309-311; "Bank Reserves and Business Fluctuations," *Journal of the American Statistical Association*, Dec. 1948, pp. 547-558; "Monetary Control under the Federal Reserve Act," *Political Science Quarterly*, Dec. 1946, pp. 505-534.

⁴ See, for example, A. J. Meigs, *Free Reserves and the Money Supply*, Chicago, 1962, and the references cited therein.

The money stock is defined as hand-to-hand currency plus commercial bank demand and time deposits held by all economic sectors except the Treasury and the Federal Reserve Banks and commercial banks. The present work, therefore, is largely a study of the monetary liabilities of banking institutions. The question immediately arises whether this is the most useful definition of the money stock. Previous studies have commonly used a narrower definition which includes only hand-to-hand currency and demand deposits. The main reason for including also time deposits at commercial banks in the new estimates is that they cannot be satisfactorily separated from demand deposits in the pre-1914 data and perhaps not meaningfully separated until the 1930's (see Chapter 5, section 1) and so, for purposes of comparability, were included for the later period. Another concern is whether this definition may be too narrow. A point of view expressed by the Banking School of the mid-1800's, and even earlier by others, contends that the liabilities of various nonbanking financial institutions are near-perfect moneys and should be included along with the liabilities of commercial banks. On these grounds, one should include postal savings and mutual savings deposits, perhaps also shares of savings and loan associations, and even U.S. savings bonds and Treasury bills and notes; it is difficult to know where to draw the line. Indeed, the Banking School contended that no hard-and-fast line can be drawn between money and nonmoneys. This possibility requires empirical examination. Conjectures on the characteristics of "money" do not help much, because the important consideration is market behavior, particularly the cross elasticities of demand between the various assets with respect to their comparative rates of return. The size of the cross elasticities—that is, the extent to which individuals behave as though certain assets were more or less equivalent to currency or demand deposits—and the amplitude of variations in comparative rates of return have not been determined. Since it is necessary to select a precise definition at the outset and impossible as yet to demonstrate that a broader concept of money is superior to a narrower one, this study follows the convenient definition stated at the beginning of this paragraph. The subsequent analysis may be viewed as contributing to one part of a broader study which would cover all liquid assets.

While the narrow definition of money used here may turn out, in

the light of future research, to be less than perfect, it seems adequate for present purposes. It is likely to account for most of the variation in a more broadly defined money-stock variable, though long-run rates of growth will depend, of course, on which assets are included. The supply of currency and commercial bank deposits probably displays considerably greater short-run changes than the supply of most other liquid assets does.

2. Cyclical Behavior of the Rate of Change in the Money Stock

Table 1 lists the short-run cycles in the rate of change in the money stock and relates the turning points to reference cycles in general business activity on a peak-to-peak and trough-to-trough basis. There has generally been a one-to-one correspondence between the cycles in money and reference cycles. There are only two exceptions; an extra money cycle with a peak in February 1941 and trough in October 1941, which preceded a peak in June 1943 matched with the February 1945 reference peak; and no expansion during a long contraction from June 1943 to December 1948 to correspond with the reference cycle having a trough in October 1945 and a peak in November 1948. The money series consistently leads corresponding reference cycles at peaks and troughs, on the average by slightly over a quarter of a reference cycle. The amplitudes of expansions and contractions of monetary and reference cycles are also significantly correlated. These and variant measures are presented and discussed in detail by Friedman and Schwartz in their volume analyzing trends and cycles in the money stock.

The chief reason for using the rate of change in the money stock in these comparisons, rather than the quantity of money, is to eliminate the strong upward trend in the quantity, which obscures fluctuations. The results justify this procedure, for the rate-of-change series corresponds, by the usual measures, much more closely and consistently to reference cycles than the quantity of money does. With the money series in this form, however, a question arises about the meaning of its timing lead over reference cycles. The lead suggests that the effect of changes in monetary growth on business activity is largely responsible for the covariation between them. Without further

evidence, however, the inference is not airtight. If the comparison were made with peaks and troughs in the rate of change in business activity, the length of the lead would undoubtedly be less, though perhaps would not disappear entirely. It is conceivable that expansions in business activity tend after a while to reduce the rate of monetary growth but that the reduction has no important feedback on business, which eventually reaches a peak a quarter cycle later and declines for wholly unrelated reasons; and similarly, for contractions and troughs. Evidence on timing, therefore, while highly suggestive, cannot be decisive on the direction of influence.

What dimensions of the variables are appropriate for comparison depends on the nature of the relationship between them, and with present knowledge no answer can be conclusive. Although the price level adjusts, at least in the long run, to the quantity of money, this does not mean that fluctuations in real output are most appropriately related to the quantity of money. Indeed, it is not implausible that different long-run rates of growth of the money stock are absorbed in the economy by corresponding differences in the rate of change in prices, while short-run variations in monetary growth mainly disturb the level of output—price changes not occurring fast enough to absorb them. The extent of the disturbance could very well depend on the size of the variation and hence imply a relation between the rate of change in money and the level of output.

Further evidence on the direction of influence is given by the correlation of amplitudes. Whatever the reason for cyclical variations in money, we should not ordinarily find a high correlation in amplitude between the phases of specific cycles in money and the corresponding phases of *subsequent* reference cycles, unless an important effect ran from the rate of change in money to business activity. We do find such a correlation, shown in Table 1. Yet, much of the correlation reflects severe business contractions and subsequent expansions, in which banking panics produced most of the decline in the money series and ending of panics produced the recovery. One might argue that the correlation can be explained by the early effect of changes in business conditions on financial institutions. In this and other ways, we cannot understand the evidence on the effects of money on business until we have examined and clarified the reverse effects of business on money.

TABLE 1
TIMING AND AMPLITUDE OF SPECIFIC CYCLES IN THE RATE OF CHANGE IN THE MONEY STOCK, 1870-1960

Specific Cycles		Matched Reference Cycles		Lead (-) or Lag (+) in Months of Specific Cycles at Matched Reference Turns		Change in Monthly Percentage Rate of Change in Money Stock Between Matched Peak and Trough Stages of Specific Cycles				Rank of Amplitude of Matched Nonway Reference Cycles		
Trough	Peak	Trough	Peak	Trough	Peak	Expansions	Contractions	Succeeding Contractions	Expansions	Contractions		
ANNUAL OR SEMIANNUAL DATA												
May 1877	July 1871	Mar. 1879	Oct. 1873	-22	-27	2.32		-1.82	3	6		
Dec. 1883	May 1885	May 1885	Mar. 1887	-17	-15	0.83		-0.49	8	17		
Dec. 1887	Dec. 1889	Apr. 1888	July 1890	-4	-7	0.61		-0.58	13	11		
Dec. 1890	Dec. 1891	May 1891	Jan. 1893	-5	-13	0.65		-1.43	14	4		
Dec. 1892	Dec. 1894	June 1894	Dec. 1895	-18	-12	1.03		-0.89	6	7		
Dec. 1895	Dec. 1898	June 1897	June 1899	-18	-6	1.74		-0.88	4	12 1/2		
Dec. 1899	Dec. 1900	Dec. 1900	Sept. 1902	-12	-21	0.70		-0.73	16	12 1/2		
Dec. 1903	Dec. 1904	Aug. 1904	May 1907	-8	-29	0.51		-2.05	9	5		
MONTHLY DATA												
Jan. 1908	Oct. 1908	June 1908	Jan. 1910	-5	-15	2.32		-1.15	5	15		
Apr. 1910	Oct. 1911	Jan. 1912	Jan. 1913	-21	-15	0.74		-1.04	17	8		
June 1913	Dec. 1916	Dec. 1914	Aug. 1918	-18	-20	2.18		-2.10				
May 1918	Dec. 1918	Mar. 1919	Jan. 1920	-10	-13	2.12		-2.55	10 1/2	3		
Jan. 1921	Apr. 1922	July 1921	May 1923	-6	-13	1.71		-0.96	2	9		
June 1923	July 1924	July 1924	Oct. 1926	-13	-27	0.92		-1.07	10 1/2	18		
Dec. 1926	Nov. 1927	Nov. 1927	Aug. 1929	-11	-21	0.21		-2.83	12	1		

(continued)

TABLE 1 (concluded)

Specific Cycles		Matched Reference Cycles		Lead (-) or Lag (+) in Months of Specific Cycles at Matched Reference Turns		Change in Monthly Percentage Rate of Change in Money Stock Between Matched Peak and Trough Stages of Specific Cycles		Rank of Amplitude of Matched Nonwar Reference Cycles ^a	
Trough	Peak	Trough	Peak	Trough	Peak	Expansions	Succeeding Contractions	Expansions	Succeeding Contractions
Oct. 1931	Apr. 1936	Mar. 1933	May 1937	-17	-13	3.96	-2.04	1	2
Oct. 1937	Feb. 1941	June 1938	Feb. 1945	-8	-20	3.78 ^b			
Oct. 1941	June 1943	Oct. 1945	Nov. 1948						
Jan. 1949	Nov. 1951	Oct. 1949	July 1953	-9	-20	0.77	-0.42	7	14
Sept. 1953	Feb. 1955	Aug. 1954	July 1957	-11	-29	0.26	-0.44	18	10
Dec. 1957	June 1958	Apr. 1958	May 1960	-4	-23	0.62	-0.88	15	16
Dec. 1959		Feb. 1961		-14					
MONTHLY DATA									
Average timing									
All matched cycles									
1871-1907									
1908-1960									
Rank correlation coefficient with amplitude of corresponding reference cycle phase									
Nonwar reference cycles, 1879-1961									
(18) excluding 1945-49									
						0.77	0.70		

Source: Friedman and Schwartz, "Money and Business Cycles," The State of Monetary Economics, Universities-National Bureau Conference, Review of Economics and Statistics, Suppl., Feb. 1963, pp. 32-64, Tables 1, 2, and 3, and underlying data (based on same series as in Chart 1). Rankings of reference cycles are based on an average of three trend-adjusted indexes of business activity (see Business Cycle Indicators, G. H. Moore, Ed., Princeton for NBER, Vol. I, 1961, p. 104).

^a Largest amplitude ranked first, next largest second, and so on.

^b Computed by suppressing extra contraction from Feb. to Oct. 1941 and treating Oct. 1937-June 1943 as a single expansion.

3. *Framework of the Analysis*

One might begin to analyze changes in the money stock by examining the behavior of its components. These can be classified in several ways. One common way is by the legal properties of moneys, distinguishing between bank money and legal-tender currency. The latter must be accepted as payment for all public and private debts. Paper currencies issued by governments and central banks do not always carry legal-tender privileges, though they do in the United States today.⁵ Monetary liabilities of commercial banks (whether notes or deposits) have never carried that privilege, which is why, in order to insure the wide acceptability of checks drawn on demand deposits, banks promise to convert them immediately on request into legal tender. On the other hand, banks may require prior notice—of 30 or more days—to withdraw time deposits, though today the privilege is seldom invoked. Because of this privilege, and also because time deposits generally cannot be transferred by check, they have typically paid a higher rate of return than demand deposits have. A division of the money stock based on legal properties is, on the surface, purely descriptive and might, therefore, appear irrelevant to an analysis of the factors affecting the amount supplied. The appearance may be misleading, however, because some of these distinctions may influence the public's attitude toward different kinds of money, and differences in the demand for components of the money stock can affect the total amount supplied.

Another way to distinguish moneys is by issuer, usually the government, the central bank, and commercial banks. The latter may be further classified by the origin of their charters—national or state or, if no charter, private—and by membership in the Federal Reserve System and the Federal Deposit Insurance Corporation. These distinctions are also largely descriptive rather than analytical from the depositors' point of view, though not if a panic threatens. The distinctions mainly help analysis in so far as the various issuers behave differently in supplying money. Such differences have been important, and a classification of monetary institutions along these lines plays a major part in the subsequent analysis.

Of the many other ways of distinguishing components of the money

⁵ Before 1933, Federal Reserve notes and Bank notes were legal tender for public but not private debts.

stock, only one other receives much attention in this study—that commonly made between commodity and paper money. Under a commodity standard, legal-tender and other paper currency is convertible into a commodity unit at a fixed rate of exchange. The commodity serves as the standard of value of the monetary unit: the U.S. dollar is defined by law as equal to so many grains of gold. The gold reserve behind Treasury and Federal Reserve monetary liabilities has at various times strongly influenced the volume of those liabilities, though less so today than before 1933, when gold coin was part of the circulating media.

The emphasis of the present study is on the behavior of the three sectors of the economy that affect the amount of money supplied—the government, the public, and the commercial banks.

The government (including the Federal Reserve Banks as a government agency) controls the issue of assets that banks use as reserves for their monetary liabilities. Such assets are called high-powered money to signify that they can serve as the base for a multiple quantity of bank deposits. When held by banks, high-powered money is not, of course, part of the stock of money held by the public. When it is not held by banks but by the public, the same term is used in recognition of its potential use by banks to expand the money stock. High-powered money therefore comprises bank reserves plus currency held by the public.

Governments have authority to define, issue, and regulate the quantity of high-powered money, but they typically delegate part of their control over the amount issued to central banks and to the suppliers of commodities used as the monetary unit, now usually gold. (The suppliers are the domestic producers of gold and the foreign-exchange dealers who import or export gold bullion, when profitable.) In the United States since the Civil War, high-powered money has included government paper issues and the stock of gold coin and bullion held by commercial banks and the public (though the last has been zero since 1934) and, since 1914, also the monetary liabilities of the Federal Reserve Banks. The latter comprise Federal Reserve currency issues and commercial bank deposits at Federal Reserve Banks which serve as bank reserves.⁶

⁶ For reasons given later, national bank notes, though technically not a government issue, are also included. For a detailed discussion of the definition and derivation of high-powered money, see notes to Table F-5 for col. 1; see also Friedman and Schwartz, *A Monetary History*, Appendix B.

Under the gold standard, gold is the medium into which paper currency is convertible—at least for international payments—and acts as a reserve behind the government's monetary liabilities. The total gold stock is therefore a "super-powered" money. It seems unnecessary to formalize this distinction, however, and we may understand the term high-powered money to include gold coin *outside* the Treasury and Federal Reserve Banks, and the term total gold stock to comprise all gold coin and monetary bullion within the country (except "earmarked" gold). Gold held by the Treasury, therefore, is not counted as high-powered money outstanding, which is limited to such assets held by banks and the public, only. Changes in the total gold stock nevertheless affect the quantity of high-powered money outstanding and will be analyzed as one of the factors affecting it.

Given the quantity of high-powered money, the public and the commercial banks jointly determine its division between public holdings and bank reserves. The public determines the fraction of total money balances it wants to hold in the form of high-powered money (in the United States today this can be only paper currency); it can do so by converting currency into bank deposits and vice versa. The banking system determines the volume of monetary liabilities it is willing to create, through loans and investments, per unit of the high-powered money it holds (that is, its reserves). Although the monetary liabilities of an individual bank include deposits due to other banks, and its monetary reserves include deposits due from other banks, for the banking system as a whole these interbank deposits cancel out. If more deposits are created than the public wants to hold, banks will lose reserves as the public seeks to establish the desired relation between deposits and currency, and conversely. Adjustments of bank reserves will continue until the quantity of deposits is consistent with the quantity the public wants to hold relative to its holdings of currency. In short, banks cannot control the quantity of both their reserves and their liabilities but only the ratio of the two.

To speak of banks' monetary assets as "reserves" for deposits is figurative, of course. In a sense all bank assets stand behind the liabilities and provide security for deposits. But earning assets do not directly limit the quantity of deposits in the same way monetary reserves do. Banks can increase both loans and deposits at the same time but, in general, not both monetary reserves and deposits. We

may single out high-powered monetary reserves on the grounds that banks stand ready to exchange deposits for them when requested and cannot create them; in addition, high-powered money generally satisfies legal reserve requirements, at least in the United States. These easily invoked points should not blind us, however, to our implicit assumption that high-powered monetary reserves are more important than other assets in determining the level of banks' liabilities. This is generally taken for granted, at least for the United States, when compared with possible alternative propositions, but it obviously provides only a first step in the analysis of banks' behavior affecting the money stock.

The banking system can increase or decrease the money stock, but there is nothing unique about this power. Any holder of money balances can produce effects on the money stock similar to those produced by banks (though not through creation or extinction of deposits). When banks reduce their holdings of high-powered money by making loans and thereby reduce their reserve ratio, they increase the money stock; but the public also increases the money stock (eventually) when it reduces its holdings of high-powered money in relation to deposits (assuming banks maintain the same reserve ratio).⁷ Changes in the currency-money and reserve-deposit ratios, therefore, have similar effects on the money stock, though they represent high-powered balances in relation to deposits of two different sectors, the banks and the public, which view deposits differently—banks, as a liability, and the public, as an asset. The two ratios are nevertheless separated in the analysis to follow, because they behave in different ways.

The exact relation of the amount of money supplied to the behavior of the three sectors is shown by a simple identity. Denote high-powered money, which reflects the behavior of the government sector, by H . Today, as mentioned, the only kind of high-powered money held by the public (which we may understand to include individuals, businesses and all financial institutions other than commercial banks) is currency (the public does not normally hold deposits at Federal Reserve Banks or the Treasury); and all currency in circulation is part of high-powered money. Consequently, the public affects the distribution of

⁷ The view that commercial banks alone create deposits (or produce changes in the quantity outstanding) can be misleading. It is more accurate to say that commercial banks are the sole custodians of the public's checking account deposits.

high-powered money between itself and banks by changing the ratio of currency *outside* commercial banks to the total money stock. Denote this by C/M , where $M = C + D$, the sum of currency and commercial bank deposits held by the public. Consider next the high-powered money outstanding not publicly held, namely, that held by commercial banks. Banks affect the money stock by their decisions on the level at which to maintain the ratio of high-powered money reserves to deposits. This ratio will, of course, vary from bank to bank, depending on the composition of its deposits between time and demand and on many other factors. For the moment, we may consolidate all commercial banks into one hypothetical unit and, to see the net effect on the money stock, examine the aggregate reserve-deposit ratio of the banking system. Denote this by R/D . Since all high-powered money issued is held either by the public as currency outside banks or by banks as reserves, $H = C + R$, from which we can derive the following identity:⁸

$$(1) \quad \frac{H}{M} = \frac{C}{M} + \frac{R}{D} - \frac{C}{M} \frac{R}{D}, \text{ or}$$

$$M = \frac{H}{\frac{C}{M} + \frac{R}{D} - \frac{C}{M} \frac{R}{D}}.$$

This expresses the total money stock in terms of the quantity of high-powered money and the currency-money and reserve-deposit ratios.⁹ I shall refer to the latter as the currency ratio and reserve ratio, except where the possibility of misunderstanding requires the full expression. The quantity of money is jointly determined by these three variables, as given by the above identity. The currency ratio is necessarily less than unity and the reserve ratio has always been well below unity, so that the third term on the right-hand side of the first identity above is less than either of the first two terms. In consequence, if

⁸ Divide both sides of the preceding expression by M and then substitute $(R/D)(1 - C/M)$ for R/M .

⁹ A more complicated approach that reduces to the same formula was used by J. E. Meade in "The Amount of Money and the Banking System," *Economic Journal*, Mar. 1934, pp. 77-83; reprinted in *Readings in Monetary Theory*, pp. 54-62.

Friedman and Schwartz (*A Monetary History*) express the two ratios differently as the ratio of deposits to currency and to reserves. For various reasons, it is more convenient to use the above forms here. The difference has no analytical significance.

high-powered money does not change, a rise in either ratio—with the other constant—reduces the total stock of money. Likewise, if the two ratios remain constant, a rise in high-powered money implies an increase in the money stock. The quantity of money supplied, therefore, varies inversely with the currency and reserve ratios and directly with the quantity of high-powered money.

These three variables will be referred to as the determinants of the money stock to differentiate them from its various components discussed earlier. Of course, they are only proximate determinants and serve merely as a useful breakdown of the money stock to facilitate analysis of the underlying economic factors at work. The behavior of the three determinants alone does not “explain” changes in the supply of money; the analysis must be carried considerably further. The determinants and the total money stock from 1875 to 1955 are shown in Chart 1. Details of the derivation of these series are presented in the volumes by Friedman and Schwartz cited in footnote 1, above.

The quantity of high-powered money, unlike the other two determinants of the money stock, is measured in the nominal currency unit, and the real value of a given nominal quantity is inversely proportional to prices. Price changes may keep the real quantity in equilibrium with other real variables in the economy and probably will, at least over the long run, making possible very large changes in nominal amount. The other two determinants, on the other hand, are measured as pure numbers and cannot be meaningfully deflated by an index of prices. The currency ratio can, at most, vary from zero to unity, and the nature of commercial banking imposes the same limits on the reserve ratio. Actually, these two determinants tend to stay within much narrower limits. It seems unlikely, therefore, that changes in those ratios could be the proximate source of past growth in the money stock, which has been sizable. As Chart 1 suggests and as we shall see further in the next chapter, the historical record bears out this expectation. The secular growth in the money stock has depended primarily on additions to high-powered money, though the contribution of changes in the two ratios to variations about the growth trend of the money stock has at certain times been substantial.

Identity 1 will be applied in this study to the monetary system in the United States since 1875. If we were to make the definition of high-powered money correspond strictly to legal distinctions, the

identity would not apply to the period before 1935 when currency included notes issued by national banks. Such notes were a liability of the issuing bank and could not be used to fulfill legal reserve requirements of national banks;¹⁰ on that basis, the notes were not high-powered money. Yet, they were backed in full by U.S. bonds deposited at the Treasury and could be redeemed at Treasury offices. The notes were in fact, if not in name, a Treasury issue. As a result, the notes and Treasury currency were identical as judged by their acceptability: After 1874, when the procedure for redeeming the notes was improved, the public did not distinguish between them and always readily accepted one in lieu of the other. (Before 1874, these notes were sometimes sold quoted at a small discount from greenbacks.) Banks could always convert national bank notes into Treasury currency if necessary to meet reserve requirements, and the notes could be used to satisfy public demands to convert deposits into currency. The notes served adequately as part of reserves in excess of requirements which banks kept in vault. National banks actually never held very large amounts of the notes circulating outside issuing banks; most of them were held by the public. The analysis is simplified here by focusing on their economic effects and by counting the note liabilities of national banks (and other currency not designated as lawful money) as high-powered money. This means that, before 1935 as well as after, all currency held by the public was high-powered money.

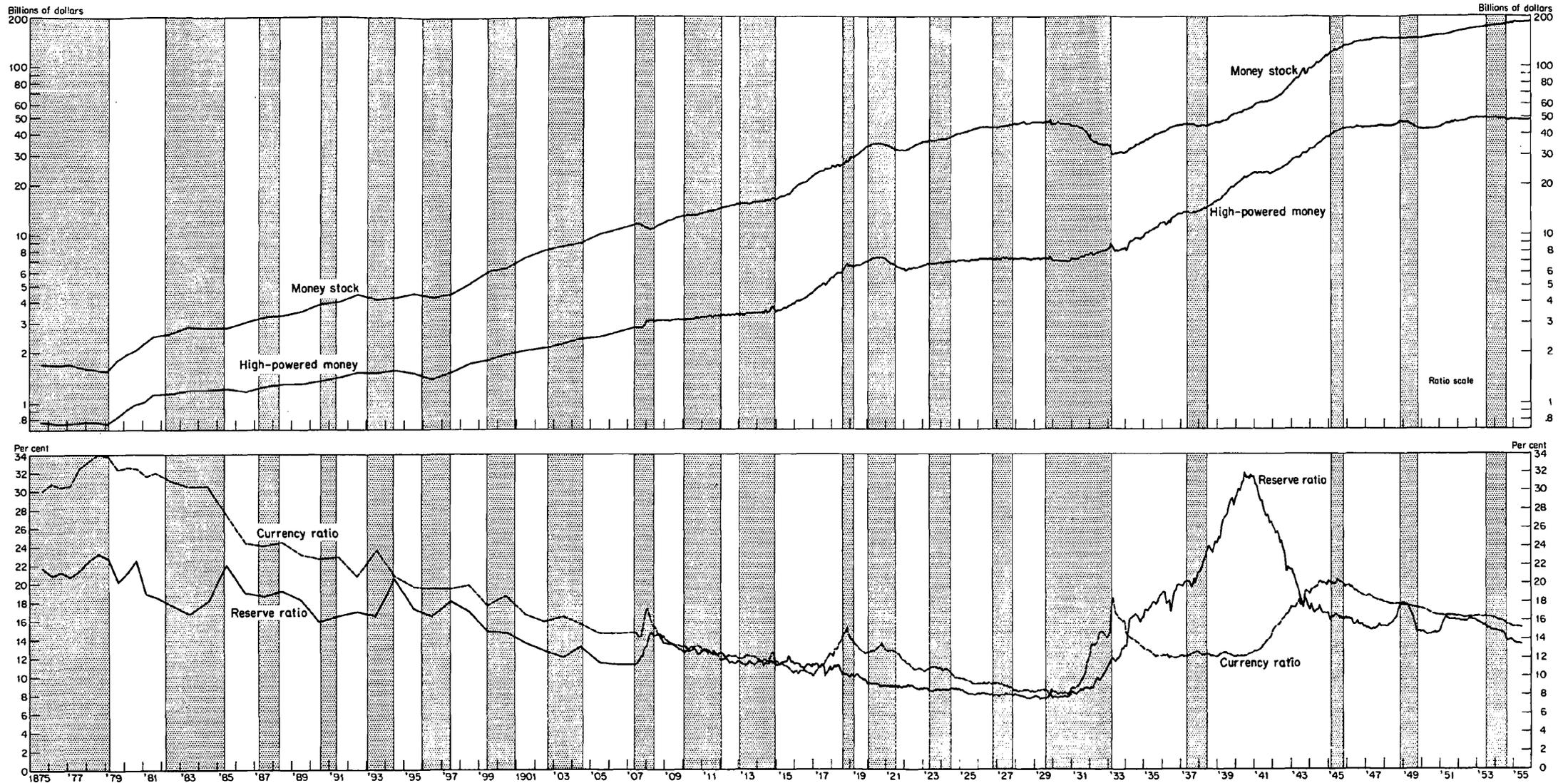
Before 1879, when the dollar was inconvertible, paper currency served as bank reserves and was accepted by the public, so that the preceding identity applies to that period too. The effect of inconvertibility, however, was to sever the fixed rate of exchange between gold and all other money and to allow the rate to fluctuate on the open market. To calculate the paper-dollar value of the gold coin in circulation, therefore, the nominal value of the gold should be raised by its open market premium over paper. Since this adjustment has a negligible effect on the figures for the total stock of money, it was not made.

Before the existence of the national banking system or, more exactly, before 1867, when state banks issued notes and so could make conversions between them and deposits interchangeably (that is, could

¹⁰ Between Dec. 1879 and July 1882, the Comptroller of the Currency also did not count silver certificates as lawful money in figuring national banks' required reserves. Sec. 12 of the act of July 12, 1882, established silver certificates as lawful money. Subsidiary silver and minor coin have never qualified as lawful money.

CHART 1

The Money Stock and the Three Determinants, 1875-1955



Source: Friedman and Schwartz, *A Monetary History of the United States, 1867-1960*, Tables A-1 and B-3.

Note: Shaded areas represent reference cycle contractions; unshaded areas, expansions.

issue both under the same conditions and at approximately the same cost), the situation was entirely different and the preceding identity does not apply. The public distinguished between state bank notes and deposits on the one hand, and gold on the other—as it should have, for the notes were no less liable than deposits were to depreciation through bank failures (except as the prior lien of notes on bank assets helped cut losses). For that period the three main determinants of the money stock were the stock of gold outside the Treasury, the ratio of gold held by the public to the total money stock, and the ratio of gold held by banks to their total monetary liabilities. In this formulation state bank notes are combined with deposits, and high-powered money outstanding is simply gold outside the Treasury (and possibly also greenbacks, when they were in circulation after 1862).

4. *The Problem of Interdependence*

High-powered money, the currency ratio, and the reserve ratio are admittedly a simple, and at the same time specific, classification of the channels through which changes occur in the money stock. Yet, if the three determinants are appropriately defined for the period under study, traditional monetary theory as well as much past research indicate that this is a useful approach. It aids in identifying and tracing effects on the money stock. This is possible, because the three determinants are not rigidly linked together through the institutional or accounting arrangements by which currency and deposits are issued. None of the determinants responds automatically to changes in the others.

This does not mean that they may not be related in their behavior, either through some economic or political effect of one on the others or through the common effects of other factors. Indeed, some interdependence is to be expected. Interdependence implies, however, that the government, the banks, and the public behave in certain ways. The postulated behavior may be confirmed or denied from analysis of the data. Later chapters present evidence bearing on many possible interrelations.

Two general sources of interdependence can be distinguished. One is indirect, arising from the dependence of the determinants on some of the same economic events. An example might be similar behavior

produced by business cycles or financial panics. The second is direct, arising from the response of one sector to changes in the determinant of another sector. An example might be a higher reserve ratio when high-powered money is rising rapidly, possibly because banks do not immediately make new investments when reserves increase. Or more complicated relationships may prevail, as one between the level of the reserve ratio and the average amplitude of cyclical fluctuations in high-powered money because of the disruptive effects of such fluctuations on the money market. The latter relation would not, of course, show up in a simple correlation between the two determinants. Indirect relations present the same problems encountered in any analysis in which many variables are involved, and the patterns of cause and effect are complex. The direct relations, in addition, present a special difficulty, because they mean, in effect, that the direction of influence runs partly from the money stock to the determinants and not entirely the other way.

An important direct relation is the dependence of high-powered money on the two ratios and the money stock. Because money-stock changes affect prices and thence the balance of international payments, gold flows are set in train, which affect high-powered money; similarly, central bank operations to stabilize the economy affect high-powered money. Stated in another way, the money stock is partly dependent on prices and business activity, where changes in high-powered money are the channel for the necessary adjustments in the money stock. This relationship is discussed in more detail in later chapters.

The evidence suggests that the dependence of the money stock on prices and business activity, as well as on other variables, is strong but is neither rigid, uniform, nor immediate. An examination of the channels through which economic variables affect the money stock can, therefore, shed light on the nature and extent of their effects. Accordingly, the plan of the work is to devote a separate chapter to the factors affecting each of the three determinants, leaving to the final two chapters the task of combining the findings for each determinant into a broader view of the factors responsible for changes in the money stock. This material is preceded by an analysis in the next chapter of the relative contribution of each determinant to changes in the money stock.