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HIGH-POWERED MONEY

HIGH-POWERED MONEY as defined here—bank reserves and currency held by the public—is ultimately under the control of governments, which have authority to alter the conditions of issue and to change the quantity outstanding. Statutory regulations concerning money therefore play an important role in the monetary histories of most countries and in particular of the United States. This country had an inconvertible paper standard from the Civil War until 1879. It was on the gold standard from then until 1933, except for an embargo on gold exports during World War I. Since 1934 it has had the so-called gold bullion standard, which—because of the huge gold stock accumulated in excess of statutory requirements during the 1920's and 1930's—until the late 1950's allowed the government much of the freedom of an inconvertible standard. Those regulations account for much of the behavior of high-powered money in this country, though they do not alone explain the timing and amplitude of many variations associated with important economic developments. To assess the role of statutory regulations and to identify other influences, it is desirable to distinguish the various sources of change in high-powered money.

For the United States, the components of high-powered money are gold coin or certificates and other money fully backed by gold; paper money or deposit balances not secured by gold reserves but constituting a liability of the Treasury or (since 1915) of Federal Reserve Banks; and (until 1935) bank notes issued as the liability of national banks. Issue of money by the U.S. government has never been completely centralized; indeed, there have always been numerous sources of issue. They can be conveniently classified, however, into four general sources: the gold stock, Federal Reserve Banks, the Treasury, and national banks. Changes in the gold stock are determined by gold production and the balance of foreign payments. The other three are issuing agencies whose operations are sources of change in high-powered money. The Federal Reserve Banks are the only agency

specifically charged with some of the responsibilities of central banking. The Treasury's operations include its cash outflow for budgetary expenditures and the management of the public debt, and inflow, including all revenues; outflow also includes silver purchases, shown separately because of the special character of silver in U.S. monetary

TABLE 9

DESCRIPTION OF SOURCES OF CHANGE IN HIGH-POWERED MONEY

By Operations of Issuing Agencies	By Changes in Monetary Assets or Liabilities
1. Gold flows (including changes in earmarkings), domestic production sold to the Treasury or coined and circulated, minus coin melted for use in the arts, or lost	1. Change in gold coin or certificates in circulation and change in the part of Treasury and Federal Reserve monetary liabilities secured by gold
2. Federal Reserve System operations: total change in Federal Reserve credit outstanding (excluding change in deposits held by foreign banks and in capital and surplus not offset by changes in fixed assets) on account of: Loans to banks Open-market operations	2. Change in Federal Reserve domestic monetary liabilities (i.e., excluding deposits held by foreign banks) minus change in FRS monetary reserves (i.e., holdings of gold and gold certificates, of Treasury currency, and of bank note liabilities of national banks)
3. Treasury operations: addition of net cash payments or subtraction of net cash receipts on account of: Budget deficits or surpluses Debt retirements or issues Deposits or withdrawals of funds at commercial banks and in miscellaneous Treasury accounts (including write-offs of discontinued currencies unredeemed and presumed lost) Cost of silver purchases and receipts from sales	3. Change in Treasury monetary liabilities (i.e., Treasury currency outstanding) minus change in high-powered monetary assets (i.e., Treasury holdings of gold, of Federal Reserve currency, of bank note liabilities of national banks, and Treasury deposits at Federal Reserve Banks)
4. Issue or retirement of notes by national banks	4. Change in bank note liabilities of national banks.

Note: Table describes high-powered money outside the Treasury and Federal Reserve Banks. For a more detailed description, see notes to Table F-5.

history. National banks issued national bank notes until 1935, under conditions set by the government. These operations covering all changes which occur in high-powered money are listed on the left-hand side of Table 9. Each corresponds to changes in a specific component of high-powered money involved in that operation, listed in the table on the right-hand side. Two or more changes may, of course, simultaneously offset each other, as in gold sterilization, when a gold inflow is offset by Treasury sale of bonds, or in the withdrawal of Treasury deposits from commercial banks to finance Treasury expenditures.

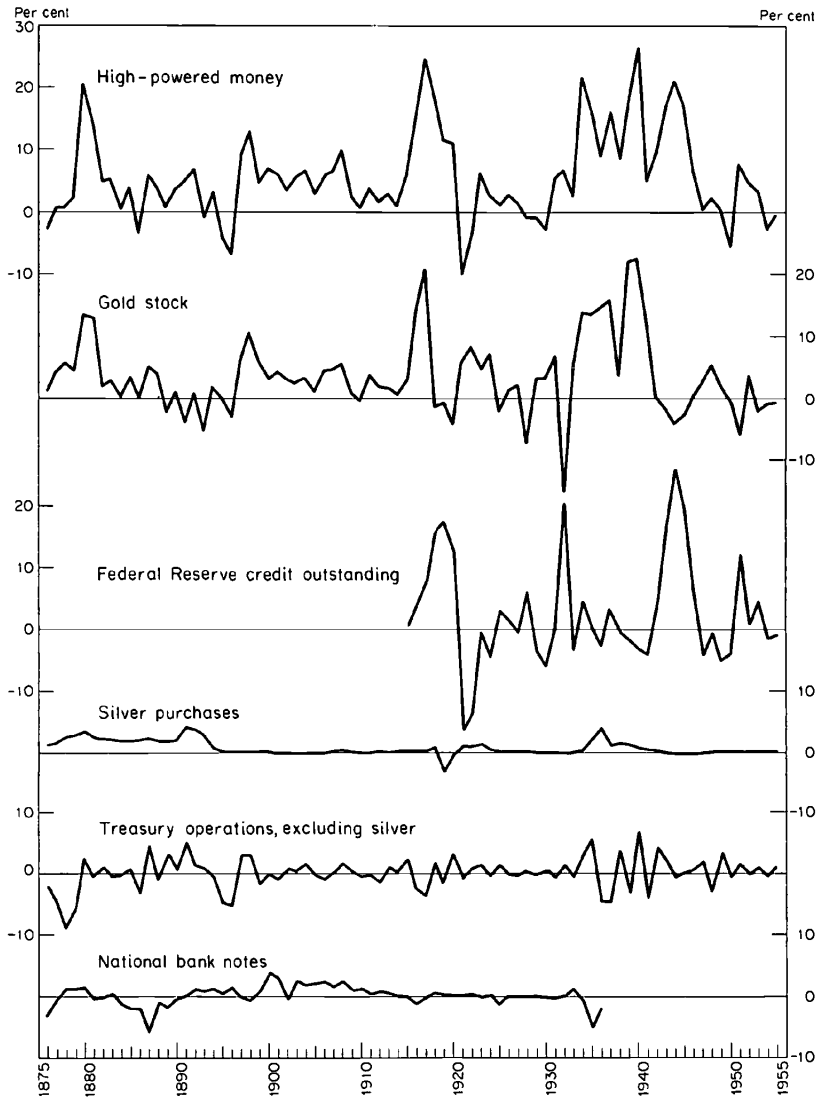
The breakdown separates the operations of the Treasury and Federal Reserve Banks. Federal Reserve activities are essentially governmental, and for many purposes the balance sheet of the Reserve Banks could be consolidated with the accounts of the Treasury. In some important respects, however, its activities are independent of the Treasury, and separate treatment seems preferable. If Federal Reserve and Treasury operations are not consolidated, there are some transactions between the two agencies that do not involve the public, such as the sale of a bond by the Treasury directly to a Reserve Bank. The bond sale shows up on Treasury accounts as a cash receipt through the issue of debt, and on Federal Reserve Bank statements as an increase in earning assets. The transaction cancels out in terms of the change in high-powered money outstanding but still shows up in records of operations of the two agencies.

The change in high-powered money attributable to the Federal Reserve Banks is the change in the Banks' total domestic monetary liabilities not covered by monetary reserves. These liabilities include amounts extended by Reserve Banks to the Treasury (which cancel out against Treasury operations) as well as to domestic commercial banks (including, of course, loans to member banks[1]) but not to foreign banks (which do not create dollar liabilities within the United States). Monetary reserves comprise the Reserve Banks' holdings of gold and gold certificates, Treasury currency, and national bank notes, all of which stand behind and in a sense create an equal amount of Federal Reserve monetary liabilities. Changes in these liabilities can also be described by the Federal Reserve operations involved. For example, a loan to a member bank increases Federal Reserve earning assets and therefore augments high-powered money. Changes in Reserve Bank

[1] Some students distinguish analytically between loans to member banks and other Federal Reserve credit outstanding. (A corresponding distinction is also made from banks' point of view between borrowings and other high-powered reserves of member banks, by defining net free reserves as equal to gross reserves minus required reserves and borrowings.) The purpose of the distinction is to assess the effects of the discount rate (relative to short-term market rates) on member bank borrowings. The distinction is of doubtful value in understanding the issue of high-powered money, because other Federal Reserve credit is not—or at least need not be—independent of the volume of member bank borrowing. Indeed, open market operations presumably are intended to provide a desired total amount of credit to banks after taking account of the amount of borrowing. Whatever the amount of borrowing may be, Reserve Banks still have full control over the total amount of their credit outstanding, though in the very short run, of course, unexpected variations may occur.

CHART 3

Sources of Change in High-Powered Money, Fiscal Years, 1876–1955



Source: Table F-6.

Note: Each source expressed as percentage of total high-powered money at beginning of fiscal year.

earning assets that do not affect their domestic monetary liabilities are excluded. Hence, an increase in assets through sale of capital stock to a new member bank or extension of deposits to foreign banks are excluded.

The definition of the change attributable to the Treasury is analogous. The Treasury operations listed in the table cover all the ways it pays out or receives money, all of which must be included to derive its net contribution to high-powered money. This source was actually derived as a residual to avoid unnecessary labor; all sources add up identically to the change in high-powered money, already computed, and any one source could be derived as a residual. As for the gold stock and note liabilities of national banks, the change in these items gives the required figure, since there are no monetary reserves behind them.[2]

Specified in this operational form, changes in high-powered money can be associated with the particular economic developments and government policies that initiated them. Part of this organization of sources of change in high-powered money is similar to a table of sources and uses of Federal Reserve credit outstanding, which appears regularly in the *Federal Reserve Bulletin*. The purpose there is different, however (changes in total high-powered money are not explicitly shown in the *Bulletin*), and there are minor differences in definition of some of the items. The scheme here helps to identify the channels through which various factors affect high-powered money. Secular and cyclical movements are distinct and are discussed separately below.

1. Secular Movements in Sources of Change in High-Powered Money

Chart 3 shows the sources of change in high-powered money outstanding for the fiscal years 1876–1955. The changes are expressed as percentages of the level of high-powered money at the beginning of the corresponding fiscal year. The data and their derivation are given in Tables F-5 and F-6. Because they show changes between two dates separated by a year (successive June 30's), these series suppress movements, however large, occurring between such dates, yet at the same

[2] The redemption fund for national bank notes, deposited with the Treasury, also satisfied legal reserve requirements for deposits of the issuing banks, and so is not treated as a reserve behind the notes.

time reflect in full any movement, however brief, if it spans a June 30. For example, a movement from May to June which is reversed from June to July shows up as two movements in opposite directions in adjacent years. In the chart, this gives the impression of a year-long movement reversed in the following year, whereas the whole operation covered but two months. Such reversals are especially apt to happen with Treasury operations. The Treasury might, for example, finance a deficit at the end of one fiscal year by running down its deposits at Federal Reserve Banks and then restore the deposits at the beginning of the next fiscal year with a sale of bonds. The two Treasury operations cancel out and have no effect on high-powered money, except momentarily; yet, if they occur in June and July, in the annual data they appear to have occurred over two full years. This explains part—though by no means all—of the random-like variations in the series for Treasury operations. In most periods, however, those operations were unimportant. The other series fluctuate radically at times but mostly for other reasons.

Chart 3 shows clearly that the gold stock accounted for most of the large changes in high-powered money up to World War I and shared that distinction thereafter with Federal Reserve credit outstanding. Visually, the fluctuations in these two sources are much larger than those in the others. Simple correlation coefficients quantify this impression. The gold-stock series accounted for about two-thirds of the variation in the annual percentage changes of high-powered money up to 1914 but for only about two-fifths from 1915 to 1955 (though these fractions would be lower if short-run cyclical variations were removed). Federal Reserve credit outstanding accounted for the major part of the remaining variation in the later period. The results are largely to be expected: operation of the gold-standard mechanism suggests (though not necessarily) that gold flows (or the domestic production absorbed and not exported) would produce many large changes in high-powered money; also that, even though large changes in other sources might have occurred, they would have tended to produce, before 1914 at least, offsetting gold flows. After 1914, changes in the U.S. gold stock, in percentage terms, were larger than ever, but the relative importance of gold diminished. The newly formed Federal Reserve Banks could expand or contract the quantity of high-powered money on a large scale, and on several occasions they did.

TABLE 10

SOURCES OF CHANGES IN HIGH-POWERED MONEY FOR SELECTED PERIODS, 1876-1955

Period (fiscal years)	Total[a] (1)	AVERAGE CHANGE IN HIGH-POWERED MONEY ATTRIBUTED TO CHANGE IN: (per cent per year)				
		Monetary Gold Stock (2)	Federal Reserve Operations (3)	Treasury Operations		National Bank Notes (6)
				Silver Purchases (4)	Total, Excluding Silver (5)	
1876-81	6.0	7.1	--	2.4	-3.4	-0.1
1882-96	1.9	0.5	--	2.0	0.1	-0.7
1897-1914	5.1	3.6	--	0.1	0.2	1.2
1915-22	8.9	5.7	3.5	-0.1	-0.2	-0.1
1923-30	1.2	1.5	-0.7	0.2	0.3	-0.2
1931-40	13.0	10.3	1.6	1.1	0.6	-0.7
1941-46	12.6	0.7	11.4	0.1	0.4	--
1947-55	1.1	0.4	0.2	0.1	0.5	--

Source: Table F-6. Simple average of percentages for each year.

[a]May not equal sum of sources because of rounding.

Their main contributions were the two large expansions during World Wars I and II. Gold flows did not correct those expansions, at first or even later, as previously they would have done. Nations erected various barriers to the free adjustment of international trade during and after the two world wars by restricting the flow of gold and goods. Foreign central banks also expanded at the same time the Federal Reserve System did, which lessened the adjustment required.

While the gold stock and Federal Reserve credit outstanding accounted for the major changes in high-powered money, the other sources were not inconsequential, especially in certain periods. This is brought out by Table 10, which presents for eight periods averages of the figures graphed in Chart 3. Although the eight were selected by marking off the major movements of the series in the chart, they also correspond with major developments in U.S. monetary history:

1875–81, the prelude and return to convertibility, in which the gold stock rose as a result of government sale of bonds to build up a reserve before resumption of specie payments in 1879 and as a result of a very favorable balance of payments in the following two years

1882–96, a period of declining prices reflecting worldwide deflation, ending with several years in which gold flowed out and the government sold bonds to preserve its gold reserve and maintain convertibility

1897–1914, in which world gold stocks increased and prices rose
1915–22, in which the usual wartime expansion of the money stock came at first through gold flows and then continued because of credit extension by the newly formed Federal Reserve Banks, followed after the war by a sharp contraction of credit and collapse of prices
1923–30, a period of stability in the money stock and prices but also one of large gold imports, which reflected a disequilibrium of world trade and a weakening of the gold-standard mechanism.
1931–40, a decade of monetary expansion as a consequence of devaluation and the resulting gold inflows
1941–46, a repetition of movements in World War I, with expansion again of Federal Reserve credit outstanding and cessation of gold flows after the outbreak of hostilities
1947–55, a return to restrained growth and stability of the money stock, as the Federal Reserve Banks, at first diverted to support of the bond market, paid increasing attention thereafter to stabilizing prices

Although there was a close association in every one of the eight periods between the average change in high-powered money and in the gold stock and Federal Reserve credit outstanding, the average contributions of the other sources were in some periods fairly large. The underlying factors may best be described by a discussion of each source.

THE GOLD STOCK

Changes in the Gold-Standard Mechanism after 1914. Although gold flows have been de-emphasized in recent theoretical discussions of international adjustments and national income determination, they have important effects on the quantity of high-powered money and thus on the money stock, and cannot be disregarded. Changes in the monetary gold stock affect high-powered money directly and, as Chart 3 and Table 10 indicate for the United States, the magnitude of the effect has been substantial. To be sure, the further effect through changes in the money stock on the balance of international payments and the equilibrium of relative national price levels, though subject to the interference of other factors and therefore difficult to identify, has clearly been less important since World War I. There are several qualifications to the importance of gold even under an unrestricted

gold-standard mechanism, especially concerning the speed of adjustments. Yet, granted the qualifications, changes in the gold stock have played a crucial role in long-run monetary developments before World War I and—to a lesser relative extent—since then as well.

In the long run there is a mutual dependence between the stock of gold and high-powered money. First, foreign payments made by shipments of gold produce an equal change in the quantity of high-powered money outstanding (unless offset by other sources) and may lead to further changes if the quantity is normally a multiple of the gold stock. And, second, changes in high-powered money eventually lead to changes in the stock of money and so in the level of money income and prices, which in turn affect the balance of foreign payments and so the flow of gold. Under the gold-standard mechanism, therefore, changes in high-powered money and gold flows affect each other. The money stock might respond slowly or incompletely to gold flows in the short run and still maintain a relation to them in the long run. The response may be partial and delayed, because the effects of gold flows can be moderated by central banks.[3]

The gold stock dominated long-run movements in the U.S. money stock, but was less decisive after 1914, however, than before. In the latter period, changes in the gold stock were large from time to time, indeed generally much larger than before, but they no longer predominated in determining the quantity of high-powered money. Changes in Federal Reserve credit outstanding were of equal size and frequency and, more important, were used to moderate or accentuate movements in the gold stock to suit the monetary policies of the government. Gold movements to a great extent thus lost their primary role and were important only secondarily as a factor to be considered by the government in pursuing particular goals.

During the first half of the 1920's gold flowed into the United States in large volume owing to the war-produced disequilibrium that monetary policies here and abroad had not corrected. The economic (and political) difficulties of maintaining the gold standard fell, therefore, on the foreign countries losing gold, whereas the Federal Reserve Banks did not face such difficulties and could—as they did—prevent

[3] Even before 1914 central banks appear to have viewed outflows with alarm and inflows with equanimity. See Arthur I. Bloomfield, *Monetary Policy under the International Gold Standard: 1880–1914*, Federal Reserve Bank of New York, 1959, pp. 23 ff.

the increased gold stock from expanding high-powered money commensurately. High-powered money fell during 1921–22, had a declining rate of increase during 1923–27, and fell again during 1928–30 (see Chart 3). While a bank deposit was created for each dollar of new gold domestically coined or acquired from abroad, addition to high-powered bank reserves from such deposits at banks was offset to a large extent by reduction of Federal Reserve earning assets. With that reduction, the ability of the banking system to expand credit was no greater after the receipt of gold than before.

The accumulation of gold in the early 1920's accompanied by reductions of Federal Reserve credit outstanding increased gold reserves in excess of requirements and gave the Reserve Banks freedom to expand or contract credit within wide limits to suit domestic policies, despite the absence of further growth in the gold stock during the remainder of the 1920's. There were two important instances of large gold outflows that induced the Reserve Banks to allow the money stock to contract sharply: one at the beginning of the period, 1920–21, and one at the end, 1931–32.[4] Otherwise, except for 1926, the June-to-June annual changes in Federal Reserve credit outstanding and in the gold stock tended to offset each other. Chart 3 reveals the resulting shift in the primary sources of change in high-powered money between the periods before and after 1914. In the periods before 1914, changes in the gold stock predominated. In the periods after, Federal Reserve credit has had equal or greater importance.

The United States still adhered to the formal observance of the international gold standard during the 1920's. After removal of the wartime embargo on export of gold in June 1919, there were no restrictions on the purchase, sale, or shipment of gold, and the Treasury maintained the convertibility of its currency at a fixed parity with gold. In terms of these criteria, the gold standard as traditionally practiced did not fall in this country until 1933, when the purchase and holding of gold for nonindustrial uses were prohibited. Although gold movements during the 1920's lost some of their control over high-powered money and were no longer the chief arbiter of international trade and price levels, those transgressions of the traditional responses to gold flows did not exceed the broadening prerogatives of central

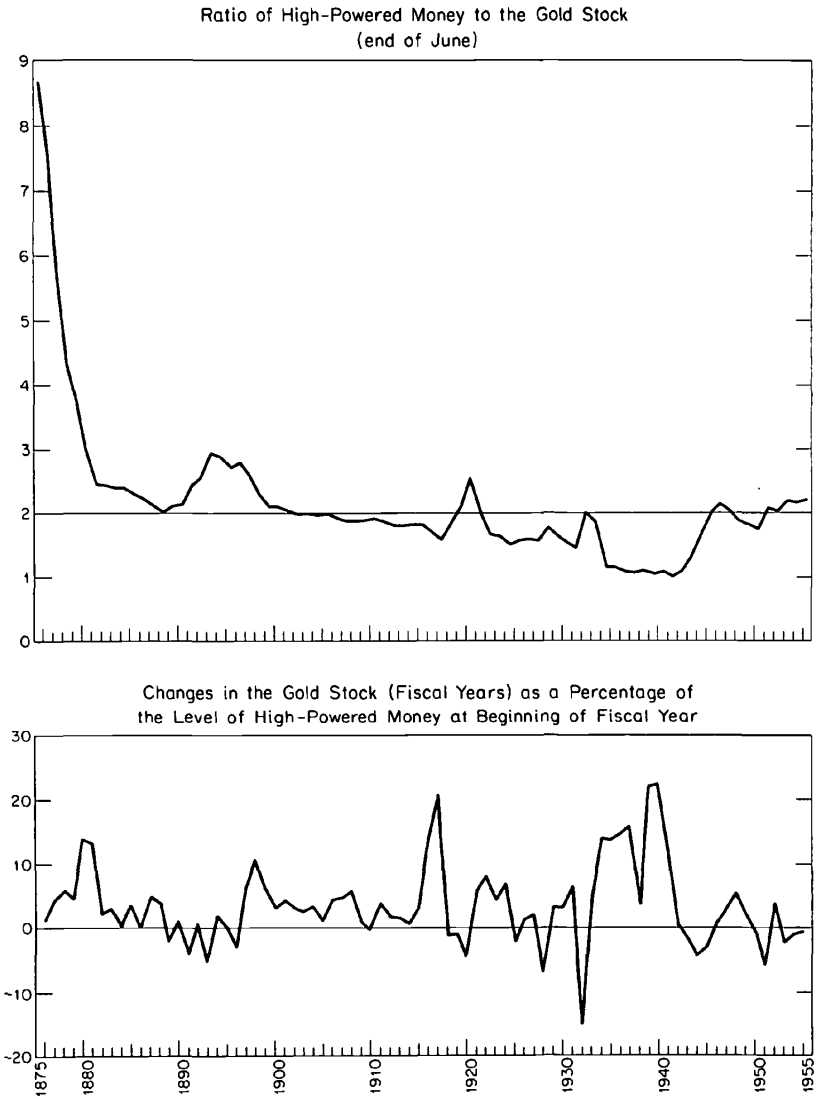
[4] See Milton Friedman and Anna Jacobson Schwartz, *A Monetary History of the United States, 1867–1960*, Princeton for NBER, 1963, Chaps. 5 and 7.

banks. The transgressions complicated the problems of maintaining convertibility for countries temporarily losing gold—especially if a loss became large before it ended—but they did not portend insurmountable difficulties until the 1930's. Indeed, they seemed to adapt the standard to the new demands of freedom for domestic economic policies. One purpose of central banks was to cushion the short-run effects on the economy of gold flows; central banks were not required or expected to supplant the final authority of those flows. If it had been understood that central banks would offset gold flows temporarily but not indefinitely, and if such actions had set the conditions for a new kind of "domesticated" gold standard to be adopted and maintained in the 1930's, we should never have come to think of the 1920's as the end of an era. Yet, with hindsight, the period can be described as a prelude to suspension of the traditional gold-standard mechanism. In the few turbulent years that were to follow, the brief return to gold after World War I ended in most countries, and currencies with limited or no convertibility supplanted convertible currencies. Gold has remained the medium of international exchange and in this way has retained part of its influence—as the United States is reminded by events since the second half of the 1950's—but so far, it no longer governs so closely as it once did the quantity of nearly all the world's money.

These developments symbolize the decline of the gold-standard mechanism as a means of adjusting imbalances of international payments. Yet, as noted, changes in the gold stock since 1914 have not been smaller and have not contributed less than before to changes in the money stock. Actually, they have been larger and have contributed more in absolute amount, as Chart 3 shows—and as indeed is to be expected. Relaxing the "rules" of the gold standard while not throwing them completely out has allowed larger and more prolonged gold flows. What has happened since 1914 is that the *relative* importance of gold has declined, owing to the creation of another major source of high-powered money—Federal Reserve Banks—together with developments previously described. As a result, the ratio of high-powered money to the gold stock, shown in Chart 4, has fluctuated considerably more since 1914 than before. Even so, Treasury policies were capable of producing such fluctuations before 1914, as the 1890–99 period demonstrates; and since resumption in 1879 no large movement either up or down in this ratio has proved to be permanent.

CHART 4

Relation Between High-Powered Money and the Gold Stock, Annually, 1875–1955



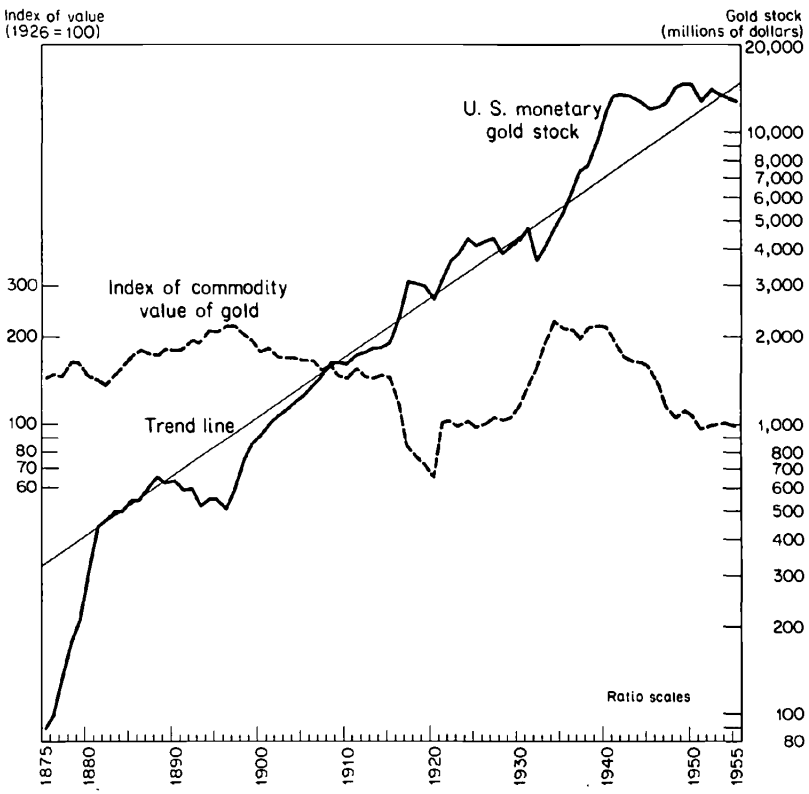
Source: Tables F-6 and F-7. The lower panel is the same as the gold-stock panel in Chart 3.

In 1955 the ratio was 2.2, close to its average level before World War I. Throughout most of that earlier period it hovered around a level of 2, except for higher ratios in the years preceding and just after 1879, when convertibility was resumed, and the 1890's, when the Treasury experienced gold drains. The monetary developments after World War I, and particularly after the 1920's, emphasized in the foregoing paragraphs, are vividly illustrated by this chart. Before World War I the series rises considerably above 2.0 in many years but seldom falls below 1.8, while thereafter it has seldom gone much above 2.0 but has fallen considerably below that in many years, particularly in the decade following devaluation in 1934. In short, the growth of high-powered money sometimes outran that of gold in the pre–World War I period and sometimes fell short in the subsequent period—hardly ever the reverse—but in due course the imbalance has so far eventually been redressed.

Factors Affecting the Growth of the Gold Stock. Government actions have affected high-powered money and hence the growth of the U.S. monetary gold stock required to produce equilibrium under the international gold standard. Such actions therefore help to explain some of the variations in its rate of growth, particularly since 1914. Most variations, however, reflect market responses to demand-and-supply factors which are largely unrelated to changes in government policies. For purposes of discussion, all such factors can be thought of as affecting either the growth of the world monetary gold stock (representing current production not absorbed by industry and arts) or this country's share of the existing world stock. A thorough analysis would cover, under the first item, the world supply of gold from production and the nonmonetary demand for the metal; and, under the second item, the changing area of the gold standard, as countries adopted or abandoned gold, monetary substitutes for gold, the pattern of international trade and capital movements, and so on. Such analyses are not yet at hand. Much is nevertheless known, and we may identify some of the main factors by comparing the deviations from trend of the U.S. monetary gold stock with the price of gold in this country (in terms of commodities). The comparison is facilitated by the series graphed in Chart 5. The first set is the annual level and secular trend of the U.S. monetary gold stock in terms of its pre-1934 dollar value (and so shows changes in the physical stock of gold only,

CHART 5

The U.S. Monetary Gold Stock and Commodity Value of Gold, Annually, 1875–1955



Source: Table F-7.

Note: U.S. monetary gold stock, valued throughout at $20.67 per fine ounce, end of June figures. Commodity value of gold, based on its dollar price and dollar prices of wholesale commodities, average of monthly data. Trend line, slope of 4.7 per cent per year (compounded continuously).

omitting changes in value due to the 1934 devaluation). The other series (dashed line) is the commodity value of gold (which incorporates changes in the dollar prices of both commodities and gold). Ordinarily a rise (say) in the commodity value of gold[5] will increase the growth of the U.S. stock both by raising the rate of world production

[5] Note that changes in commodity prices (in terms of dollars) produce changes in the value of gold (in terms of commodities) in the opposite direction.

of gold and, if the rise in value here is not matched in other countries, by attracting here part of the existing world stock; and conversely.

In addition to the two world war periods, the chart reveals four large deviations in the stock from its secular trend. Each of the four, except the first, may be divided into two submovements, one that takes the series away from the trend line, and a second that brings the series back to the trend line: 1875–81; 1889–96 and 1896–1907; 1920–24 and 1924–32; 1932–41 and 1941–55. All can be associated with important changes either in the value and therefore production of gold or in government policies affecting the gold stock.

1875–81. The U.S. Treasury accumulated a gold reserve, and in 1879 the United States returned to the gold standard. The sharp rise in the gold stock is not to be explained by changes in the commodity value of gold; although dollar prices fell in the United States during the 1870's, so also did the dollar premium on gold. The rise reflects preparations for convertibility taken by the Treasury, discussed later in this chapter in the subsection on Treasury Operations.

1889–96 AND 1896–1907. The movements reflected corresponding changes in world gold production. To understand the changes we must go back to developments in gold mining which occurred in earlier decades.

Following the opening of rich fields in California in 1848 and in Australia in 1851, no important new gold discoveries were made for some time, so that, starting in 1875 and lasting until 1887, the rate of growth in the world monetary gold stock dropped from the 8 per cent annual rate attained in the early 1850's to about 1 per cent.[6] Also, several countries adopted the gold standard in that period, which forced a wider distribution of the given supply. As a result, the commodity value of gold rose substantially from the early 1870's to the late 1890's.[7] Around 1888 world gold production began to expand again, and in a few years quite rapidly, so that output doubled by 1896–97 and almost doubled again by 1907.[8] Output reached a peak in 1912 with an annual rate of production equal to about four and a

[6] Based on Joseph Kitchin's estimates, *Interim Report of the Gold Delegation of the Financial Committee*, Geneva, League of Nations, Sept. 8, 1930, Table B, pp. 83–84.

[7] As gauged by British prices (see G. Warren and F. Pearson, *Prices*, New York, Wiley, 1933, pp. 74–77).

[8] See estimates of annual world production by the Director of the Mint in his *Annual Report*, 1913, p. 314.

half times that of 1878–87; the rate declined only moderately in 1913–14.

The upturn in production around 1888 was due primarily to a series of technological innovations in the purification of gold ore, which allowed profitable mining of lower-grade ores previously abandoned. The main advances involved the use of chlorine gas and of cyanide of potash in the extraction process. The chlorination process had spread widely by the mid-1870's,[9] and the cyanide process was first introduced on a large scale around 1891. The latter was the cheaper method and was soon adopted universally. That gold was soluble in a solution of cyanide of potash had long been known, but the first practical technique for utilizing cyanide to extract gold from the many substances with which it is combined in nature was not patented until 1885.[10]

There were also some important new gold discoveries in the period 1885–90 and after. The famous Transvaal fields in South Africa opened up at that time, though they did not become important until after 1890. The first of many rich deposits was found in western Australia in 1889. In the early 1890's there were also substantial increases in output partly from new discoveries and partly from opening up abandoned mines in Colorado, British Columbia, Mexico, and other parts of South and Central America. (The rich strikes along the Yukon and Klondike Rivers in Alaska first occurred late in 1896.) All together, the new fields produced a substantial increase in world output, but the earlier innovations in processing the ore provided the main stimulus. The low-grade ores in many of the new fields could not have been profitably worked by the older methods of purification, especially in the new Transvaal fields, which alone accounted for about a quarter of world output in 1900–10.[11]

It was probably no accident that those discoveries came in the late 1880's and 1890's. The commodity value of gold then was at high levels and still rising (see Chart 5). That the technological innovations for purifying gold ore were also spurred by economic incentives is a more tenuous proposition; innovations are partly inspirational, and the proverb, "necessity is the mother of invention," may not apply. Yet the proposition that it does seems credible, because the solubility of gold in cyanide of potash was already known, as noted, and great

[9] It was the "leading process" used in California in 1876 (see Alfred G. Lock, *Gold: Its Occurrence and Extraction*, New York, Spon, 1882, p. 186).

[10] See Edward S. Meade, *The Story of Gold*, New York, Appleton, 1909, pp. 123–133.

[11] *Annual Report*, Director of the Mint, 1911, pp. 46–47.

reductions in the cost of refining gold ore only awaited a practical application of that chemical reaction. Indeed, several similar methods were patented in this country and abroad within a few years of each other.[12]

WORLD GOLD PRODUCTION AND THE U.S. GOLD STOCK, 1873–1913. What part did gold production play in the growth of the U.S. stock during the period 1873–1913? Table 11 presents data dividing the growth of the U.S. monetary gold stock into growth of the world stock and changes in the U.S. share of the world stock. The normal share of current world production going to each gold-standard country is the ratio of its stock to the existing world stock. If the ratio does not change, the country's stock grows at the same rate as the world stock. Differences between the actual growth rates of its stock and the world stock can then be attributed to changes over time in its share of the world stock. Although the figures available on growth of the world gold stock are rough, they should suffice to bring out general movements. The growth rate of the U.S. stock, as we might expect, has fluctuated more than that of the world stock because of recurring changes in the U.S. share of the world stock. The U.S. share has also risen over time mainly because of expansion of the U.S. economy relative to that of all other gold-standard countries, making the rates in column 3 positive on the average.

The variations in these rates reflect short-run disturbances in international payments, owing to monetary developments abroad as well as to fluctuations in international trade and capital movements. The variations are not entirely suppressed, even though the table measures average rates of change between reference cycle peaks.

Because of that variation, world gold production does not completely account for the increased growth of the U.S. stock starting in 1896. In 1896–1913, compared with the preceding fourteen-year period, the annual rate of growth of the world stock rose by nearly 2 percentage points, whereas that of the U.S. stock rose by over 7 percentage points. The changes in the U.S. share from the first to the second summary period reinforced the effect of world production on the growth of the U.S. stock. The distribution of the world gold stock frequently changes, of course, even aside from short-run fluctuations. Countries expand and demand gold at different rates, and doubling the rate of growth of the world stock need not precisely or even

[12] Meade, *The Story of Gold*, p. 128.

TABLE 11

SOURCES OF SECULAR GROWTH OF THE U.S. GOLD STOCK: AVERAGE RATES OF CHANGE BETWEEN REFERENCE CYCLE PEAKS, 1873-1913

Peak to Peak of Successive Reference Cycles	AVERAGE RATE OF CHANGE IN U. S. MONETARY GOLD STOCK (per cent per year)		
		Attributed to:	
	Total (1)	Growth of World Gold Stock (2)	Change in U.S. Share of World Stock (3)
1873-82	17.9	1.3	16.6
1882-87	4.0	1.0	3.1
1887-90	2.6	1.4	1.1
1890-93	-2.8	1.9	-4.8
1893-96	-4.8	3.1	-7.9
1896-1900	14.4	3.7	10.7
1900-03	7.4	3.2	4.2
1903-07	6.5	3.8	2.7
1907-10	3.6	4.3	-0.7
1910-13	4.0	2.9	1.1
Summary			
1882-96	0.3	1.7	-1.4
1896-1913	7.6	3.6 (4.1)	3.9 (3.4)

Note: Rates computed between Dec. 30 figures for fiscal year reference peaks, except the 1873 peak, which is based on figures for June 30 of that year.

Source, by Column

(1): Table F-7, col. 1. Data for 1873 from Annual Report, of the Director of the Mint, 1907.

(2): Estimates of Kitchin, Interim Report of the Gold Delegation, Table B, pp. 83-84. Later studies suggest that Kitchin's figure for 1913 is too low by perhaps about $1,045 million (see C. O. Hardy, Is There Enough Gold?, Washington, Brookings, 1936, p. 207). Rates shown in parentheses are based on the revised figure and Kitchin's figure for 1896. Kitchin's 1896 figure is probably also understated, however, so the rate in parentheses in col. 2 is undoubtedly too high. The rate based on Kitchin's figures for both 1896 and 1913 may well be closer to the actual rate.

(3): Col. 1 minus col. 2; may not exactly equal the difference between figures shown for cols. 1 and 2 because of rounding.

approximately double the rate for every country. On the other hand, the disturbances behind the U.S. gold outflows during 1890–96 were not unrelated to the slow growth of the world gold stock in that and previous decades. The Baring crisis of 1890, with its subsequent international repercussions, and the domestic agitation over silver a few years later both had roots in the worldwide deflation of prices which accompanied the comparatively low output of gold. From this

point of view, the increased growth of the world gold stock beginning around 1890 also removed the additional factors that produced gold outflows from the United States and then allowed the U.S. gold stock to raise its share of the world stock. Had those episodes not occurred, the average rate of growth of the U.S. stock might have been somewhat higher for 1882–96 and somewhat lower for 1896–1913, and hence closer to the world rate.

This view finds support in the response of the government to gold flows at other times. The government has often acted, in part from political pressures and in part on its own volition, to cushion their effect on the monetary system.[13] The ratio of high-powered money to the gold stock tended to be higher than usual in periods of large and prolonged gold outflows; and conversely with inflows. This can be seen by comparing the upper and lower panels of Chart 4, particularly for the rise in the ratio from 1890 to 1893 and decline after 1896, for the decline during the early 1920's and most of the 1930's, and for the sharp rise from 1931 to 1932. The government offset part of the movements in the gold stock in those periods by issuing or retiring nongold components of high-powered money. Such actions help to prolong gold movements by perpetuating the disequilibrium of foreign payments which gold flows help to correct. Changes in the U.S. share would consequently tend to parallel the swings in annual world gold production.

Whatever effects government actions had on the U.S. share of the world gold stock, all countries could not, of course, produce the same effects simultaneously, simply because every country with a rising share would force some others to have falling shares. The only movements common to all countries' gold stocks are those in world gold production not used in industry and arts; a large change in that aggregate necessarily produces a corresponding change in the growth of most countries' stocks. Considerable qualitative evidence indicates that most countries experienced first a fall in growth of their gold stocks during the 1870's and 1880's and then an upsurge sometime during the 1890's, thus corroborating our data on the world gold stock. We may, therefore, attribute the increase in the rate of growth of the gold stock in the U.S. and other countries from 1882–96 to 1896–1913 largely to changes in gold production—and these in turn to the

[13] Though only to a limited extent, as Chart 3 shows.

economic and technological conditions of supply—rather than to changes in their shares of the total or to nonmonetary demands for gold.

Were the factors affecting world gold production independent of other monetary variables and thus entirely exogenous? They were certainly not related to increases in aggregate output or in the aggregate demand for goods and services, which have been held responsible for the secular rise in prices from 1897 to 1914 (see Chapter 6) and so also, by implication, for the corresponding increase in the rate of change in the money stock. Such increases in aggregate output or demand would tend to raise prices and costs and thereby to discourage gold production, and not under ordinary circumstances tend to stimulate it. More likely, the deflation of prices in the decades following the Civil War, which raised the commodity value of gold, also stimulated the increase in its rate of production, as previously suggested. In that event, increased growth of the gold and money stocks in turn accounted for the upturn in prices. The effect worked slowly, however. World prices commenced a fairly steady decline in the early 1870's, while world gold production did not expand appreciably until after 1890. And when the U.S. gold stock rose sharply after 1896, the effect on the money stock was partly, though not wholly, offset by the other sources of change in high-powered money. By this interpretation, the U.S. gold stock was not an exogenous variable in that period but formed part of a closed system: the gold stock determined the long-run level of the money stock and hence commodity prices, which in turn determined the production of gold and so the level of its stock—though with a long lag, to be sure. Aside from the recognition of long lags, this is essentially the old classical theory of commodity money. It accords quite well with the evidence on long-run movements.

1920–24 AND 1924–32. The first half of the 1920's recorded the previously mentioned upheaval in international trade and finance following World War I. Thereafter, the U.S. gold stock was roughly constant up to 1931, which means it fell in relation to its secularly rising trend (see Chart 5). The halt in growth of the stock for half a decade may be explained in part by its rapid growth in the early 1920's followed by the return to convertibility and to prosperity of nations abroad, and in part by slackening of world production[14]

[14] *Banking and Monetary Statistics*, Board of Governors of the Federal Reserve System, 1943, p. 542.

associated with a value of gold almost 50 per cent lower in the 1920's than before World War I.

1932–41 AND 1941–55. The Great Depression beginning in 1929 and the international financial panic in 1931 disrupted world trade and induced governments to adopt monetary reforms of various kinds: devaluation of their currencies, exchange controls, and inflationary domestic policies. By all odds the most severe blow to the gold-standard mechanism was the general use and acceptance of national interferences with gold flows to accommodate domestic monetary policies. Of equal or greater significance for the long-run behavior of prices, however, was devaluation, which produced large increases in world gold production. In the United States the large and protracted expansion of high-powered money in the 1930's came from the steady accumulation in this country of a substantial part of the existing world gold stock and of current gold production.

Increase of the U.S. gold stock, as Chart 5 shows, commenced on a large scale even before the formal devaluation of the dollar, a step not taken until early 1934. Earlier, on March 6, 1933, convertibility had been abandoned, and on October 25 of that year the government began to purchase gold on the open market at prices above the old parity of $20.67 an ounce with a view to depreciating the value of the dollar.[15] The U.S. buying price was gradually raised and finally pegged at $35 an ounce on January 31, 1934, at which price the Treasury has since bought all gold offered (except domestic coin and scrap).[16] In Chart 3,

[15] Holders of domestic gold coin did not profit from the higher value of gold, since they had to turn it all in to the Treasury, which purchased all domestic gold coin and scrap at the old parity. Notwithstanding the nationalization of the domestic gold stock, only inconvenience prevented Americans from purchasing and holding gold to their account abroad (see R. Harrod, *The Dollar*, New York, 1954, p. 69).

Domestic producers of gold, whose exports had been banned since Mar. 1933, began to profit from a rise in value in Sept., a month before the government's buying program began. From Sept. 8 to Oct. 24 the Treasury bought gold from domestic producers at the best price available abroad and resold it in foreign markets. The increase in high-powered money from purchases thus tended to be canceled by sales abroad (the Treasury received foreign exchange from the sales, with which it could buy back the money issued for its purchases). The operation was equivalent to exporting the currently produced gold (assuming the Treasury's payments and receipts were equal); hence, high-powered money outstanding in the U.S. was not directly affected by that operation.

[16] Most Treasury purchases at the new official price have been financed by issue of gold certificates to Federal Reserve Banks and have increased high-powered money. Purchases from Oct. 25, 1933, to Jan. 30, 1934, however, at prices above the old parity price then authorized were financed by issues of 90-day debentures and so did not at the time produce increases in high-powered money (see G. G. Johnson, *The Treasury and Monetary Policy 1933–1938*, Cambridge, Mass., 1939, p. 24).

the percentage additions to the gold stock are based on the value of its physical changes; the stock figures exclude the Treasury's bookkeeping profit in 1933–34 from appreciation in the dollar value of its gold holdings purchased before devaluation, since only actual purchases of gold by the Treasury directly affect the dollar amount of high-powered money in circulation. The solid curve in Chart 5 records physical changes in the stock valued at the old parity.

Devaluation did not immediately depreciate proportionately the general purchasing power of the dollar; indeed, the $35 price, in view of the nearly 50 per cent decline in wholesale prices from 1929 to 1932, proved to be a bonanza to producers of gold throughout the decade. Prices of wholesale commodities did not until the next decade rise as high as might ordinarily be expected from such huge additions to the gold stock (considering also that offsetting changes in Federal Reserve credit outstanding were negligible). The rate of growth of the stock did not fall off until after the outbreak of World War II. Its growth first accelerated with the threat of war in 1938–39 but then stopped with the imposition of exchange controls abroad. The U.S. stock actually declined slightly during the war.

It began to grow again after the war from 1945 until 1949 and then declined moderately in most of the following years up to 1955. It increased in the next two years and then began a steady decline, still continuing in the early 1960's (not shown on charts). The post-war shift from growth to decline of the U.S. gold stock may be attributed to the resurgence of European economies from wartime setbacks and to a fall in world gold production, which reflected a value of the metal considerably reduced from the high level of the late 1930's. That the commodity value of gold had returned in the 1950's to its level in the 1920's means that the 1934 devaluation did eventually lead to much higher commodity prices, but the full outcome took two decades.

SUMMARY. The preceding discussion of the large variations in the rate of growth of the U.S. monetary gold stock has emphasized changes in the commodity value of gold as a major part of the explanation. Other factors, particularly government monetary policies, have also played an important part, though often through their effect on the value of gold. Most effects of long-run significance worked through changes in world gold production but were delayed by lags of varying duration. There are at least two reasons for long lags. First, the

monetary gold stock is extremely large compared with annual additions. Second, world gold production may respond slowly to changes in the value of gold, partly because response sometimes comes through discovery of new ore fields and improved technology for refining gold ore. World price levels began to decline in the 1870's, for example, but world gold production did not rise appreciably until the 1890's. Once production started to rise, it kept rising for two decades, despite sharp price increases in gold-standard countries after 1896. The continued upsurge in output reflected newly discovered techniques and newly opened mines, both of which remained profitable despite the ensuing rise in commodity prices and mining costs. On the other hand, when the value of gold increased sharply, as with devaluation in the early 1930's, production expanded rapidly.[17]

The effect just described of the value of gold on its world production and stock shows up clearly. Although data on the world stock are increasingly incomplete after the mid-1930's, mainly because of lack of data for Russia, and cannot be easily analyzed for the whole period, data on world production are reasonably accurate for the earlier periods covered here.[18] The production data show the response to three major swings in the value of gold since the 1870's: the worldwide decline in prices after 1873, the rise after 1896 until 1920, and the sharp decline together with currency devaluations of the early 1930's. World gold output reacted with varying lags to each of the swings in the expected way and in amounts that towered over the magnitude of its short-run fluctuations and of its long-run changes in other periods.

The U.S. gold stock reflects not only world production but also comparative national price levels and other factors. The effect on it of changes in the value of gold is complicated and seems difficult to quantify. Simple correlation of the two series would not clarify the relation and for that reason has not been computed. Lack of easy quantification, however, should not lessen our recognition of the importance of these effects.

[17] It should be noted that the positive lagged relation between the two series in Chart 5 tends to be obscured by a strong inverse relation concurrently. The latter reflects the entirely separate effect of changes in the gold stock acting through the money stock on prices, discussed in Chapter 6.

[18] See G. Warren and F. Pearson, *Gold and Prices*, New York, Wiley, 1935, p. 121; and *Banking and Monetary Statistics*. For estimates of recent years, see W. J. Busschau, "Some Notes on Gold Production and Stocks," appendix paper to *Shall We Return to a Gold Standard Now?*, New York, National Industrial Conference Board, Studies in Business Economics No. 43, 1954.

FEDERAL RESERVE CREDIT OUTSTANDING

Unlike changes in the gold stock, changes in Federal Reserve credit outstanding cannot be associated with a short list of economic variables, for they reflect the policies of the Federal Reserve System. The policy followed at any time conceivably may link the changes in credit to particular variables, but the basis of the link will disappear when the policy is altered. When the currency is convertible into gold, at least for foreign payments, the quantity of Reserve credit outstanding will in the long run be related to the domestic gold stock. Nevertheless, the relation can be far from firm, even practically nonexistent for long periods, as in the interwar period, when the disruptions of war and depression led governments to interfere with the normal operation of the gold-standard mechanism. Thanks to an accumulation of sizable excess gold reserves during and after World War I, the Federal Reserve Board acquired great leeway in pursuing policies without regard for gold flows.

How, under those circumstances, is one to describe and interpret the Reserve System's behavior? It might at first seem sensible to suppose that the proper operation of a central bank is to produce a constant rate of growth of its credit outstanding; one might then compare the actual growth with the standard. But the Board could not and did not disregard changes in other components of high-powered money, in other determinants of the money stock, and developments in the economy at large. A policy aimed at producing a constant rate of growth of the money stock (never, of course, adopted) might or might not have been proper, but certainly a policy with that aim for Federal Reserve credit outstanding or total high-powered money would not have been. Indeed, the multitude of factors by which central bankers may be guided makes interpretation of their actions difficult, and their pronouncements have been far from explicit. There is a danger of imagining elaborate policies where none existed. Moreover, for many of the years before World War II, one is impressed with how often short-run exigencies seemed to displace longer-range considerations. In any event, the time series for Federal Reserve credit outstanding in Chart 3 is volatile and, taken in the abstract, seemingly void of any pattern that would relate it to a few other economic variables; the series only "comes to life" if we place each

movement in its historical setting. Inasmuch as many such discussions are available elsewhere,[19] this section briefly reviews the major developments.

The Federal Reserve System was established to prevent banking panics like that of 1907. Designed to provide a source of emergency reserves for commercial banks in times of stress, the System proved its importance during its first years in this respect, but for an unexpected purpose: to supply the wartime demand for credit which developed soon after the Reserve Banks were organized. Their discounts created high-powered reserves for the banking system. In 1917, Federal Reserve credit supplemented gold inflows in expanding bank reserves and, for the next three years, when gold was being exported, continued the reserve expansion. The Reserve Banks did not, it should be noted, directly finance much of the government's wartime budget deficit, which was almost wholly covered instead by sale of U.S. bonds to commercial banks and the public. But the Reserve Banks prevented a large rise in the cost of borrowed money by keeping their discount rates low and supplying at those rates most of the credit demanded. In that way, they expanded the quantity of high-powered money available to commercial banks for loans to businesses as well as for investment in U.S. bonds.

For a little over a year after the end of the war the government's war-connected expenses continued and were met by issuing short-term certificates at low rates. The Federal Reserve Board hesitated to hinder the Treasury's financing and did not restrict credit. Although many people expected that the high prices of 1918 would collapse immediately after the war, there was no major decline; readjustment to consumer-goods production was exceedingly quick, and the wartime boom resumed. At the end of 1919, with most of the Treasury's short-term borrowing needs out of the way, discount rates were raised to encourage liquidation of the credit previously extended and to halt the fall in the Reserve Banks' gold-reserve ratio. Federal Reserve credit outstanding was nevertheless stable throughout most of 1920 and did not begin to decline until the end of that year; then it fell drastically. The business contraction, which started a few months after the rise in rates, reduced the demand for loans and hastened the

[19] See in particular the relevant chapters of Friedman and Schwartz, *A Monetary History*.

subsequent liquidation of credit. The decline in business, while comparatively short, was deep.

Between the contraction of Federal Reserve credit outstanding in 1921–22 and the advent of World War II, the quantity underwent comparatively moderate cyclical fluctuations, with but one exception: a sharp increase to offset an outflow of gold in the international disturbance of 1931. Following the British suspension of convertibility on September 21, 1931, holders of dollar funds converted them into foreign exchange at a rapid rate in expectation of a similar action by the U.S. government. Most of the resulting gold outflow occurred in September and October. The Reserve Banks more than offset that loss by an expansion of credit over the fiscal year 1932 as a whole, shown in Chart 3, though not before first contracting credit sharply from November 1931 through March 1932. The contraction of credit was motivated by fear that gold reserves might otherwise fall below legal requirements and lead to suspension—apparently considered worse than the action taken.

The significance of the absence of large increases in Federal Reserve credit outstanding during the 1920's is that the Reserve Banks were not using the excess gold reserves built up during World War I to increase high-powered money outstanding. Furthermore, because of the apparently temporary nature of the large increases in the gold stock during the postwar years 1921–24, it seemed proper to prevent those flows from expanding high-powered money. They did so by offsetting decreases in Reserve Bank credit outstanding. The Reserve Banks had the resources to spare the economy the inconvenience of short-run adjustments whenever possible, and judicious management of those resources for the general welfare seemed to call for an offset to such disturbances. In some degree, too, the Reserve Board was probably sensitive to charges that it had fostered inflation by its willingness to serve the wartime financial needs of the Treasury, and it was in no mood to accept the ordinary consequences of gold flows.[20] Having accumulated excess gold reserves, the Reserve Banks could then offset outflows without encroaching upon their statutory reserve requirements. The increases in Reserve credit outstanding in

[20] The Board was not perturbed by the mild contractions in prices during the 1920's, even though it had been criticized severely for its part in the 1921 deflation (see H. L. Reed, *Federal Reserve Policy, 1921–1930*, New York, McGraw-Hill, 1930, pp. 31–32).

1925 and 1928, for example, almost wholly counteracted concurrent losses of gold. Nevertheless, losses were temporary during that period and were never, contrary to earlier expectations, very large, thanks in part to the continued overvaluation of the British pound and to the Reserve System's earlier policy of offsetting gold inflows. The policy worked effectively to suppress the equilibrating mechanism that would ordinarily have tended to diminish or even reverse the prevailing forces responsible for bringing gold from abroad. Because of that policy and difficulties abroad, the System had to cope mainly with embarrassing increases in the gold stock. The widely discussed decision to dampen speculation by tightening credit during the stock market boom of 1929, which shows up in a decline in high-powered money in Chart 3 for fiscal years 1929–30, required steps to counteract a sizable increase in the gold stock.

When, after 1933, gold-stock increases became enormous, the Reserve Banks allowed the increases to expand high-powered money. Although the expansion seemed desirable in view of the low state of business activity, its size soon caused concern, and in 1936–37 reserve requirements of member banks were raised to prevent possible inflationary expansion of bank loans (discussed in Chapter 5). Substantial reductions in Federal Reserve credit outstanding to offset the gold stock increases were not made, however. Instead, the Treasury sterilized the gold flows by selling bonds (discussed later under Treasury Operations).

The increases in the gold stock, at first accelerated by the unsettling events following the outbreak of World War II in Europe, were interrupted upon United States involvement. The expansion of high-powered money nevertheless continued, though the source now became Federal Reserve credit instead of changes in the gold stock. With the prospect of deficit financing by sale of government bonds, the Treasury and the Federal Reserve agreed in early 1942 that the prevailing level of interest rates, by any standard extremely low, was high enough for the government's borrowing costs. So the country waged the war at $2\frac{1}{2}$ per cent—that is, the longest-term government securities paid that rate; shorter-term, correspondingly less. Naturally, since the Treasury could not be expected to raise all the funds it needed at those rates, the Federal Reserve had in effect committed itself to make up the difference by standing ready to buy all U.S. securities offered at the

agreed prices. As fully expected, those prices, which reflected interest rates reached after a decade of depression, offered yields below "the market" in the wartime years of full activity, and the Reserve Banks had to buy in heavy volume.

Yet, this episode compares favorably with that during World War I in terms of percentage increases in high-powered money. In 1917–18 the average increase per year was 21 per cent, and in 1942–45 it was 16 per cent. The direction of the difference is surprising, because the average annual federal deficit was three times as large in proportion to national income during the second war as it was during the first. Also, in the first war, U.S. bonds paid a higher rate of interest. Of the many circumstances that may be adduced to explain the difference, two seem especially important.

First, commercial banks at the start of the second war had huge usable reserves (that is, high-powered reserves above legally required amounts), which allowed banks to create, as they did, a multiple expansion of credit to purchase government bonds. From December 1940 to December 1945, of $80 billion of earning assets commercial banks added to their portfolios, about $46 billion was accounted for by the investment of usable reserves held at the beginning of the period.[21] Thus, 57.5 per cent of the increase in portfolios represented investment of usable reserves, the other remaining 42.5 per cent, investment of increases in high-powered reserves. By comparison, just before and during World War I, usable reserves were relatively low.

Second, the percentage increase per year in Federal Reserve credit outstanding was much less during the second than the first war despite the bond supports in the second. There may have been a special reason for the public's willingness to acquire and hold U.S. bonds off the market at low yields, mentioned later.

With the end of the war and of large Treasury deficits, the Federal

[21] This figure is derived by dividing usable reserves invested over the period by the total reserve ratio at the end of the period. Table F-10 shows that the total reserve ratio dropped 14.3 percentage points over the period and stood at 15.9 per cent at the end of the period. (The required reserve ratio for both member and other commercial banks was approximately the same at the end as at the beginning of the period, and so the drop in the total ratio approximates that in the usable ratio.) Table F-8 (cols. 6 and 8) shows deposits to be $51.2 billion at the beginning of the period. Hence, the amount of reserves invested by the end of the period equaled approximately $46 billion ($51.2 billion $\times$ 0.143/0.159).

Reserve Banks did not abandon the bond-support program, though several minor adjustments were allowed in the pattern of interest rates. Such continued interference with the security markets was unprecedented for peacetime. Reasons given to justify it reflected in part the desire of the government to keep down the interest burden of the federal debt and in part the belief that low interest rates would promote full employment. The deflationary aftermath of World War I and the protracted unemployment of the 1930's were still vivid memories, and measures to prevent a recurrence of such conditions seemed more important than restraint by the Federal Reserve on the postwar rise in commodity prices. Standing ready to accept all U.S. bonds at the supported price, the Reserve Banks could not, of course, also sell them in sufficient volume to restrict credit effectively.

The Reserve Banks were able, nonetheless, to make moderate reductions in their credit outstanding from mid-1946 to mid-1950, enough at least to offset concurrent additions to the gold stock and to hold the growth of high-powered money to a low rate (in fiscal year 1950, negative). That was accomplished, of course, only because holders of U.S. securities did not choose to cash in at the support prices, though it is not clear why: whether the low yields were actually competitive with the going return on alternative investments, taking into account the risk differential; or whether the guaranteed stability in selling price made U.S. bonds almost equivalent to money and thus justified their low yields by endowing them with qualities not possessed by alternative investments. Of the two alternative explanations, the second is likely to have been more important. Without the transformation of U.S. interest-bearing debt into a near money, their yields were likely to have been too low for the amount outstanding, in which case the Reserve Banks would have been obliged to buy heavily.

The dangers to monetary stability that many feared from the bond-support program arose suddenly when war erupted in Korea in June 1950, and the Reserve Banks had to underwrite an inflationary upsurge of bank credit. The consequences of the commitment to low interest rates are shown by the sharp rise in Reserve credit outstanding. For fiscal year 1951, the amount increased over $5 billion, most of which can be ascribed to the sale of U.S. securities by commercial banks. High-powered reserves so supplied to commercial banks amounted to almost one-third of the June 1950 level of their reserves,

although the actual increase in reserves was considerably less because of an outflow of gold at the same time.

Those events apparently crystallized a growing dissatisfaction among Federal Reserve officials with the bond-support program, for in March 1951 they reached an "Accord" with the Treasury not to guarantee the support of U.S. bond prices, though an explicit announcement that the support program had ended was not made for another two years. The declining rate of growth of high-powered money thereafter reflects the application by the Reserve Banks of increasing restraint on monetary expansion. The policy helped achieve a roughly constant level of prices from 1952 through 1955. Federal Reserve officials were able to devote their full powers to the avowed pursuit of economic stability more or less unhindered by obligations to accommodate the credit "needs" of business and agriculture, as during the 1920's; by heavy gold flows, as during the 1930's; or by large Treasury deficits, as during both world wars.

SILVER PURCHASES

Many countries not on a silver standard make regular purchases of silver bullion for coinage; annual amounts of coins issued are typically a small fraction of the total money stock and are determined by the public's demand for them. In the United States which, since 1873, has not been on a formal bimetallic standard, such purchases have been expanded several times with the intention of raising the general price level by issue of large quantities of silver coins or paper "silver certificates" with silver bullion as backing. The required legislation has received support in Congress, usually in periods of deflation, from representatives of agricultural and silver-producing states. The effect of the silver-purchase acts was, therefore, an early counterpart on a smaller scale of recession deficits in recent decades.[22] The "silver issue" in American politics erupted for the first time in the latter 1870's and resulted in the passage of the Bland-Allison Silver Purchase Act of 1878. In 1873, Congress had discontinued the free coinage of silver dollars[23] (except for the little-used "trade dollars" for export)

[22] On the origin of silver-purchase legislation, see A. D. Noyes, *Forty Years of American Finance*, New York, Putnam, 1909, pp. 6–7, 35–38.

[23] Though purchase of small amounts of silver for fractional coinage continued, in particular to replace the fractional paper currency ("shinplasters") issued during the Civil War.

with not a murmur of dissent. It was three years later, in the midst of the 1873–79 depression that the action was branded the "crime of '73." U.S. prices had started to decline following the Civil War and continued to decline with preparations for resumption in 1879 and thereafter with a secular decline in world prices lasting until the mid-1890's. As already suggested, the growth of world trade and of gold use was outpacing the growth of the world gold stock and so was depressing price levels. Political leaders of western agricultural states joined forces with those of silver-producing states and territories—which had witnessed a fall of the price of silver to lower and lower levels at a time when several rich strikes were adding to its domestic output—to advocate a return to the free coinage of silver. Arresting the decline in the price of silver became the panacea for reversing the decline in all prices—a forlorn hope so long as the gold standard was maintained. Most of the silver supporters proposed, in effect, abandoning the gold standard, but the most they ever achieved was to require the Treasury to purchase silver. The only beneficiaries of the legislation were owners of silver mines.

The contribution of those purchases to the growth of high-powered money is shown in Chart 3. Under the provisions of the Bland-Allison Act, the Treasury began in March 1878 to purchase about $2 million of silver bullion a month, which slightly increased the rate of purchases for fractional coinage previously made under prior acts (in 1873, 1875, and 1876), by then tapering off. The silver movement reached its high point with the passage of the Sherman Act in 1890, which required the Treasury approximately to double its silver purchases. About the same time, the secular decline in world prices resulted in a series of large gold outflows from this country, intensified perhaps by uncertainty over future U.S. monetary policies raised by the silver issue. The decline in the Treasury's gold reserve, combined with its forced purchases of silver, proved such a threat to the continued convertibility of currency into gold that the Sherman Act was repealed in 1893, despite strong opposition by the silver forces. The repeal fanned the political fire, which blazed up during the tense Presidential election of 1896, in which the unsuccessful candidate, William Jennings Bryan, ran on a platform of unlimited free coinage of silver. Though Bryan ran again in 1900 for the Presidency on the same platform, the issue no longer agitated the nation, because events provided

another solution: U.S. prices began a secular rise in 1897, following an earlier upturn in world prices, which lasted for a decade or more.

After 1893, the only silver purchases other than those for fractional coinage were made just after World War I, and then again beginning in 1934 in order to inflate the money stock—but again with the chief result of subsidizing silver production.[24] The latter purchases were fairly large until 1936 but then gradually lost importance as a percentage of high-powered money and became negligible after 1942.[25]

Aside from the direct monetary effects of silver purchases on the growth of high-powered money, they are also alleged to have impaired confidence in the dollar in the 1890's. If so, the purchases would have induced conversions of paper to gold currency, both internally and abroad, and would have contributed far more, in this way than through direct effects, to the Treasury's difficulties in maintaining the necessary gold reserve for convertibility. It seems reasonable to expect such indirect effects, and historians have unreservedly proffered this thesis with the companion implication that dishoarding of gold after Bryan's defeat greatly augmented the Treasury's reserve.[26] It is not so clear, however, how important the indirect effects were. They may have played a part in net capital imports declining and becoming net exports during the 1890's; the frequent and unfavorable comment on the silver issue in the English press is partial evidence of such an effect. There were other factors, however, which encourged a withdrawal of foreign funds, such as the blow to investors' confidence in foreign securities stemming from the Baring crisis in 1890. Furthermore, the net capital flow was outward from the United States, though declining in amount, until well after 1900, whereas the silver issue had lost importance long before. While dollar securities must have been looked upon abroad as entailing some risk of inconvertibility into gold, the size of the effect on foreign investment is unknown.[27]

[24] Also, sale of silver from Treasury holdings was authorized for special purposes during the two world wars.

[25] In 1963, with the open market price of silver rising, Congress repealed the silver-purchase legislation on the books since the 1930's, apparently ending a long—and costly—chapter of U.S. financial history.

[26] See, for example, D. R. Dewey, *Financial History of the United States*, New York, Longmans, 1931, p. 454; and E. W. Kemmerer, *Money: The Principles of Money and Their Exemplification*, New York, Macmillan, 1938, p. 391.

[27] For a detailed discussion, see Friedman and Schwartz, *A Monetary History*, Chap. 3.

Was there, in addition, an internal drain on the Treasury's gold reserve reflecting domestic concern over the future of the dollar? The data I have examined give evidence of such a drain but not in the way usually implied. Banks and not the public were responsible for the drain. Consider first the hoarding of gold outside banks. The ratio of gold coin and certificates to currency (including gold) held by the public actually declined from around 22 per cent in early 1890 to 19 per cent in July 1893; then, as a result of the banking panic in that year, it rose to about 25 per cent by February 1894; thereafter it declined slowly. It rose from 20.7 to 21.2 per cent from July to October of 1896, which drained about $5 million from the Treasury's gold reserve, an amount almost indistinguishable from a seasonal movement;[28] the ratio remained practically constant during the year following Bryan's defeat. According to these figures, therefore, public hoarding of gold began after the Sherman Act had been in effect for over two years and was moderate during the election campaign of 1896; nor did the public dishoard gold after the election.

The Treasury's gold reserve declined steadily after 1889, most of what it lost going abroad or to national banks. The ratio of gold specie to total vault cash of national banks rose from an average level of 27 per cent before 1892 to nearly 40 per cent by 1895–96. Although most of the increase came before repeal of the Sherman Act, the ratio continued to rise throughout 1894 and then held just under the 40 per cent level, not increasing at all during the agitation of 1896. After the defeat of Bryan, the ratio did not fall—as often implied—but rose sharply during 1897, probably because of the large gold inflows beginning in that year. The increased gold holdings before 1895 undoubtedly reflected speculation by banks on a rise in the price of

[28] These figures include the gold holdings of the public plus nonnational banks. It is clear, however, that those banks held relatively little, though the exact amounts are not available (see data on reporting nonnational banks in the *Annual Report* of the Comptroller of the Currency).

There is evidence of a short-lived decline of confidence in the dollar during July 1896, following Bryan's nomination. The Treasury's gold reserve fell over $10 million during the first three weeks of that month. Most of the gold went abroad. By the end of the month the reserve stood higher than at the beginning, however, helped by a transfer of gold from banks and the organization of a private exchange pool to prevent further outflows, both at the request of the government, and by a growing belief that Bryan would not win (see M. Simon, "The Hot Money Movement and the Private Exchange Pool Proposal of 1896," *Journal of Economic History*, Mar. 1960, pp. 31–50).

gold, which would occur if the Treasury suspended convertibility, though it is not clear why banks rather than the public should speculate. Banks had nothing to lose from suspension and no more to gain than the public had.[29] They were apparently not operating on behalf of their depositors, since there is no indication that the acceptance of deposits payable in gold, discontinued in 1879, was revived.[30] In any event, national banks accumulated about $50 million of gold specie from 1892 to 1894, the approximate amount of the maximum fall of the Treasury's reserve below the desired level of $100 million during that period.

Fears of currency depreciation may have been responsible for a rise in the average yield on currency bonds in 1896 compared with that on gold bonds, though the difference was only about three-tenths of a percentage point.[31] Very likely, the psychological effects of the silver agitation were not, therefore, negligible, though claims of gold hoarding by the public seem exaggerated. The data indicate, as noted above, that the decline in the Treasury's reserve can be attributed to the accumulation of gold by national banks.

TREASURY OPERATIONS, EXCLUDING SILVER PURCHASES

These operations have generally not been used as an instrument of monetary policy in the customary sense of that term. The Treasury has seldom produced changes in high-powered money for monetary purposes. It has no mandate from Congress and used to have little

[29] Nevertheless, banks had begun to insert gold clauses in notes and mortgages in the early 1890's.

[30] An article in the New York *Tribune* (Feb. 11, 1893) states: "At some of the banks it was learned that inquiries had been made in regard to the withdrawal of depositors' balances in gold." The article then lists the rules adopted by the New York Clearing House Association on Nov. 11, 1878, prohibiting gold deposits after Dec. 31, 1878. It continues: "bankers . . . stated to the persons making the inquiries that under the rules of the Clearing House they were prohibited from opening gold accounts, and as the New York banks generally loan their money repayable in funds current at the New York Clearing House, they would expect to pay their depositors in kind. It is understood that the banks will generally take this stand."

[31] Based on my comparison of currency and gold railroad bonds (from F. R. Macauley, *Some Theoretical Problems Suggested by The Movements of Interest Rates, Bond Yields and Stock Prices*, New York, NBER, 1938, Table 1 and p. A68). Average yields on currency bonds fell by four-tenths of a percentage point from Sept. 1896 to Jan. 1897, and average yields on gold bonds fell one-tenth of a point, a difference of three-tenths of a point suggesting that the comparative yields on currency bonds had increased by that amount before Bryan's defeat in November.

flexibility in its financial operations to change the money stock. Moreover, Congress has specifically authorized the issue of each kind of currency. The only discretion the Treasury has had over amounts issued are special cases. During the Civil War, Congress authorized issue of greenbacks, within certain limits, and minor amounts of various other circulating notes as needed for expenses. The various silver purchase acts permitted the Treasury to issue silver dollars or certificates on the basis of seigniorage, that is, the profit in purchasing silver at a price lower than its value when coined.[32] The Thomas Amendment to the Farm Relief Act of 1933 authorized issue of up to $3 billion of greenbacks to retire U.S. debt outstanding, but none were ever issued and the authority was rescinded by the act of June 12, 1945. Otherwise, the Treasury, in terms of its monetary effects, has mostly functioned as a currency exchange, converting coins and paper bills on demand and issuing gold or silver dollars and certificates on the basis of its purchases of gold and silver bullion. To be sure, the Treasury is not specifically required to reissue currency when paid in, although Congress has restricted the legal retirement of certain currencies.[33] Budget surpluses or bond sales might have been used to

[32] In Chart 3 such issues are covered by Treasury operations, excluding silver; the series for silver purchases includes only their cost. Before 1934, seigniorage, after deduction of certain mint costs, has been included by Treasury accounting practice in budget receipts, the official figures for which are used in Table F-5. The table therefore understates the contribution of the budget to high-powered money (because seigniorage as received does not reduce high-powered money outstanding; when spent, usually not in the year acquired, seigniorage finances budget expenditures from the issue of new money). The table also overstates correspondingly the contribution of the residual item, miscellaneous accounts. The amounts of seigniorage have not been insignificant: under the Bland-Allison Act it was $68.6 million and under the Sherman Act, $64.3 million (see *Annual Report* of the Director of the Mint, 1906, pp. 77–78). Seigniorage from purchases under the Silver Purchase Act of 1934 has not been included in regular budget receipts (see *Annual Report* of the Secretary of the Treasury, 1935, p. 264). Sales have apparently been treated in a comparable manner. On the treatment of seigniorage, see Johnson, *The Treasury and Monetary Policy*, pp. 179–80; and D. H. Leavens, *Silver Money*, Bloomington, 1939, pp. 270–281.

[33] One example is the repeal in 1878 of the provision of the Resumption Act calling for limited retirement of greenbacks. Their circulation is still set by law at the quantity then outstanding—$346,681,016. The other examples are the Sherman Act which, until its repeal, prohibited legal retirement of Treasury notes of 1890 issued in payment for the silver purchases prescribed by the Act; and the Silver Purchase Act of 1934, which required issue of silver certificates in an amount not less than the cost of silver purchased. Those acts allowed but did not require, except the act of 1878 which did, that the notes or certificates actually be reissued when paid into the Treasury. A restriction on reissuing notes was imposed by the act of 1900, which provided that, should the Treasury's gold reserve fall below $150 million, notes presented for redemption thereafter must not be reissued until the reserve again reached that level.

withdraw Treasury currency from circulation, but such use has occurred on only three occasions, discussed below. Consequently, Treasury operations have not in the long run made a significant contribution to high-powered money. Table 10 shows their annual fluctuations also tend in most short-run periods to average close to zero.

There are only four instances of importance since 1875 in which Treasury operations, excluding silver purchases, were used as an instrument of monetary policy to affect high-powered money: (1) preparations for resumption of specie payments in 1875–79; (2) sale of bonds to augment the Treasury's gold reserve in 1895–96; (3) support of New York banks during seasonal and cyclical stringencies of credit from around 1900 to World War I; and (4) gold sterilization during 1936–38. In other years, those operations produced more or less random effects on high-powered money, as Chart 3 suggests, though monthly data, not derived, might reveal seasonal or cyclical patterns arising from the nature of Treasury budget receipts and other operations. We may look more closely at the four operations just listed.

1. During 1877–78, in order to build up its gold reserve before resumption of specie payments at the start of 1879, the Treasury sold bonds as authorized by the Resumption Act of 1875. The sources of change in high-powered money show the arithmetic of those preparations. Chart 3 and Table F-5 were derived on a fiscal-year basis, however, and need to be supplemented. In the second half of fiscal 1879, after preparations for resumption had been completed and specie payments begun, other large operations of the Treasury swamped the results of its actions before resumption. In particular, the Treasury continued refunding its war-incurred debt on a large scale after 1879, which explains the large increase in its deposits at commercial banks for that fiscal year (see Table F-5), most of which came after the end of 1878 and had nothing to do with resumption. The sources have been estimated, therefore, for the first half of fiscal 1879. Combined with figures for the preceding fiscal years back to June 1875, they are shown in Table 12.

During that period, the Treasury sold bonds for $118 million, though only $95.5 million was used specifically for purchasing gold,[34] the remainder having been issued in connection with refunding

[34] *Annual Report on the Finances*, Secretary of the Treasury, 1878, p. ix.

operations. The Treasury's gold reserve (not shown in the table) rose to $135.4 million at the end of 1878, an increase of $81.7 million over its holdings on June 30, 1875.[35] As the figures imply, about $14 million of the gold purchased was paid out again (before resumption, the Treasury was obligated to pay the interest on its bonds in gold). Bond sales provided half of the Treasury's contractionary influence on high-powered money; a budget surplus of $94 million provided the other half. The surplus and the bond sales totalled $212 million,

TABLE 12

SOURCES OF CHANGE IN HIGH-POWERED MONEY, JUNE 30, 1875, THROUGH DECEMBER 31, 1878
(millions of dollars)

		Treasury Operations						
Total	Monetary Gold Stock	Silver Purchases	Total, Excluding Silver	Budget	Debt	Deposits at Banks	Miscellaneous Accounts	National Bank Notes
-26	106	54	-166	-94	-118	38	8	-20

Source: Table F-5, except for June to Dec. 1878, which was derived from the same sources as the earlier figures were. Premiums received over par value of bonds sold, which are counted as a budget item in Table F-5, are here excluded from the budget and put into the debt account.

part of it absorbed by increases of Treasury deposits at banks and by changes in miscellaneous accounts, leaving the net effect on high-powered money at $166 million. Of this, silver purchases absorbed $54 million. Another $106 million purchased newly-mined and imported gold (as shown by the gold stock increase). While those purchases augmented the Treasury's reserve, they did not affect high-powered money outstanding because most of the bond sales "sterilized" the increase in the gold stock. The net remainder of Treasury operations, totaling $6 million, retired that amount of U.S. currency, which would have comprised the total reduction in high-powered money if national banks had not also retired $20 million of notes.

What the change in high-powered money would have been had the Treasury done nothing is not clear. While its contractionary

[35] *Ibid.*, 1899, p. 42; and *Annual Report*, Director of the Mint, 1907, p. 87. The net reserve at the end of 1878, that is, after deducting the quantity of gold certificates outstanding ("warehouse receipts" for gold), was $114 million and increased $77 million over the period.

influence equalled $166 million, the gold stock rose $106 million, owing in part to the Treasury's direct purchases abroad. No doubt part of the increase would have occurred anyway. Hence, if Treasury operations (excluding silver) had averaged zero, the change in high-powered money would have been augmented by at least $60 million (assuming also no change in the gold stock) and perhaps by as much as $166 million (assuming the same increase in the gold stock). On the basis of the actual quantity of high-powered money and the levels of the currency and reserve ratios at the end of 1878, this means that the money stock would have been higher by 8 to 22 per cent, if the Treasury had not acted. If the price level had been that much higher (that is, assuming the level of economic activity and the velocity of money had been the same), resumption would have been a much more precarious undertaking. In short, the Treasury's operations were not a negligible factor in the monetary adjustments of that period.[36]

2. By fiscal 1895 the Treasury's free gold reserve (that is, excluding a 100 per cent reserve for the small amount of gold certificates outstanding) had shrunk to an average end-of-month level of $89 million and threatened to fall further. Although the silver purchase clause of the Sherman Act had been repealed in 1893, further balance-of-payments deficits appeared likely in view of the declining level of prices abroad. A free gold reserve of $100 million had been considered the minimum required, and the fall below that figure was thought to undermine confidence in the government's ability to maintain convertibility and thus to intensify the drain on the reserve. Since the cash budget began to run a sizable deficit in fiscal 1894, the only way to acquire gold was to sell bonds. The Treasury had sold $59 million of bonds[37] in early 1894, but it had not even covered the budget deficit in that fiscal year, though Treasury operations (excluding silver) as a whole had slightly reduced high-powered money by virtue of changes in miscellaneous accounts. Inflationists in Congress controverted the legality of the bond sales, since the Resumption Act of 1875 did not give the Treasury specific authority to sell bonds after specie

[36] See also James Kindahl, "Economic Factors in Specie Resumption: The United States, 1865–79," *Journal of Political Economy*, Feb. 1961, pp. 30–48; and Friedman and Schwartz, *A Monetary History*, Chap. 2.

[37] Figures on bond sales quoted in this section include a premium over the par value of the bonds sold, which in Table F-5 is included in budget receipts in accordance with Treasury accounting practice.

payments were resumed in 1879. The courts effectively settled the issue by upholding their legality. Another sale of bonds was made in the autumn of 1894, which raised about the same amount of money as the preceding issue had and was equally unsuccessful in building up the gold reserve. The government nevertheless persisted in its course; in early 1895, selling $65 million to a syndicate on stiff terms[38]—to the indignation of the inflationists in Congress—and a year later, $111 million on open subscription. Aided by a decline in the budget deficit and, as related earlier, a general rise in world gold production, the sales raised the Treasury's gold reserve. Thereafter, the reserve generally rose, except during July 1896, through substantial inflows of gold.

The government was preoccupied with replenishing its gold reserve, but its success in stopping further drains largely depended on reducing high-powered money. Normally, the two objectives are accomplished together—selling bonds for gold to domestic buyers also retires high-powered money. To the degree that foreign buyers take the bonds, however, high-powered money is not changed, since the effect of the operation is cancelled, other things the same, by an induced importation of gold in payment for the bonds. In fiscal 1894, as noted, bond sales fell short of the budget deficit, though total Treasury operations (excluding silver) absorbed $4 million of high-powered money. Yet, as a result of concurrent silver purchases, issues of national bank notes, and gold inflows, high-powered money expanded $50 million or 3.3 per cent. In contrast, bond sales of $234 million in the following two fiscal years far exceeded a budget deficit of $67 million, and total Treasury operations (excluding silver) took $152 million of high-powered money out of circulation. Largely for these reasons, but also because of a gold outflow and despite issues of national bank notes, the total reduction in high-powered money was $170 million or 11 per cent.

The reduction was only a little more than the amount of silver purchased in the four preceding fiscal years, 1891–94,[39] and might well have been avoided in the absence of those purchases, not to

[38] See Noyes, *Forty Years*, Chap. X.

[39] Silver purchases in those years totalled $158.9 million (the figures in Table F-5 add to $160 million because of rounding errors), of which $3.0 million represented purchases under authority of the Bland-Allison Act of 1878, and $155.9 million, under the Sherman Act.

mention any capital exports produced by the accompanying agitation over silver.

3. In order to safeguard the public moneys, federal law circumscribes the uses and movements of Treasury funds. The Treasury's ability to change the amount of high-powered money outstanding for purposes of moderating short-run disturbances of its own or others' making in the money market is limited and was strictly so before World War I. Today, the Treasury may shift its cash holdings as desired from its vaults to commercial bank depositories (though in practice, seldom does) or may issue and retire short-term securities in order to forestall random disturbances in the money stock. Such use of short-term debt did not develop until World War I, however, and before 1907 depositing Treasury funds at banks was circumscribed by the Independent Treasury Act of 1846. To use long-term bonds for such short-run purposes was too cumbersome. Moreover, issue of long terms for other purposes than to acquire or augment the gold reserve might not have been legal; in any case, there was certainly no precedent or Congressional intent before 1907 to justify purchase or sale for other purposes. The Treasury could delay calling funds paid over by the public to Treasury accounts in national banks—a long-time practice following new bond issues, which avoided sudden large reductions in high-powered money outstanding. The Treasury could not legally increase high-powered money by depositing currency on hand at banks. Yet in 1902 and later and to some extent even before, the Treasury increased and withdrew U.S. deposits held at banks in order to alleviate periodic stringencies in the money market,[40] though wide publicity was first given to the actions of Secretary Shaw in the early 1900's. Along with his two predecessors, Shaw viewed the Treasury as having great potentiality for such purposes. He employed various devices to preserve the legality of his actions, and Congress later specifically authorized such transfers in the act of March 4, 1907.

The effect on high-powered money of those operations was too short lived to be seen in the annual data of Chart 3. They are analyzed in detail later in terms of their effect on bank reserves (see Chapter 5, section 3).

[40] On that development, see Margaret G. Myers, *The New York Money Market*, New York, Columbia University Press, 1931, Vol. I, pp. 381–390; and Esther R. Taus, *Central Banking Functions of the United States Treasury, 1789–1941*, New York, Columbia, 1943, pp. 97–128; and Friedman and Schwartz, *A Monetary History*, Chap. 4.

4. Following the official devaluation of the dollar in 1934, the gold stock increased enormously and almost continuously until 1941. By 1936 the government became alarmed over the inflationary potentialities of the large rise in bank reserves and decided to prevent further inflows from expanding the monetary base. The only way, except by appreciation of the dollar, was to issue bonds to pay for the the gold acquired, referred to since as the sterilization of gold.

Beginning with December 24, 1936, all increases in the gold stock for the remainder of the fiscal year were sterilized—a little over $1 billion.[41] In the following fiscal year, upon recommendation of the Board of Governors of the Federal Reserve System, the Treasury helped to ease monetary conditions by paying out some of the gold previously sterilized and using the proceeds to retire an equal amount of bonds. Economic activity was on the downgrade at that time, and a stimulus to monetary expansion was desired. In April 1938, with business still depressed, all the remaining gold previously sterilized was desterilized and the program abandoned. For fiscal year 1938 as a whole, therefore, there was a net addition to high-powered money from that operation in an amount equal to the previous fiscal year's sterilization of gold.[42] The net effect of Treasury operations on high-powered money was negative in fiscal year 1937 and positive in fiscal 1938, but only by half the amount of the changes in the Treasury's inactive gold account (where the sterilized gold was recorded) because of offsetting changes in other Treasury operations.

The four instances described cover the main contributions to high-powered money of Treasury operations (excluding silver) that had a monetary purpose. In assessing the importance of Treasury operations, we should not overlook their effect on expectations, however intangible and elusive it may be. The first two of those incidents showed that Treasury operations could be decisive in making possible resumption and maintenance of convertibility. The Department usually displayed determination to act when necessary, which helped engender expectations of continued convertibility with the effect of smoothing out

[41] Through sale of bonds by the Treasury, not the Federal Reserve Banks, which it was felt did not hold sufficient bonds to undertake the operation. The Gold Reserve Act of 1934 gave the Treasury authority to finance gold purchases with bonds, should there persist any doubt whether it had that authority under prior legislation.

[42] In Table F-5, the issue and retirement of the sterilization bonds are included in the debt account.

minor fluctuations in the balance of payments. The importance of such expectations is illustrated by what happened in the first half of the 1890's, when doubts arose over the government's determination to stay on gold, and adverse expectations seem to have augmented the drain on the Treasury's gold reserve (though not as a result of flows to the public, as we found earlier). At other times in the pre-1914 period, the widespread assumption that convertibility could be relied upon may largely account for the smooth operation—mysteriously smooth, from a post-World War I perspective—of the gold-standard mechanism.

NATIONAL BANK NOTES

The stated chief purpose of the National Currency Act of 1863 and as amended in 1864 was to give nationally chartered banks authority to issue paper currency—national bank notes—and to set up arrangements for their backing and redemption, by which the government in effect guaranteed their full convertibility into Treasury currency. The act, as amended, limited note issues of individual national banks in two ways: first, to 90 per cent of their paid-in capital stock;[43] and second, to 90 per cent of the par or market value—whichever was lower—of certain U.S. bonds the banks were required to purchase on the open market and deposit with the Treasury as collateral for note issues. The act of 1900 changed those provisions to allow issues up to 100 per cent of the paid-in capital and of the par or market value of the bonds purchased.

The National Currency Act also restricted the aggregate amount of notes issued by national banks and apportioned the issue rights among individual banks according to state population, location, and certain characteristics of those banks. That provision was swept aside by the Resumption Act of 1875. The quantity of notes outstanding after 1875 therefore depended on their profitability under the capital limitations described in the preceding paragraph. Congress clearly intended the notes to provide a steadily growing quantity of currency for the nation's internal trade but, as Chart 3 shows, changes in the quantity outstanding fluctuated widely over the period, with significant effects at times on the growth of high-powered money. We may look to changes in profitability of the notes to explain the fluctuations.

[43] This limitation, 100 per cent in the act of 1864, was reduced by the act of March 3, 1865, to 90 per cent for banks with capital under $500,000 and to progressively lower percentages down to 60 per cent for banks with greater capital. The act of 1882 made it 90 per cent for all banks.

The profit in issuing the notes may be defined as the difference between the rate of return on capital used to issue notes and the rate on other investments. A bank obtained $90 (after 1900, $100) of notes for issue by purchasing a U.S. bond (of $100 par value) on the open market and depositing it with the Treasury (prices of the bonds were generally at par or above). The notes so obtained could best be spent, if obtaining and issuing them were profitable in the first place, by purchasing another U.S. bond and obtaining more notes for issue, and so on. To side-step the infinite progression implicit in the procedure, we may suppose the bank paid for its initial purchase of bonds with the notes obtained on the deposit of the bonds, plus enough of its own capital funds to make up the difference. (Since the bonds were purchased before the notes were obtained, the bank needed extra funds in the interim, producing a negligible cost in foregone interest earnings.) The capital tied up in acquiring one bond was simply the difference between the market price of the bond P, and the amount of notes issued on the basis of it which, before 1900, was $P - 90$; it would be 0.1 P, if P were less than par. The return to the bank equaled the income on the bond the notes helped to purchase, which may be expressed as $Pi/100$, where i is the percentage yield on the bond to maturity. The annual expense for issuing $90 of notes may be designated by E and comprises an assessment levied by the Treasury to cover its cost of redeeming the notes (about 6 to 7 cents a year per $90 of notes) and a 1 per cent tax per year (reduced to one-half of 1 per cent by the act of 1900) paid by national banks to the government, as required by law.[44] The annual rate of return on capital invested in issuing notes up to 1900 may then be written:

$$\frac{Pi/100 - E}{P - 90},$$

assuming that the market price exceeds the par value of the bonds, as it generally did throughout the period.

Table 13 compares the rate of return on the notes with the average

[44] The issuing bank also had to hold a cash reserve at the Treasury (equal to 5 per cent of the notes authorized for issue), used to redeem notes received through public payments for taxes and other purposes (which the issuing bank could then re-issue). Until 1914, the redemption fund could be applied against the bank's statutory reserve requirements for deposits (sect. 3 of act of June 20, 1874) and so did not constitute a cost of issuing notes. The Federal Reserve Act discontinued inclusion of the redemption funds as part of reserves held, and thereafter the redemption fund constituted a cost of note issue.

rate on capital from all assets of national banks for the years 1879–97, the period of large reductions in the quantity of notes outstanding. The inclusion of notes themselves in all assets biases the figures in

TABLE 13

COMPARISON OF RETURN ON NATIONAL BANK NOTES WITH CHANGE IN THEIR CIRCULATION, 1879–97

Year	Rate of Return on Capital to National Banks from: (per cent per year)			Notes Issued (+) or Retired (-) in Fiscal Year (as per cent of amounts outstanding at beginning of fiscal year)
	Issuing Notes (in Jan.) (1)	All Assets (middle 6 months of fiscal year) (2)	Excess of Rate for Notes over that for All Assets (1)-(2) (3)	(4)
1879	31.2	5.0	26.2	3.0
1880	21.5	7.4	14.1	3.2
1881	11.5	8.4	3.1	-1.9
1882	9.4	9.2	0.2	-1.0
1883	8.5	8.4	0.1	1.0
1884	7.1	8.6	-1.5	-5.5
1885	7.3	6.4	0.9	-8.5
1886	6.7	8.0	-1.3	-9.7
1887	7.5	9.0	-1.5	-29.7
1888	7.9	8.6	-0.7	-8.8
1889	4.8	9.0	-4.2	-16.7
1890	4.9	8.6	-3.7	-2.3
1891	6.2	9.2	-3.0	-1.6
1892	7.8	7.6	0.2	13.7
1893	9.3	7.8	1.5	9.2
1894	9.2	4.2	5.0	11.0
1895	9.3	5.2	4.1	3.5
1896	10.5	5.6	4.9	11.8
1897	9.3	5.4	3.9	-1.0

Source, by Column

(1): Computed by formula in text, where P is the price of the bond whose use as security for national bank note circulation increased the most or decreased the least, arithmetically, over the fiscal years; i is the yield; and E is the cost of issuing $90 of notes.

Data on use of bonds for national bank circulation, from Annual Report, Comptroller of the Currency, 1897, Vol. I, p. 378. Calculations in the table are for the bond whose use for securing notes increased the most or decreased the least in the fiscal year, except in 1881. In that year, the 5 per cent and 6 per cent bonds, whose use increased the most, matured, and so were dropped in favor of the 4 1/2 per cent bonds, whose use decreased the least. Due dates are from ibid. and Annual Report on the Finances, Secretary of the Treasury, various years, particularly 1894, table on outstanding principal of the public debt.

Price P: 1879–84, the average of the Jan. opening and closing prices; for Jan. 1882, $1 was subtracted from the opening price which included interest; 1885–86, from Annual Report, Comptroller of the Currency, 1896, Vol. I, p. 551; 1887–97, from ibid., 1898, Vol. I, p. 402.

Yield i: Obtained from ibid., various years, when given; otherwise, from semiannual yield tables, even though the bonds were quarterly--a procedure that understates the yield by a negligible amount.

NOTES TO TABLE 13 (concluded)

Annual cost of note issue E per $90 of notes: 1883-97, 90 cents, plus $90 times aggregate cost of note issue (ibid., 1896, Vol. I, p. 543; 1897, Vol. I, p. 375), divided by an annual average, centered on Jan. 1, of notes secured by U.S. bonds (ibid., 1897, Vol. I, p. 352). 1879-82, cost per $90 of notes assumed to be same as in 1883 (96 cents).

(2): Ratio of net earnings to capital, including surplus (from Annual Report, Comptroller of the Currency, various years, covering half-years ending Mar. 1), doubled to give annual rate. This introduces a possible rounding error of plus or minus 0.1. A tax on bank capital before 1883 should be deducted from the figures, since the return on notes takes no account of it. The tax affected the figures insignificantly, however, and was ignored.

(3): Col. 1 minus col. 2.

(4): Annual Report, Comptroller of the Currency, 1918, Vol. II, pp. 254 ff., with interpolations of call-date figures to June 30, where needed.

column 3 downward, but the understatement is bound to be slight since notes provided a small part of total bank revenue.

The preceding formula ignores the loss of income on notes in the process of being re-issued after being returned to the Treasury or to the issuing banks for redemption. The quantity of such notes must have been a negligible fraction of the total outstanding, however, because the public accepted them as a perfect substitute for greenbacks after 1874 and made no special effort to redeem them. Any national bank could re-issue the notes of other banks; it did not have to send them to the issuing bank for redemption and usually did not. Yet issuing banks did on the average hold cash reserves at the Treasury in excess of the 5 per cent of notes outstanding required for the redemption fund (see footnote 44). The aggregate balance sheet for all national banks shows an item "due from the Treasurer," which represented the amount on deposit in excess of the 5 per cent redemption fund, usually 10 to 20 per cent of the fund—that is, about one-half to 1 per cent of the notes outstanding. It included balances kept at the Treasury to replenish the 5 per cent fund (if depleted by note redemptions) and money in transit between the banks and the Treasury to settle transactions involved in issuing notes. What part of the funds on deposit at the Treasury represented a regular claim on banks' capital solely for issuing notes is not clear; in any event, the whole part has been omitted in the rate-of-return formula used for Table 13. If they had been taken into account on the assumption that they constituted a regular claim and hence produced an expected cost of issuing notes, the capital tied up would be increased at most by 10 per cent—appropriate for a

bond selling at par, too high for a bond with a premium—and the rates in column 1 would be reduced at most by one-tenth, or less than one percentage point for a profit rate of 10 per cent.

Note Issues Before 1900. The cause of the decline in notes outstanding during the 1880's is readily apparent from the table. The handsome profit in issuing national bank notes (see column 3) available in the late 1870's[45] disappeared in the early 1880's until 1892, when once again the profit differential rose above zero. The fluctuations in profitability were due almost entirely to corresponding fluctuations in the premium on U.S. bonds. Since the law specified that notes could be issued only on the collateral of government bonds up to 90 per cent of their par value or market price, whichever was lower, any premium on the bonds above par value represented extra cost for which no notes could be issued. A rise in the premium thus raised the amount of capital tied up without a corresponding increase in income. A rise in the premium also lowered the yield on the bonds, but it was of much less importance for determining profitability than the amount of capital tied up was.[46]

There was a general decline in all long-term interest rates from about 1870 to 1899. The premium on U.S. bonds tended to rise, especially during the 1880's when the Treasury, after retiring all its callable bonds, bid for others on the open market in order to prevent a recurring budget surplus from devouring the money stock. The premium fell sharply twice: from 1876 to 1879, when the Treasury was

[45] In his 1873 *Annual Report* (p. xxxiii), the Comptroller of the Currency (John Jay Knox) computed the return on capital in issuing notes. His figure is too low, because he assumed the notes would be loaned to customers at the prevailing rate of interest, whereas their use in buying more bonds to secure more notes was much more profitable, as described in the text. In terms of banks' balance sheets, the operation was one in which banks obtained the income on U.S. bonds, held as assets, in exchange for issuing the notes as liabilities and tying up a small amount (after 1900, almost none) of their own capital. The Comptroller's computation, in effect, makes the capital tied up equal to the full price of the bonds, which is absurd. His method of computation and error appear in succeeding annual reports and in various histories of the notes. The purpose of his computations was to disprove a popular opinion—as a rule, a poor guide but in that case, correct—that the notes were at most times highly profitable. (See also Friedman and Schwartz, *A Monetary History*, Chap. 2.)

[46] Suppose, in the preceding formula, the bond was a perpetuity; then its yield could be expressed by its coupon rate, r (a constant), divided by the price. Hence, the formula becomes $(r - E)/(P - 90)$. In this form the return on notes clearly varies inversely and sharply with the price of the bond. For example, if P rose 10 per cent from par, the rate of return would be cut in half. If the bond has a finite maturity, the expression for $Pi/100$ is more complicated but, unless the maturity is very short, still tends to approximate r and so is largely unaffected by changes in P.

borrowing to accumulate a gold reserve and there was some question whether resumption would succeed; and from 1890 to November 1896, when the Treasury changed abruptly after 1893 from purchaser to heavy seller of its bonds, because of a succession of unplanned budget deficits and fear that the government might adopt the program of the silver supporters and be forced off the gold standard. To be sure, the yield on U.S. bonds rose by less than one-half a percentage point from its 1889–92 low, after which the notes became profitable again. Yet the rise in yield was enough to reduce the premium on the bonds by about $10 and was crucial to profitability of the notes. The 4's of 1907—the bonds that secured the largest fraction of the notes outstanding at the time—sold, on average, $28.25 above their par value of $100 in 1889. By the first of 1891 the premium had been cut by one-fourth and two years later was down to $13.

Note issues were widely criticized at the time for not being "elastic with the needs of trade." Among other things, that meant the notes were not quickly expanded in times of stringency or panic, when the desired currency ratio rises sharply. While elasticity of the money stock seems undesirable as a general rule, since during brisk trade it would fan the boom, there was a mechanism at work—albeit unintended by the authors of the National Currency Act—to accomplish just that kind of elasticity. When money tightened and interest rates rose, the price of U.S. bonds tended to decline, and the profitability of the notes thereby increased; even though yields on alternative investments also rose, the amount of the premium on U.S. bonds was crucial. When money eased, the opposite occurred. Nevertheless, changes in the quantity of notes outstanding in response to short-run financial conditions, including panics, were relatively small and so were, in the foregoing terms, unresponsive to the needs of trade. The reason was that the incentive for expansion of note issues apparently required a long time to produce an appreciable response; note issues appear to have been long-run investments for banks, and large short-run adjustments to changes in the rate of return were not attempted.[47]

[47] One restraining factor in effect since 1882 was the obligatory six months' wait, before issuing new notes, whenever banks deposited lawful money at the Treasury in order to reduce their notes outstanding; and even then the reduction was limited to $3 million a month for each bank. The Gold Standard Act of 1900 repealed the waiting period for new issues, and the act of March 4, 1907, raised the allowable rate of decrease in circulation to $9 million a month for each bank.

Apart from failing to provide for such elasticity—of doubtful desirability—the conditions for obtaining notes did indeed link their issue to the amount of the premium on U.S. bonds—again of doubtful desirability. In justice to the authors of the act, we should realize that the unprofitability of the notes in the 1880's and their consequent large-scale retirement were probably not foreseen or desired. If U.S. bonds had continued to sell near par, the notes would have been very profitable. When the bonds rose to a premium, permission to issue notes up to full par value instead of to only 90 per cent would have helped maintain their profitability—a change, as noted, made in 1900 when no longer necessary. No one proposed going further and allowing banks to issue notes up to the full *market* value of the bonds, because that was undesirable on other grounds: the premium on bonds should not serve as security for notes; the government could be expected to guarantee only notes issued against the par value of its bonds, which was all it stood ready to redeem. In retrospect, the mistake of proponents of national bank notes was to base their issue on government bonds. Various proposals—mainly to refund U.S. bonds at lower coupon rates which would have permitted selling at par—were in fact made at the time; but legislative attempts to enact them were blocked by the silver coalition, which preferred that increases in the money stock should favor silver dollars.

In consequence, nothing was done, with the unintended result that declines in the notes during the 1880's offset almost three-fourths of the concurrent purchases of silver, presumably made to inflate prices by expanding the money supply. After 1890, the notes became profitable again as a result of a rise in U.S. bond yields reflecting in part fears about maintenance of the gold standard after the silver supporters had enacted the Sherman Silver Purchase Act. Expansion of national bank notes together with the silver purchases may have seemed desirable to Congressional proponents of inflation, but the resulting additions to the money stock reinforced the drain on the Treasury's gold reserve and thereby threatened maintenance of the gold standard. On such alarming prospects, as we have seen, Congress mustered the votes to repeal the Sherman Act.

The relation between profitability and rate of note issue or retirement provides a means of estimating bias in our profitability figures, assuming banks expand circulation when the true profit is positive and

contract when it is negative. If we regress changes in the notes outstanding on the computed profit rate (columns 3 and 4 in Table 13), the correlation coefficient is 0.48 excluding the first two years, which have extreme rates of return. According to the regression equation, no notes were issued when the computed profit rate was 1.7 per cent per year. That figure implies average costs, not included in our calculations for Table 13, of that amount in issuing the notes, reflecting possibly administrative and handling costs to the issuing bank over and above the assessment and tax levied by the Treasury.

Note Issues after 1900. Issuing notes became extremely profitable following the passage of the Gold Standard Act of 1900.[48] The quantity of notes in circulation expanded rapidly and did not level off until shortly before World War I. Notes outstanding, secured entirely by bonds (that is, not covered by lawful money deposited at the Treasury to redeem or retire notes), increased from $265 million in mid-1900 to just under $725 million in 1913, a rise of nearly 175 per cent. Acquisition of U.S. bonds by banks had no important effect on their prices and on the profitability of issuing notes. Since the capital stock of national banks after about 1905 exceeded the quantity of eligible bonds outstanding, the latter provided the only limit on the increase

[48] The return after 1900 was around 25 per cent per year. This may be illustrated by calculations for 1905 and 1913 based on the consols of 1930 as security, which paid 2 per cent and sold for less than $105 (yielding 1.76 per cent to maturity) in 1905, and after 1913, usually for less than $101. The act of 1900 made the tax on notes secured by the bonds one-half of 1 per cent per year, and other costs to the banks in issuing $90 of notes were reported by the Comptroller as $0.0625 per year. The capital tied up in 1905 was only the premium on the bond, about $5. After 1913, capital tied up included the premium, about $1, as well as the 5 per cent redemption fund (see footnote 44). By the preceding formula, the rate of return for 1905 was

$$\frac{105(0.0176) - 0.5625}{5} = 25.7 \text{ per cent per year;}$$

and after 1913, ignoring the slight effect on the 2 per cent yield of the $1 premium, was

$$\frac{101(0.02) - 0.5625}{6} = 24.3 \text{ per cent per year.}$$

Recomputing with a 5 per cent redemption fund raised by 20 per cent to take account of funds in transit gives rates lower by 1/6 and 1/7, respectively, a comparatively unimportant reduction.

In the foregoing computations, other costs in issuing the notes may, as suggested by the regression, have been overlooked, but that would not weaken the conclusion that the notes were profitable, given that banks issued them at all. If issuing some notes was profitable—as it obviously was—the same would be true of an unlimited quantity, because the profit was not in any apparent way affected by the volume of notes issued, so long as bond prices did not rise materially.

in national bank notes. On October 13, 1913, for example, national banks held as security for notes and government deposits (which also required such collateral) 84 per cent of the eligible bonds outstanding. That left little room for further expansion. By 1926, when the percentage had reached 98, further expansion was virtually impossible without an extension of the issue privilege to other bonds.

The number of eligible bonds actually fell after World War I. Their total value stood at about $900 million from 1901 to World War I, fell through debt retirement during the first half of the 1920's to about $675 million and remained at that level until 1932. In that year, Congress extended the circulation privilege to an additional $3 billion U.S. bonds then outstanding, but only for three years. Banks took advantage of that largesse to only a limited extent. Then in 1935, the Treasury decided to withdraw all such notes from circulation by retiring the last issue of bonds having the circulation privilege. The mechanics of the retirement were the transfer of liability for the notes from national banks to the Treasury, a transaction that canceled the Treasury's liability for an equal amount of the bonds previously used as security. The notes have been gradually retired and replaced by Federal Reserve notes. There was not, therefore, any sudden or long-run change in high-powered money outstanding as a result of national bank note retirement.[49]

These facts show how the shortage of bonds for collateral prevented national banks from increasing note issues very much after the mid-1920's, except for the temporary expansion allowed in 1932–35. It is nevertheless puzzling why, in view of the large profit in issuing the notes after the mid-1890's, their expansion occurred so slowly and never reached 100 per cent of the amount allowed. In 1905, more than five years after the profit had become extremely attractive, national banks had deposited, in order to secure notes and government deposits, less than 60 per cent of the eligible bonds outstanding; and by 1913, as noted, only 84 per cent. Why did banks not bid for the available bonds immediately? Furthermore, while no national bank could issue notes in excess of its paid-in capital, most of them kept under that limit. We might expect, therefore, that bidding for the available bonds would push their prices up high enough to wipe out most of the

[49] See J. D. Paris, *Monetary Policies of the United States 1932–1938*, New York, Columbia University Press, 1938, Chap. V, "The Passing of the National Bank Note."

profit in issuing notes. Yet quoted prices on the largest block of eligible bonds, the consols of 1930, never rose much above their par value. Immediately after their issue in 1900, they went to a premium, touching a high of $110.25 in October 1902 (at which price the return to capital tied up in issuing notes, by the preceding formula, was still an attractive 17.1 per cent per year); yet the premium had all but disappeared by 1909.

We may distinguish two separate puzzles here: First, why most banks did not expand their notes more rapidly; and second, why individual banks did not try to expand their circulation to the limit imposed by their paid-in capital and thus bid up bond prices. The slow expansion suggests that national banks waited until it seemed certain that no reason to withdraw the notes would arise in the near future. Why a withdrawal need be feared, however, is not clear. The bonds securing the notes could always be sold or, if called, redeemed to provide funds to retire the notes. No embarrassing drain on cash reserves of a bank retiring its notes need occur. There was, perhaps, one remote danger: should the market value of the bonds used for collateral fall below par, issuing banks would have to make up the difference immediately by a cash deposit at the Treasury. But that never occurred and never seemed likely to during the period.

Slow expansion aside, failure of prices of eligible bonds to rise much above par indicates that banks were not bidding aggressively for them on the open market. A possible explanation is that the bonds covered by those quotations could not for some reason be used as collateral; or that the quotations were irrelevant, possibly because trading at published prices involved mostly small lots, whereas large lots required much higher prices. This is only a conjecture, however.

Notwithstanding these puzzles, the factors underlying the major movements in notes outstanding are fairly clear and stem, as shown, from the conditions and limitations of their issue.

SUMMARY OF SECULAR MOVEMENTS

The foregoing pages present a historical commentary on the events connected with long-run changes in high-powered money. The discussion emphasizes the major role of the government: how in one way or another it has been involved in all the sources of change, even

in the production of gold. Government monetary activities are of wider scope than those represented by statutory regulations.

The various sources of change are discussed separately and to some extent as though they were independent. As just concluded, however, all stood within the government's control. For this and other reasons, interrelations between them were likely. Consider the various sources of change: (1) Although Treasury operations (excluding silver) usually reflect the need to meet budget expenditures or financial requirements of various government agencies and so for the most part would be independent of the other sources, the four episodes examined were all connected with gold flows (the fourth, indirectly through market stringencies produced by gold outflows) and so represented attempts to affect movements in the gold stock; moreover, those episodes cover most of the largest contributions of Treasury operations to changes in high-powered money. (2) Silver purchases were intended to produce inflation and generally were made in times of deflation when the money stock had fallen below its long-run trend line. (3) Federal Reserve operations were obviously related to the other sources of change, because the Reserve Banks worked to offset undesired movements in high-powered money produced by the other sources. (4) The gold stock is related to the other sources indirectly through effects of changes in the money stock on the domestic price level and international trade. (5) When still permitted, issue of national bank notes, alone among the various sources, was unrelated to the others, although there was a possible connection through Congressional control over conditions of issue. On the whole, the profitability of the notes fluctuated (inversely) with the premium on U.S. bonds.

Such interrelations mean that changes in high-powered money cannot be explained simply as the sum of the sources of change, since these are partly determined by the behavior of the aggregate and of each other. Between 1879 and 1914, high-powered money was closely associated with the behavior of the gold stock, reflecting limits on changes in high-powered money set by the gold-standard mechanism. In mathematical terms, there was a constraint on the *long-run* trend of high-powered money expressed by a linear dependence between the sources of change. Short-run movements in the sources of change could be independent; reaction through the constraint was often delayed, sometimes considerably. After 1914 a more general kind of

constraint prevailed—government policy on money and related matters. It operated even less rigidly than its counterpart in the earlier period; policy sometimes bent to the force of events and did not remain independent of past monetary developments. To the extent that high-powered money reflected government policies here and abroad in the later period, the relative contribution of the sources of change reflected the particular form in which those policies were implemented.

To stress government influences does not mean that the quantity of high-powered money was whatever government policy prescribed; far from it. The government often had no set policy and, when it did, was often hamstrung by political or economic limitations on its ability to achieve particular goals. It may help to summarize various parts of this chapter by listing briefly the economic factors that had important effects on the growth of high-powered money.

Commodity Prices. First, and most important in the long run, was the effect on the gold stock of changes in the commodity value of gold, chiefly changes in the dollar prices of commodities but also occasional alterations in the dollar price of gold. Domestic price movements affected the U.S. gold stock inversely, both through world gold production—insofar as U.S. prices followed world price levels—and through changes in the U.S. share of the existing world monetary gold stock—insofar as U.S. and world price movements diverged. Friedman and Schwartz found that purchasing-power parity between the dollar and the British pound mostly varied within a fairly narrow range,[50] suggesting that the balance of trade and gold flows may have been sensitive to differences in relative prices even in the short run, except for certain periods in which international trade was disrupted. The effect of price movements on gold production was also strong but, as we saw, occurred with long and varying lags. Consequently, effects of only the very largest movements in prices can be readily detected in the data on gold production and the U.S. stock. Emphasis on those effects does not of course deny important autonomous influences on world gold production owing to the depletion of mines or to the fortuitous discovery of gold-bearing ores. Nevertheless, the largest deviations from trend since 1875 have been related to price movements or devaluation.

[50] *A Monetary History*, Chap. 13, sect. 2.

Movements in commodity prices apparently did not greatly affect any of the other sources of change in high-powered money, except possibly silver purchases, which have been increased in periods of deflation.

Interest Rates. The only effect of other specific economic variables was that of interest rates on issues of national bank notes. The conditions of issue were so arranged (not intentionally) that a rise in interest rates depressed U.S. bond prices and increased the profitability of issuing the notes—and conversely. Hence, there was a positive relation between their issue and interest rates, though it was by no means close and only shows up in the large movements during the 1880's and 1890's. Thereafter, the quantity of U.S. bonds eligible as security for the notes limited further note issues, though the actual circulation approached the limit very slowly.

General Business Conditions. Federal Reserve operations and, before them, Treasury operations are primarily instruments of government monetary policies and, for that very reason, reflect developments in business activity, but not in a uniform or consistent way. If there was any consistent pattern, it was mitigation of the impact of gold-stock movements on high-powered money, at least temporarily, and of other sharp reductions in the money stock due to other sources of change. On the other hand, Federal Reserve operations have at critical times reinforced such reductions, as in 1921 and 1931, and have also been an independent source of large increases, as during the two world wars.

On the whole, however, the contribution of those operations to secular movements in high-powered money has been minor; they are of more interest in short-run movements, discussed in the next section. Indeed, if we confine our attention to major long-run movements and omit war periods, the principal source of change in high-powered money, by far, has been growth of the gold stock.

2. *Cyclical Movements in the Sources of Change in High-Powered Money*

The effects of different institutional developments and economic variables on the determinants can be partly disentangled, when the relevant movements are large and the number of important factors in any period is small—largely true for secular movements. Cyclical movements, however, are a kaleidoscope of many effects, commingling

in a constantly changing pattern. Identifying even one effect is difficult. We can still find clues to the major effects from cyclical patterns of the principal sources of change in high-powered money. The series are plotted according to the National Bureau's chronology of expansions and contractions in reference cycles (Table 1). The period of expansion is divided into thirds, and standings for stages II, III, and IV are averages of the series for these three periods, respectively, centered at the midpoints. Standings for stages VI, VII, and VIII are averages for a similar division into thirds of the contraction period. For monthly data, stage I is an average of the three months surrounding the initial trough, stage V the peak, and stage IX the terminal trough.

Chart 6 presents the reference cycle patterns of change in high-powered money, in the gold stock, and in the residual, found by subtracting the second from the first. The residual is the sum of the sources listed in Table 10, columns 3–6, reflecting chiefly Treasury and Federal Reserve operations but also all other nongold sources of change. The patterns show the change in each series as a percentage of the average level of high-powered money over the cycle, which is convenient for tracing the sources of change in high-powered money. Some stages cover a short time span and may reflect sharp changes in the series that did not last long. Hence, we should not attach too much significance to sharp movements formed by just one stage of a pattern.

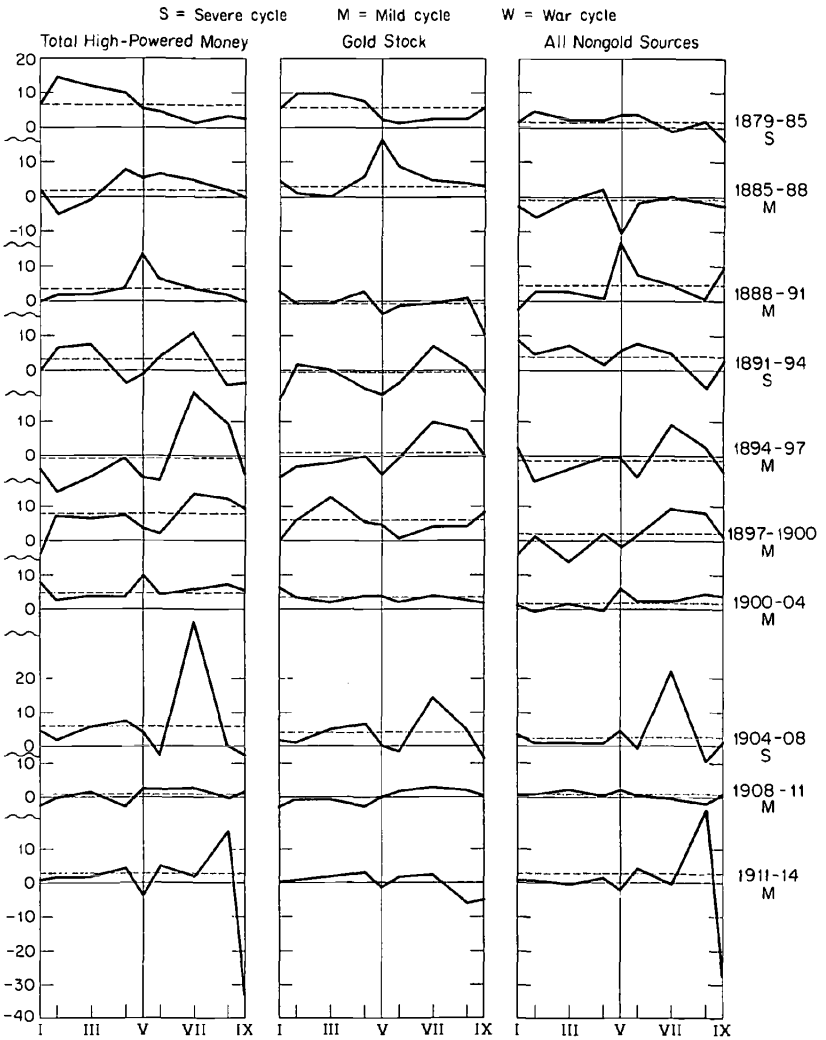
Chart 6 shows little uniformity from cycle to cycle for either of the sources of change. For the nongold sources before 1914, many of the cycles have large dissimilar movements. The only recurring pattern of any consequence is a rise in stage VII of the 1894–97, 1897–1900, and 1904–08 cycles, partly attributable to the Treasury's relief of banks, mentioned earlier,[51] and in stage VIII of the 1911–14 cycle, due to the emergency issues of national bank notes in the 1914 panic.[52] After 1914, in the two world war cycles, the Reserve Banks first expanded and then sharply cut the rate of growth of high-powered money. Aside from the war cycles, there is still no uniform pattern after 1914, though the fluctuations display a larger amplitude on the average and seem more responsive to major changes in economic

[51] Under Treasury Operations, item 3; see also Chapter 5, sect. 3.

[52] See Chap. 4, sect. 2; and O. M. W. Sprague, "The Crisis of 1914 in the United States, *American Economic Review*, Sept. 1915, pp. 522–23.

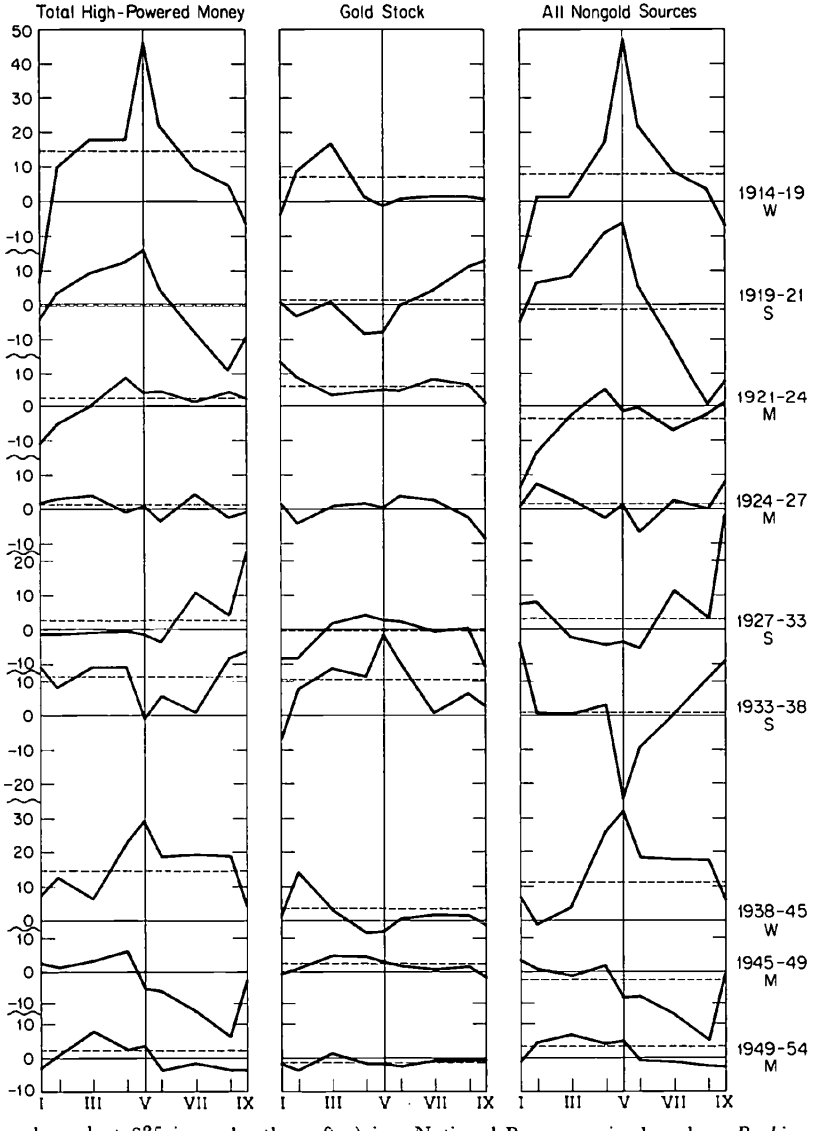
CHART 6

Reference Cycle Patterns of Sources of Change in High-Powered Money, 1879–1954 (change per year as percentage of average reference cycle level of high-powered money)



Source: Severe cycles comprise the six most severe reference contractions in business activity by the ranking in Table 1. All other nonwar cycles are mild. Stage standings were computed from changes in quarterly averages of seasonally adjusted end-of-month data, divided by the average level of total high-powered money over each cycle. Total high-powered money, the same as for Table F-1 (a monthly seasonally-adjusted version of the annual series described in the notes to col. 1 of Table F-5). The gold stock (valued at $20.67 per fine ounce through the 1927–33

CHART 6 (*concluded*)

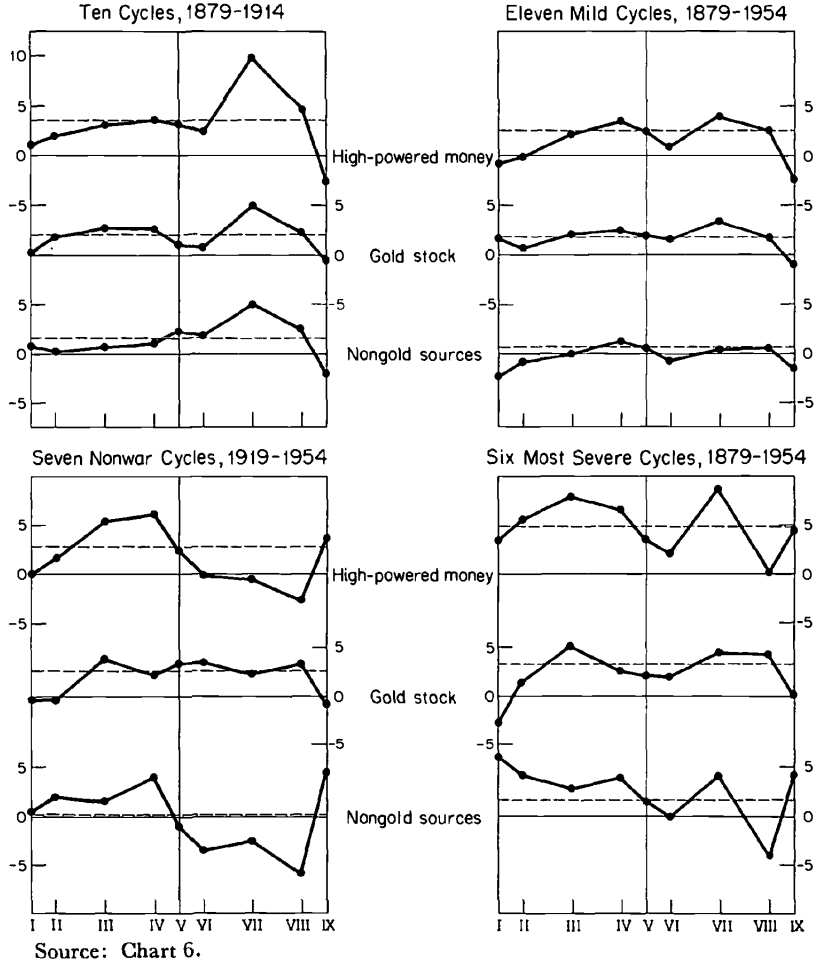


cycle and at $35 in cycles thereafter) is a National Bureau series based on *Banking and Monetary Statistics*, pp. 373–377, for 1914–41 and *Federal Reserve Bulletin*, thereafter, and on monthly Treasury estimates 1879–1913 adjusted before 1907 to the level of annual bench marks given in *Annual Report*, Director of the Mint, 1907, p. 87. All nongold sources is the difference for each stage of the standing of total high-powered money and the standing of the gold stock; hence, the sum of the two patterns on the right equal the pattern on the left for the stages of each cycle.

Note: Horizontal broken lines show average values of the series over each cycle.

CHART 7

Average Reference Cycle Patterns of Sources of Change in High-Powered Money (change per year as percentage of average reference cycle level of high-powered money)



Source: Chart 6.

Note: Horizontal broken lines show average values of the series over each group of cycles.

activity, as shown by the comparatively sharp peaks or troughs formed in stage IV, V, or VI. The latter configurations are due largely to Federal Reserve credit outstanding, which is the main item in the nongold sources. The Reserve Banks responded to changes in the business climate, but not in any uniform way from cycle to cycle. Federal Reserve credit outstanding is largely responsible for the increased amplitude of fluctuations in the nongold sources after 1914.

For the gold stock, as well, no recurring movements run through a majority of the patterns. Changes in the gold stock result from domestic production and the balance of foreign payments. The former probably does not display much cyclical variation, except when there are unusually sharp changes in the commodity value of gold. The balance of foreign payments, on the other hand, is the focal point of myriad developments in international trade and finance and in both domestic and foreign economic activity. For most cycles after 1914, the structural disruptions of international trade may well have swamped any uniform cyclical responses that occurred. The absence of a uniform pattern is not unexpected, therefore, for the later period. Before 1914, one might expect to find clearer evidence of international influences but, whatever their role, they did not leave a consistent imprint on the gold stock.

A few tendencies running through some of the patterns may be brought out by two comparisons: one between the average pattern of nonwar cycles before and after 1914, and the other between cycles with severe and mild contractions in business activity. The comparisons are presented in Chart 7. Since the patterns for each cycle are expressed as percentages of the average level of high-powered money, the averages do not overemphasize movements in the later cycles, even though in dollar terms the original data have an upward trend.

In the earlier of the two periods, there was a tendency in contractions of the gold and nongold sources of change to reinforce each other. This might be expected of a monetary system committed to the gold-standard mechanism and with Treasury currency outstanding—generally true of the U.S. monetary system at that time. If the gold and nongold sources were uncorrelated, the gold flows would have a less than proportional effect on high-powered money and so on the money stock; whereas a high positive correlation tends to make the

effect nearly proportional. In the later period, the correlation is slightly negative, indicating an offset, though cyclical variations in gold, moderate in the individual patterns, are nearly nonexistent in the average pattern. High-powered money acquired a new pattern produced by the nongold sources, chiefly as a result of Federal Reserve actions. The new pattern—expanded growth during reference expansions and reduced growth (often even decline) during reference contractions—undoubtedly did not represent a deliberate Federal Reserve policy. As can be seen in Chart 6, that pattern occurred mainly in mild cycles and is probably explained as the response of an agency willing to satisfy market demands for credit, which vary more or less with business activity. Yet this is not the whole story, since there was a tightening of credit just before peaks when the demand usually continues strong.

The mild and severe cycles differed in the tendency of the nongold sources to decline before peaks. Those sources declined throughout severe reference expansions but expanded until stage IV of mild expansions. The great diversity among severe cycles, however, indicates that such behavior falls far short of being an invariant pattern for such cycles. As Chart 6 shows, the four most recent severe cycles display a variety of patterns. The only safe generalization is that high-powered money has a greater amplitude in severe cycles, which is largely true of both the gold and nongold sources of change.

The diversity among cycles in Chart 6 accounts for the small amplitude of the average patterns in Chart 7. The averaging flattens out not only the most atypical movements but also many other fluctuations. Since there are few regularities to start with, what remains are muted reflections of the largest movements, and little else. In view of the diversity, it is advisable to avoid averages and to confine the analysis to groups of individual cycles. For that purpose, the establishment of the Federal Reserve Banks in 1914 seems a meaningful dividing line between earlier and later cycles. In the earlier period, gold was the dominant source of change in high-powered money, and international factors probably had much more influence then than later. In the later period, the Reserve Banks—a new source of change in high-powered money—introduced a new set of influences, of which the interdependence among the determinants analyzed in Chapter 2 is a partial reflection.

PRE-WORLD WAR I CYCLES

Changes in the gold stock result chiefly from imbalances between foreign payments and receipts. These international influences on high-powered money are brought out by Chart 8, which presents pre-1914 reference cycle patterns of the balance of commodity trade. The balance is given as a percentage of the average level of high-powered money during each reference cycle and so is comparable with the series in the two preceding charts. Data on services are unobtainable and cannot be added to make up the total trade balance. Although relatively large in average amount, the services balance probably displays a much smaller amplitude of cyclical variation than does the commodity balance.[53] The patterns to the right show all other sources of change in the gold stock, found by subtracting the stage standings for the commodity balance from the corresponding standings for the gold stock in Chart 6. Both patterns have the intra-cyclical trend removed and are displayed as deviations from the zero line, because the average levels of the patterns for the two series are not related.

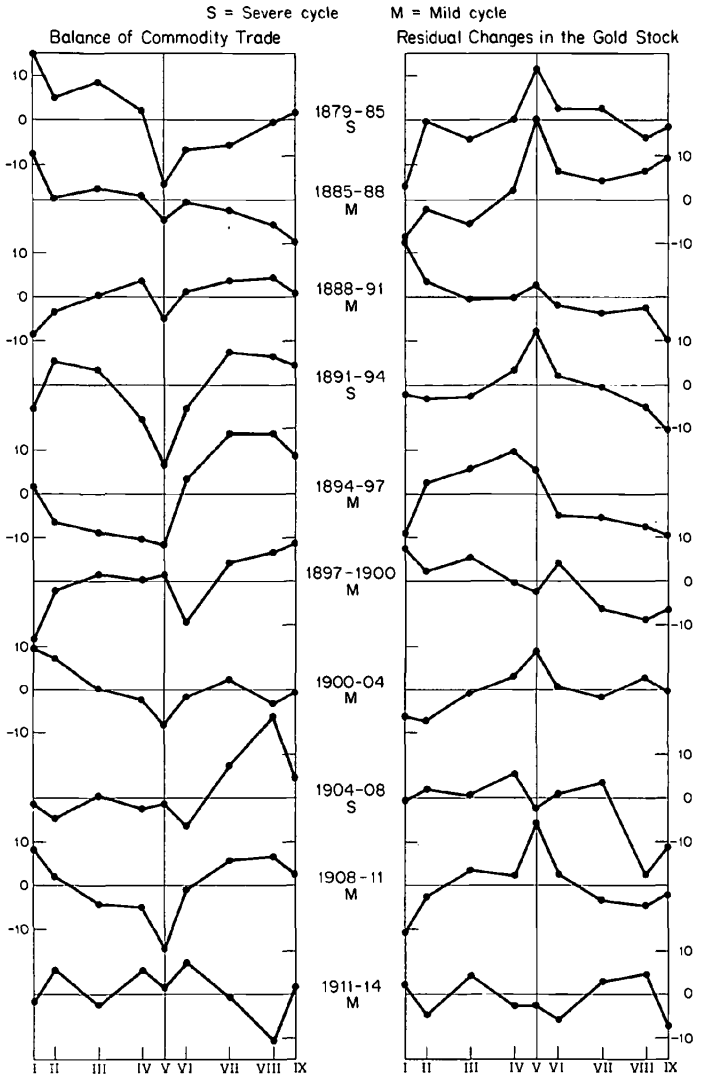
Although there is not much uniformity among the patterns for the gold stock in Chart 6, one similarity is their tendency to dip sharply around reference peaks. The dip is most prominent in the 1891–94, 1894–97, and 1904–08 cycles, though many of the others before 1914, as well as some after, display traces of it. The dip largely accounts for the greater amplitude of the gold-stock patterns before 1914 than after. It shows up clearly in the patterns for the balance of commodity trade in Chart 8 and can be attributed to them. The behavior of the trade balance can be traced, in turn, to imports and exports. Partway through reference expansions, the rising volume of exports tapered off and declined, while the volume of imports continued to rise; during reference contractions imports declined, while exports recovered rapidly at first and then slowly.[54] The imports pattern reflects domestic business activity, which typically had the same effect on imports as on domestic expenditures. The causes of the pattern for exports are not so transparent. One explanation is that rising prices during reference

[53] See Ilse Mintz, *Trade Balances During Business Cycles: U.S. and Britain since 1880*, NBER, Occasional Paper 67, 1959, pp. 6–7.

[54] *Ibid.*, p. 15. This pattern for exports is less characteristic of post-World War I cycles.

CHART 8

Reference Cycle Patterns of Balance of Commodity Trade, and Residual Changes in the Gold Stock, 1879–1914
(amount per year as percentage of average reference cycle level of high-powered money)



Source

Severe and mild cycles, same as for Chart 6. Stage standings were computed from seasonally adjusted quarterly data, divided by the average level of total high-powered money over each cycle. Intracyclical trend was removed by adjusting the standing of all nine stages to average zero for each cycle. Balance of commodity trade is from Mintz, *Trade Balances During Business Cycles*, Table A-1.

Residual changes in the gold stock are the difference for each stage between the standing of the gold stock in Chart 6 (after removing intracyclical trend as above) and the standing of the balance of commodity trade.

expansions eventually curtailed the amount demanded abroad and produced the pre-peak decline in the volume of exports. Yet by far the most important factors affecting exports were changes in foreign demand that seem unrelated to domestic prices.[55] Domestic price changes were secondary.

The dips in the trade balance around reference peaks were the most prominent part of what was often an inverse cyclical pattern. Although imports usually had a positive pattern, contributing to an inverse pattern in the trade balance, exports were usually out of step with domestic cycles, expanding or contracting in conformity with world trade. In that way, foreign business conditions had an irregular influence on domestic business cycles.[56]

Fluctuations in the trade balance have two related but distinct influences on domestic activity: a direct influence through current spending of the excess of foreign expenditures on U.S. exports over U.S. expenditures on imports from abroad; and an indirect influence through the accumulated effect of gold flows on the money stock. The two influences work in the same direction but with different timing. Insofar as fluctuations in the trade balance have an immediate influence—largely true of the direct impact on spending—the inverse pattern moderates domestic cycles, reducing aggregate expenditures during business expansions and augmenting them during contractions. Insofar as the fluctuations have a delayed influence—largely true of the accumulated effect of gold flows on the money stock—the inverse pattern might also reinforce domestic cycles, at least in part, and perhaps even help to initiate them. The declines during the latter

[55] See Mintz, *American Exports During Business Cycles, 1879–1958*, New York, NBER, Occasional Paper 76, 1961, especially Chaps. 3 and 6; and NBER, "Staff Progress Reports," Jan.–May 15, 1963 (mimeographed), p. 43.

[56] See Mintz, *Trade Balances*.

part of each business expansion might act with a lag to depress the economy during the first part of the subsequent contraction and, conversely, for contractions and subsequent expansions. When a variable moves counter to business cycles, as the pre-1914 trade balance did, it may help to moderate or to generate cycles or, at different times, both. Whether it has predominantly one effect or the other, allowing for lags, is difficult to determine.

Although the contribution of the trade balance and gold flows to business cycles is not clear, the monetary effects of the trade balance transmitted through gold flows may be further analyzed. Charts 6 and 8 indicate that the trade-balance and gold-stock patterns do not correspond closely, particularly in amplitude. A comparison of the right and left panels of Chart 8 shows why. The residual sources of change in the gold stock largely offset the monetary effects of the trade balance. Stage by stage of each cycle, the two patterns usually lie on opposite sides of the zero line. Only in one-tenth of the stages shown do the two lie on the same side. The negative association applies also to amplitudes of the patterns. The correlation coefficient between the two patterns, giving each stage equal weight, is -0.83, indicating that the trade balance is highly correlated with the residual sources and only faintly correlated with changes in the gold stock. This is doubtless an overstatement of the "true" association, since the residual patterns were derived by subtracting the trade-balance patterns from the gold-stock patterns, thus producing a spurious negative correlation between measurement errors in the trade balance and the residual. That might account for much of the observed correlation. However, if we assume the measurement errors are not unusually large, the correlation is highly significant.

The pre-1914 residual sources consist of domestic gold production, the services balance, and capital movements (both short and long term). Short-term capital movements are probably responsible for most of the offset; the other two items would not ordinarily be very sensitive to short-run developments. Chart 8 therefore provides important evidence that pre-1914 capital movements dampened cyclical variations in the gold stock. This is consistent with the observation of many commentators that gold movements in that period were small and infrequent relative to the large cyclical fluctuations in

international trade patterns.[57] International lending apparently took care of most cyclical and other temporary imbalances of payments, and gold stocks were largely unaffected, except when there was a basic disequilibrium persisting for more than one or two cycles. How the offsetting capital movements came about is not clear. Were they induced by speculative arbitrage of exchange rate movements or by interest rate differentials? Whatever the answer, capital movements in that period acted to stabilize exchange rates, understandable in a milieu with no threat—except briefly in the 1890's—of government tampering with foreign exchange markets.

The capital flows offset movements in the trade balance incompletely, however. Many of the gold-stock patterns resemble movements in the trade balance. In addition, while capital offsets postponed the need for gold flows, they could not by their nature last long and may have engendered expectations which transmitted changes in the trade balance to the money market in other ways. Commercial banks may have managed their reserves partly with an eye on short-term capital movements, keeping more plentiful reserves than they otherwise would have when short-term capital flowed in, and keeping less reserves when it flowed out, in readiness for a reversal of capital movements later on. Such behavior by banks would produce part of the effects on the money stock that offsetting capital movements prevent the trade balance from producing directly. To determine whether banks behaved in that way requires a careful examination of banking data, so far not undertaken. Aside from expectations, the effect of the trade balance on the money stock appears to have been weak, blunted by capital movements and buffeted by the nongold sources of change in high-powered money. Nevertheless, it was real, since high-powered money owed much of its double-hump pattern before 1914 to the trade balance.

If business cycles are transmitted internationally through the balance of trade, one of the intriguing implications is that the balance has just the opposite effect in each direction. A favorable U.S. balance, for example, stimulates the domestic economy and at the same time

[57] See, for example, Arthur I. Bloomfield, *Short-Term Capital Movements Under the Pre-1914 Gold Standard*, Princeton Studies in International Finance No. 11, 1963, esp. pp. 43–44.

depresses the economies of other countries. Consequently, there has long been a tendency to attribute synchronous world cycles[58] to disturbances originating in one country and unilaterally transmitted abroad. For example, the United States is often thought to be the source of many worldwide cycles.[59] The generally inverse pattern of the U.S. trade balance in the pre-1914 period supports this view. If we ignore lags, an inverse trade balance sends gold abroad and stimulates foreign economies, while U.S. activity expands, and depresses them by bringing gold back, while U.S. activity contracts. In the other direction, the effect of the pattern is to moderate U.S. cycles.

Yet one might argue—about the pre-1914 period at least—that U.S. cycles frequently stemmed from foreign influences and were not usually transmitted abroad. This country's economy during the nineteenth century could not have counted heavily with most foreign economies, while world trade clearly affected U.S. exports. Their irregular cyclical pattern, as noted, reflected the ups and downs of foreign business activity, which often moved counter to domestic business. To be sure, since cyclical fluctuations in the U.S. trade balance were generally moderate, the direct effects on domestic expenditures may have been of minor importance, while the indirect effects on the money stock were partly offset by capital movements and were usually overshadowed by domestic factors. At certain times, however, fluctuations in the trade balance were large and—even when of short duration—may have triggered cyclical movements in other variables. The gold outflow in 1931 was brief but, as mentioned, had far-reaching repercussions.

The evidence is not clear-cut and does not allow firm conclusions. The inverse pattern of the U.S. balance may be misleading because of lags. Even if the direct expenditure effects occur more or less immediately, many of the indirect monetary effects may have appreciable lags. In addition, feedback cannot be assumed to be unimportant. A disturbance from one country travels out around the world, collides with those from other countries, and is sent back, modified and delayed,

[58] Business cycle peaks in Great Britain, France, and Germany matched U.S. reference peaks from 1882 to 1913, except 1887, 1893, 1895, and 1910. See Oskar Morgenstern, *International Financial Transactions and Business Cycles*, Princeton for NBER, 1959, Chap. II.

[59] For a discussion of the literature and the evidence, see Mintz, *Trade Balances*, especially pp. 1–5 and 83–90.

as a series of disturbances over time. Because of the difficulty of disentangling foreign and domestic influences, the extent to which business cycles are transmitted internationally remains obscure, except perhaps in countries closely tied, like the United States and Canada. Studies to clarify the international transmission of cycles have so far merely scratched the surface of a vast subject.

In view of its complexity, we might hope to illuminate the problem with evidence from later cycles. Unfortunately, foreign influences are hidden even more thoroughly in the later period, despite their obviously great importance. Gold flows became larger after 1914 but relatively less decisive in domestic monetary affairs owing to the increased role of central banks. The following discussion of the later period therefore largely ignores the cyclical role of gold, in acknowledgment of our ignorance of its role rather than because of any evidence of its unimportance after 1914.

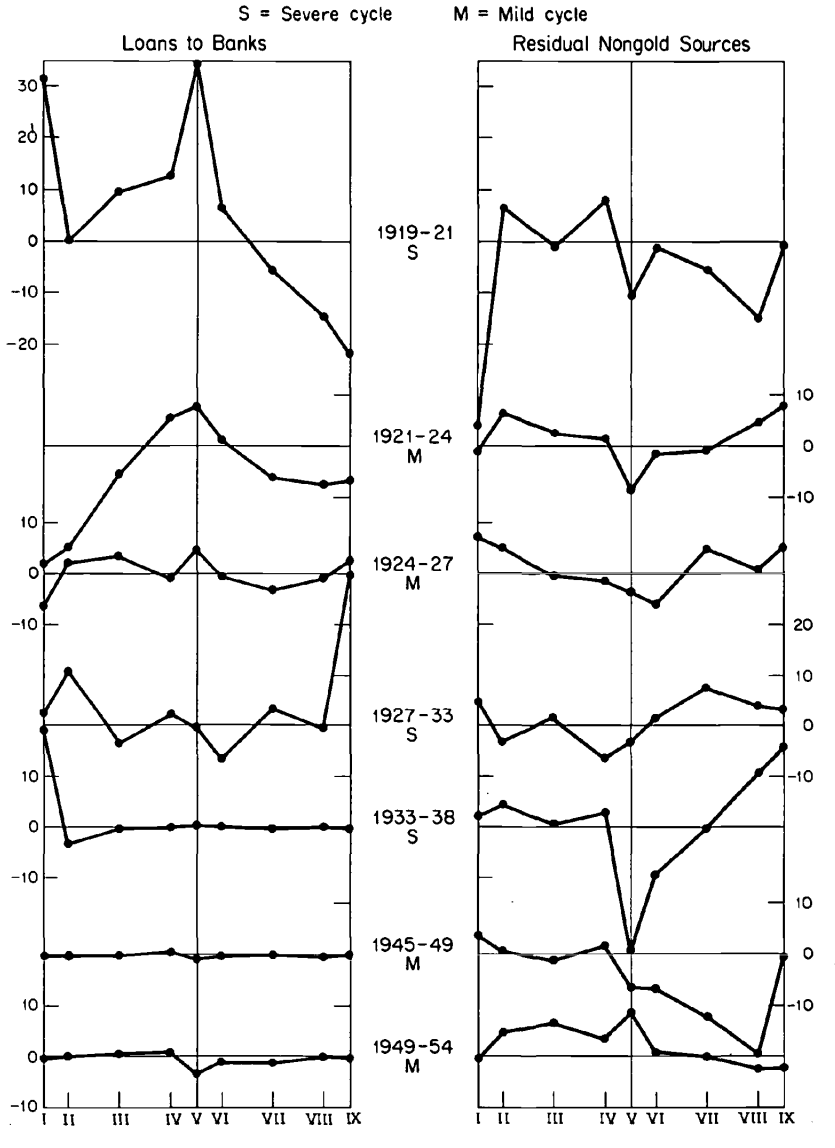
POST-WORLD WAR I CYCLES

In Chapter 2 we estimated that high-powered money offset about one-quarter of the pre-1914 fluctuations in the currency and reserve ratios. Since it seemed to reflect parallel responses to business cycles rather than a direct relation, offsetting movements among the three determinants were disregarded in the preceding section. The estimate of the offset for the post-1918 period was much greater in certain stages, and most of the increase was tentatively attributed to steps taken by the Federal Reserve Banks to counteract the effects on the money stock of changes in the two ratios. Insofar as high-powered money reflects the behavior of the two ratios in part but not in full, the contribution of government monetary policies is difficult to interpret.

To clarify the behavior of Federal Reserve Banks, it may help to separate their discounts and advances to commercial banks from the other nongold sources of change in high-powered money. Loans to banks are sometimes viewed as a "passive" element in Federal Reserve actions compared with "active" steps like open market operations, since loans are made at the initiative of member banks and are controlled by the authorities only indirectly through the discount rate and persuasion. In Chart 9, reference cycle patterns of changes in loans outstanding to member banks are shown as a percentage of the average level of high-powered money during each reference cycle

CHART 9

Nonwar Reference Cycle Patterns of Change in Federal Reserve Loans to Member Banks and of Residual Nongold Sources of Change in High-Powered Money, 1919–54 (change per year as percentage of average reference cycle level of high-powered money)



Source

For severe and mild cycles, the same as for Charts 6 and 8. The stage standings of loans to banks were computed from quarterly changes in seasonally adjusted monthly averages of daily figures (from *Annual Report*, Federal Reserve Board, 1928, pp. 47–49; *Banking and Monetary Statistics*, pp. 369 ff.; and *Federal Reserve Bulletin*). The standings were then divided by the average level of total high-powered money over each cycle. No adjustment was made for trend.

Residual nongold sources are the difference for each stage between the standing of all nongold sources in Chart 6 and the standing of loans to banks.

and so may be directly compared with patterns in the preceding charts. Also shown are the patterns of the residual nongold sources of change in high-powered money, found by subtracting the standings of the left-hand patterns in Chart 9 from those for total nongold sources in the right-hand strip of Chart 6. The residual comprises Federal Reserve open market operations, Treasury operations (including silver purchases), and issues of national bank notes. The latter two were minor except during the 1930's, when the Treasury for a while offset gold inflows, and national bank notes were retired (see Chart 3).

During the Federal Reserve Banks' first two decades, their loans to banks were an important source of changes in high-powered money. During the 1930's, however, those loans were hardly used at all, as commercial banks found it more advantageous to hold excess reserves than to borrow. Since the 1930's, the volume of loans to banks has grown but, relative to the quantity of high-powered money outstanding, they have remained insignificant, although they receive wide attention as an indicator (together with the quantity of excess reserves) of banks' ability and willingness to expand credit.

Changes in loans to banks conformed positively to the three reference cycles from 1919–1927. The patterns for the reference cycles since 1945 (including the 1954–58 and 1958–61 cycles, not shown), though of small amplitude, also conform positively and, in addition, lead at peaks both in amount of change and in absolute level. The positive conformity seems readily explained by cyclical fluctuations in the market demand for funds. Commercial loans fluctuate with economic activity and are a major source of cyclical variation in bank reserves. To help ease pressure during expansions, banks borrow from Federal Reserve Banks even for temporary relief, if the discount rate is not too high. Why loans to banks have declined before reference peaks in the post-1945 cycles is not clear, since bank loans to business typically

continue to rise until or past the peak in economic activity. Perhaps the Federal Reserve System, through persuasion and increases in the discount rate, was responsible for the early decline, or banks might have been wary of raising their indebtedness beyond certain limits, despite the high demand by customers for more credit.

The pattern for the 1927–33 cycle, though erratic, conforms on the whole inversely, apparently for special reasons. Increases in the discount rate in 1928–29—which Federal Reserve officials hoped would dampen stock market speculation—discouraged banks from borrowing as much as might otherwise have been expected. In 1930–33, the deepening distress of banks forced them to borrow.

Given that loans to banks generally conform positively, one might, in search of countercyclical monetary policies, expect that the residual nongold sources of change in high-powered money would display inverse conformity with at least enough amplitude to offset the fluctuations in loans to banks. Or one might expect inverse conformity because, turning the direction of influence around, Reserve Banks allow member banks to borrow temporarily to cushion the impact of open market operations. If we put aside the post-1933 cycles, when loans to banks were negligible, the only earlier pattern to fulfill the expectation even approximately is that for 1924–27—in all respects a very mild cycle. The 1921–24 pattern has inverse conformity but lacks sufficient amplitude to offset the sharp recovery in loans to banks during the expansion stages. Possibly, though, the insufficient amplitude should be overlooked as allowing a welcome correction of the 1921 contraction in which credit liquidation had gone too far. The 1919–21 and 1927–33 patterns fail to meet the expectation because they reinforce the fluctuations in loans to banks, though under quite different circumstances. In the 1919–21 cycle, residual nongold sources offset some of the more extreme movements in loans to banks but had a positive conformity over all. Here, monetary policy and market forces worked in the same directions. Following the end of hostilities in 1918, the Federal Reserve Banks at first allowed the wartime expansion of credit to continue for fear of rocking the government bond market. Later, in 1920, the discount rate was raised to encourage a liquidation of credit, which proceeded to run out of control. In the expansion phase of the 1927–33 cycle, though the residual nongold sources offset some of the stage-to-stage movements in loans to banks,

both patterns reflect the policy mentioned earlier of tightening credit to starve the bull market in stocks. During the subsequent reference contraction in 1929–33 both patterns rose, but with amazing restraint considering the magnitude of the disaster then overtaking the economy.

In Chart 7, the average pattern for total nongold sources in the post-1919 period displays positive conformity. Chart 9 helps to show why. The positive patterns of loans to banks are not offset by inverse patterns of the residual nongold sources. Only the 1924–27 cycle had even an approximate offset. In the 1921–24 cycle, the offset was partial, and in the 1919–21, 1945–49, and 1949–54 cycles the residual nongold sources had positive conformity. The special reasons for the positive pattern in the 1919–21 cycle have been mentioned. Special reasons partly explain the last two also. Countercyclical policies yielded to the bond-support program during World War II and until the early 1950's and exposed Federal Reserve credit outstanding to cyclical swings in interest rates and market demands for credit. That leaves the two cycles from 1927 to 1938 as the only ones in the post-1919 period in which the total nongold sources had inverse conformity (see Chart 6). Even then, the 1927–33 pattern, though inverse, can hardly be called countercyclical, when the money stock fell by one-third from 1929 to 1933. The 1933–39 pattern mainly reflects Treasury operations in sterilizing gold, since the Federal Reserve virtually ceased open-market operations during the second half of the 1930's.

If we exclude all these special influences, the remaining cycles are too few to support generalizations about Federal Reserve policies. Interpretation of the patterns is also obscured by their dependence on the currency and reserve ratios. High-powered money offset about nine-tenths of the contributions of the two ratios to the rate of change of the money stock in specific-cycle stages III through VI (Chapter 2). The offset accounted for about one-half the cyclical variation in the contribution of high-powered money in those stages and seemed to reflect in large part countercyclical measures taken by the authorities. In the other stages the offset was much lower and seemed to reflect simply parallel responses of the three determinants to business cycles. According to the average timing relations shown in Table 1, the specific-cycle stages with the high interdependence correspond roughly to stages I through IV of the post-1919 cycles. As can be inferred from

Chart 2 and is shown later, these stages correspond to a falling contribution of the currency ratio and rising contribution of the reserve ratio, with that of the currency ratio predominating. Offsetting behavior by high-powered money would be a slightly rising rate of change during reference expansions. This may explain why the average pattern for the nongold source in Chart 7 for the latter period rises from stage I to stage IV.

In general, however, the over-all positive conformity of changes in high-powered money to reference cycles cannot be explained by a dependence on the two ratios. One reason is that the dependence was estimated among cycles separately for each stage and so does not necessarily imply anything about stage-to-stage movements in high-powered money. It implies only that the contribution of this determinant was high when the combined contribution of the two ratios was low, and vice versa. Average patterns may well conceal such a relationship. Another reason already suggested is that the dependence accounts for only one-half the cyclical variation in high-powered money; the total variation is obscured by the other half, which has no uniform pattern.

SUMMARY OF CYCLICAL MOVEMENTS

Although their objectives and reactions to cyclical developments varied appreciably, therefore, credit policies of the Reserve Banks had a major impact on monetary conditions from the beginning. The average patterns for high-powered money shown in Chart 7 are substantially different before and after World War I. In the earlier period, the change in high-powered money fluctuates most during reference contractions, having a high peak in stage VII. This pattern can be attributed to corresponding movements in the gold and nongold sources of change and largely reflects the inverse cyclical pattern of the trade balance. In the later period, a high peak occurs instead during reference expansions, and the ensuing decline continues past the reference peak to stage VIII. This behavior reflects almost entirely the pattern of nongold sources, the gold stock showing no consistent pattern except a fall at reference troughs.

Chapter 2 describes cyclical fluctuations in high-powered money as erratic, at least compared with those in the currency and reserve ratios. In the post-World War I period, most of the erratic behavior

resulted from special actions taken by the Reserve Banks and Treasury, as the economy passed through war, severe depression, and other difficult times. Although the second half of the 1950's has brought new problems for the monetary authorities, nothing so far compares with the preceding four hectic decades.