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Reserve notes, Federal Reserve bank notes, and national bank notes. *All* banks, unless otherwise qualified, are all member and non-member banks combined.

*Non-national* banks are member and non-member banks without national charters, including commercial banks, loan and trust companies, savings banks, and private banks.

*Vault cash* includes all kinds of United States currency, metallic and paper, issued by all banks, Federal Reserve Banks, and by the Treasury, whether or not considered part of legal reserves, either held on the premises of member and non-member banks or in transit to or from a Federal Reserve Bank.

*Currency in public circulation*, i.e., outside all banks, Federal Reserve Banks, and both the Treasury Department in Washington, D. C. and the mints and assay offices in the country, includes currency in active use or in hoards held by individuals, business firms, municipalities, states, and non-excluded federal government agencies; also such United States currency as may have been carried abroad, lost, or destroyed.

## 2 DERIVATION OF THE SERIES

### CURRENCY HOLDINGS OF ALL BANKS

Monthly estimates of currency in the hands of the public are the difference between a published monthly series of 'Currency outside the Treasury and the Federal Reserve Banks' (i.e., currency held by the public and by all banks) and estimates of all bank vault cash.<sup>3</sup> The monthly series on vault cash in all banks was constructed from data on vault cash holdings reported by the first five groups of banks listed in Table 1.

The weekly reporting member bank series, for Wednesdays (Fridays before May 1921) closest to the end of each month and to call dates (Chart 1), and the member bank call date series (Chart 2) are familiar data. Call date figures on vault cash in non-member banks, however, have not previously been published. Many state banking departments report on the condition of non-national commercial banks and trust companies, savings banks, loan companies, and private banks—member and non-member. Each state banking department regulates the frequency with which each class of bank within its jurisdiction must report, as well as the form of the condition statement. Many, however, require condition statements as

<sup>3</sup>End-of-month data, published in the Treasury Circulation Statement, are reprinted in the *Federal Reserve Bulletin* under the heading Money (or Currency) in Circulation (App. A). 'Currency in public circulation' is used here to describe currency in the hands only of the public, and should not be confused with the Treasury term, which includes currency in the vaults of all banks.

TABLE 1  
Classes of Banks Reporting Vault Cash, 1914-1944

	REPORTING DATES	SOURCE
1 Weekly Reporting Member Banks: in N.Y., outside N.Y., & Total	Weekly: Fridays, Dec. 1917-April 1921; Wednesdays thereafter	<i>Federal Reserve Bulletin</i>
2 Member Banks of the Federal Reserve System: in Central Reserve Cities, Reserve Cities, Country Districts, & Total	Call Dates: 1914-44 <i>No. of Call Dates each Year</i> 1 1914 3 1921-22; 1926; 1932-33; 1936-37; 1942-44 4 1917-20; 1923-25; 1927-31; 1934-35; 1938-41 6 1915-16	<i>Annual Reports of the Board of Governors of the Federal Reserve System, and Member Bank Call Reports</i>
3 Non-National Banks in Various States	Call dates, varying from 1 to 6, 1914-44	Reports of state Banking Departments
4 All Reporting Banks	On or about June 30: 1914-35; 1938 On or about June 30 and Dec. 31: 1936-37; 1939-44	<i>Annual Reports of the Comptroller of the Currency</i>
5 All National Banks	Call Dates: 1914-44 <i>No. of Call Dates each Year</i> 3 1926; 1932-33; 1936-37; 1942-44 4 1923-25; 1927-31; 1934-35; 1938-41 5 1921-22 6 1914-20	<i>Annual Reports of the Comptroller of the Currency</i>
6 All Non-Member Banks	On or about June 30: 1914-35; 1938 On or about June 30 and Dec. 31: 1936-37; 1939-44	Data for all reporting banks minus data for member banks
7 Philadelphia & Boston Clearing House Banks	Saturdays: Philadelphia, July 1917-Oct. 1930; Boston, Jan. 1914-June 1917; Feb. 1926-Jan. 1933	<i>Commercial and Financial Chronicle</i>
8 N.Y.C. Clearing House Banks	Saturdays and weekly averages: Jan. 1914-March 1928	<i>Commercial and Financial Chronicle</i>
9 N.Y.C. Non-National Banks*	Saturdays: Jan. 1914-July 1920	<i>Commercial and Financial Chronicle</i>
10 All N.Y.C. Banks	Saturdays: Jan. 1914-March 1928	<i>Commercial and Financial Chronicle</i>

\*This series is obtainable from condition statements of banks, denoted in the source as 'State banks and trust companies in Greater New York', i.e., in the five boroughs of New York City.

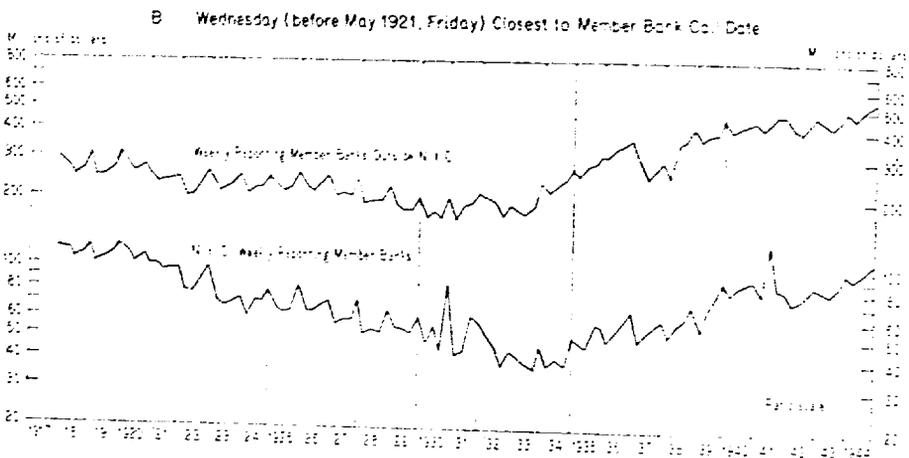
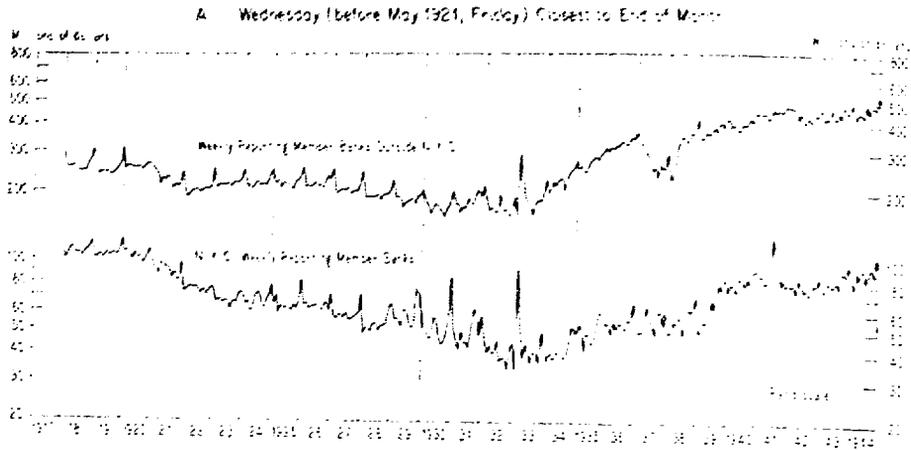
of the dates on which member banks report, although not all publish returns segregating vault cash.

Twenty-four states and the District of Columbia reported vault cash holdings of non-national banks on at least two consecutive member bank call dates between December 1917 and June 1944. To obtain a non-member bank series, vault cash holdings of non-national member banks by states (directly available in the Member Bank Call Reports, June 1919-June 1929, and calculable thereafter from all member bank and national bank data), were subtracted from total non-national bank vault cash, as reported by the states listed in Table B 4.<sup>4</sup> Non-member bank figures, thus compiled for June 1919-June 1944, cover a varying number of states, but, by overlapping, the data have been made continuous from one call date to the next.<sup>5</sup> Whenever the constituency of the sample changed,

<sup>4</sup>As non-national member bank data, by states, are unavailable before June 1919, we used non-national instead of non-member bank call date figures.

<sup>5</sup>The series ends in June 1944 because few state bank reports are as yet available beyond that date, and in these, either vault cash is shown in combination with one or more other items

Vault Cash Held by Weekly Reporting Member Banks In and Outside New York City,  
December 1917 - December 1944

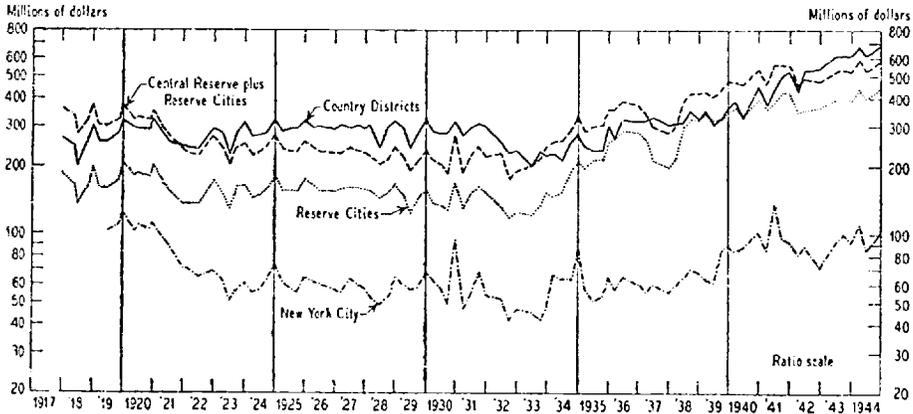


two figures were compiled, one comparable with the figure for the preceding call date, the other with that for the following. The level of non-member bank vault cash on Chart 3 has no meaning, since non-continuous lines, traced from a chart with a proper scale, have been joined. The significance of the non-member bank series lies in the similarity of its movement with that of vault cash in all member banks. We call the sum of vault cash in all member and the changing sample of non-member banks the 'call date sample' of all bank data which is, of course, also noncontinuous.

The all bank vault cash series (Chart 4), available once a year (in some recent years, twice), is a revision of the Comptroller's data. The revision was deemed advisable because some of the non-national bank vault cash figures included by the Comptroller are estimates that, in several years, are unsatisfactory. Certain states do not report 'cash on hand' separately from 'cash items' and/or 'due from banks'

considered as part of liquid reserves, i.e., due from banks and cash items in process of collection, or else the dating of the returns does not correspond with member bank call dates.

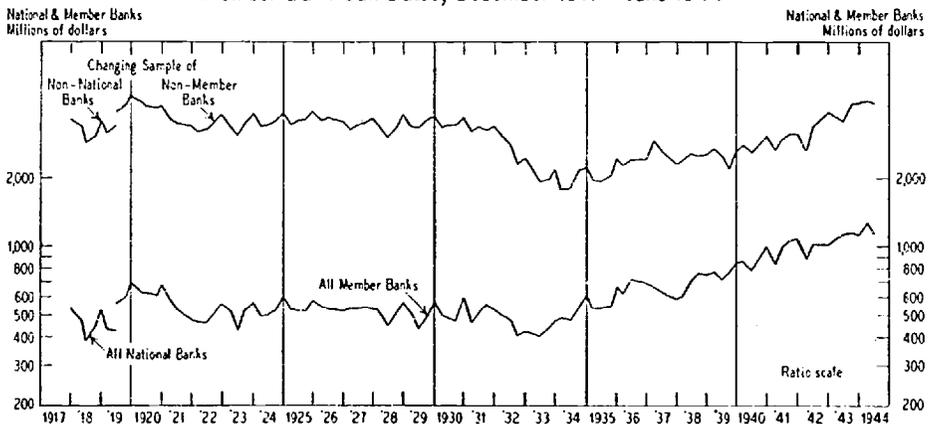
CHART 2  
**Vault Cash Held by Four Groups of Member Banks**  
**Member Bank Call Dates, December 1917 - December 1944**



Data for N.Y.C. central reserve city member banks first become available at the call date on June 30, 1919.

or other asset categories. The Comptroller has published an arbitrary distribution of some of these aggregates; others he has allocated wholly to one of the component categories, leaving the other categories blank. The sum of our adjustments (which, to some extent, are offsetting) is over 6 percent at its maximum in 1928, but in half the years is less than 1 percent of the Comptroller's total annual figure (see App. B). We have also included an estimate of vault cash in non-reporting banks.

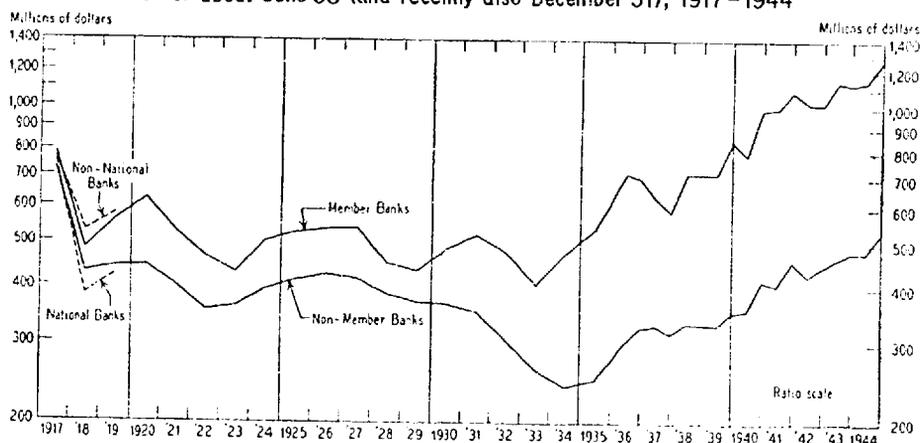
CHART 3  
**Vault Cash Held by All Member (National) and a**  
**Changing Sample of Non-Member (Non-National) Banks**  
**Member Bank Call Dates, December 1917 - June 1944**



As explained in Section 2, the curves plotted for non-national and non-member bank call date figures are noncontinuous; consequently their level has no significance. Proportionate movements of the non-national (non-member) and national (member) data are, however, comparable from one call date to the next. For amounts of vault cash held by the changing sample of non-national and non-member banks, see Tables B 2 and 5.

CHART 4

Vault Cash Held by Member (National) and Non-Member (Non-National) Banks  
On or about June 30 (and recently also December 31), 1917-1944



A pervasive correspondence, especially marked before 1931, in the movements of vault cash reported on similar dates (e.g., weekly, at call dates) for various classes of banks is evident in Charts 1-4. The view that non-member bank series behave more sluggishly than member bank series is not borne out by the movements of vault cash in Chart 3. The parallelism of the weekly reporting member bank series in and outside New York City, while not so striking when plotted monthly, is good for dates nearest call dates (see Chart 1, Parts A and B). Because uniformity is apparent in the fluctuations of identically dated vault cash series for diverse groups of banks, movements of vault cash held by weekly reporting member banks might be considered representative of movements of holdings by all banks on similar dates.

Our method of estimation assumes that the monthly movements of vault cash in all banks (which are unknown) are fundamentally replicas of the monthly movements of weekly reporting member bank holdings. We do not, however, apply directly the proportionate changes from one month to the next in the weekly reporting member bank series to the annual (or semi-annual) all bank figures. We use the more inclusive statistics of the 'call date sample' to correct the slope of the monthly series from one call date to the next. The annual (or semi-annual) series gives the correct height of the final series and also provides the basis for an additional correction in movement. If the monthly, call date, and annual (or semi-annual) data paralleled each other perfectly, i.e., exhibited the same proportionate changes over the same time intervals, the transfer of the monthly movements of the weekly reporting series to the all bank series would be simple—in fact, there would be no need for the intermediate call date series.

This ideal condition does not, however, exist. Indeed a further complication arises from differences in dating between the weekly and the call date series. But it will simplify the exposition of our method if at this point we postpone the problem. To adjust the slope of the monthly movements of the weekly reporting member bank series between call dates to that of the 'call date sample', we first express the monthly data falling within the period from one call date to the next as relatives of the initial call date figure in the interval. The relative of the final to the initial call date figure of the period is next compared with the similar relative derived from the 'call date sample'; the difference between these two relatives is distributed along a straight line by months over the period of the call date interval, and the amount of the monthly correction is then added to the appropriate monthly relative based on the initial call date.

Now let us consider the dating of the series. Because of the marked intra-weekly periodicity of vault cash data the weekly data nearest the call dates could not be compared directly with the call date statistics.<sup>6</sup> While the dates on which weekly reporting member banks

<sup>6</sup>Only partial information exists on the character of the intra-weekly movement of vault cash.

W. R. Burgess has shown, *The Reserve Banks and the Money Market* (Harper, 1936, 2d ed., pp. 81-4), that for six months in 1926 currency demands of all banks on the New York Federal Reserve Bank tended to exceed deposits on Thursdays, Fridays, and Saturdays, while on Mondays, Tuesdays, and Wednesdays, there was a net inflow of currency. This weekly movement was modified by demands for currency before the 15th, the last day of the month, and holidays.

Net deposits of currency on Tuesdays, Wednesdays, and Thursdays, and net outflows on Fridays, Saturdays, and Mondays were the weekly pattern in the Minneapolis Reserve district during 1927 (*Monthly Review of Agricultural and Business Conditions in the Ninth Federal Reserve District*, Dec. 29, 1927).

Unpublished figures of vault cash held by all member banks, reported daily during June 1930, are available from the Federal Reserve Board. Member banks in each district were classified according to their reserve status and also by shipping time from their Federal Reserve Banks. For all reserve classes of member banks, the weekly average of vault cash was at its lowest on Saturday and at its peak on Thursday in the reporting month. The holdings of all classes of banks were substantially larger on Monday than on Saturday. In central reserve and reserve city banks holdings were reduced on Tuesday while country bank vault cash continued to increase. All reserve classes of banks showed additions to vault cash on Wednesday, and withdrawals on Friday and Saturday.

Tests with vault cash data available for Saturdays and in the form of weekly averages for 1921-27 (see Table I, line 8) indicate that the intra-weekly pattern itself is characterized by seasonal and secular changes. We computed ratios of the Saturday vault cash holdings of Federal Reserve member banks belonging to the New York City Clearing House to their weekly average holdings. The central tendency of the ratios when arrayed in an annual frequency table was consistently and progressively upward. The monthly averages of the ratios were then compared with annual averages for each year. The number of monthly ratios that exceeded the annual averages varied from month to month. Only one monthly ratio during the three summer months of July, August, and September exceeded the annual averages. During February and March only one monthly ratio was smaller than the annual averages, and in October and November only two were smaller. In the remaining months there was no marked tendency for the monthly ratios to be either above or below the annual averages.

In recent years the spread of Saturday bank closings during the summer months has introduced new complications into the use of an index of daily variability of vault cash.

report fall on the same day each week, call dates on which all banks, all member and some non-national banks report fall on different days of the week. To get the adjustment factors we therefore sought a series constituted like the weekly reporting member bank series but dated just like the 'call date sample' of all bank holdings. Call date figures on vault cash in all member banks in central reserve and reserve cities combined almost exactly suited our purpose, for the coverage of this series is nearly identical with that of the weekly reporting member bank series (Chart 2). "Although the weekly reporting member banks include banks in some 40 cities that are not classified as reserve cities, changes in banking conditions as reflected by the weekly series are similar to those shown by the series for central reserve and reserve city banks. In December 1941 the ratio of loans and investments of weekly reporting member banks to loans and investments of central reserve and reserve city banks was 97 percent."<sup>7</sup> We subtracted the percentage change from one call date to another of vault cash in all member banks in central reserve and reserve cities combined (a substitute for the weekly reporting member bank series at call dates) from similar percentages derived from the 'call date sample'. The slope of the monthly relatives of the weekly reporting member bank series was adjusted to that of the 'call date sample' by adding the amount of the difference between the percentages just described, distributed along a straight line by months over the periods closest to the call dates.<sup>8</sup> In this way we circumvented the problem that arose from the lack of comparability due to differences in dating between the weekly reporting member bank and call date series.

The base of our monthly relatives then had to be shifted from the initial call date figure of each call-date-to-call-date period to the initial June of each June-to-June year, in preparation for making the final correction to the slope. The relatives of the all bank data, from June to June (or semi-annually), were compared with the corresponding monthly relatives. The difference between the two relatives for each year (or half-year) was distributed along a straight line by months, and the monthly correction was then

<sup>7</sup>*Banking and Monetary Statistics* (Board of Governors of the Federal Reserve System, 1943), p. 127. On four Wednesdays in June 1930, when vault cash figures are available for all member banks according to reserve classification (see note 6 above), the data for weekly reporting member banks can be compared with those for all member banks in central reserve and reserve cities combined. While the level of vault cash in weekly reporting member banks averaged 11 percent higher than in central reserve and reserve cities combined on these four Wednesdays, the percentage changes from week to week in both series were virtually the same.

<sup>8</sup>Because of the similarity in the movements of the non-member and member bank data, it was not necessary to take into account the disparity in the weights of member and non-member banks in the 'call date sample'.

added to the corresponding monthly relative. Our final series of monthly relative movements was thus computed. To derive actual figures of vault cash in all banks, the initial June figure for each year must be multiplied by the twelve monthly relatives determined for that year.

Our vault cash estimates for December 1917-December 1944 were next subtracted from data on currency outside the Treasury and the Federal Reserve Banks.<sup>9</sup> The Treasury publishes these data for the last day of the month, which of course falls on varying days of the week. The vault cash estimates are Wednesday figures (Friday before May 1921) closest to the end of the month. Because vault cash has a marked intra-weekly periodicity, it is desirable to have both subtrahend and minuend dated alike. This is possible for the period since 1922, for which the Federal Reserve System has made the Treasury series available on a Wednesday basis.

#### RELIABILITY OF THE NEW ESTIMATES

Our series of currency in public circulation since 1922, except in June (and recently December), is as of the Wednesday closest to the end of the month. Before 1922 the vault cash estimates, for weekly dates closest to the end of the month, were subtracted from end-of-month figures for currency outside the Treasury and the Federal Reserve Banks. For December 1917-December 1921 currency in public circulation is therefore biased by the weekly pattern of the latter, which is reported on varying days of the week. Our residuals may be slightly distorted also because the dating of our June (and recently December) vault cash figures does not regularly correspond to that of currency outside the Treasury and the Federal Reserve Banks.<sup>10</sup>

<sup>9</sup>We do not believe that vault cash can be estimated reliably monthly before December 1917. See Appendix B for a call date series, December 1914-December 1917, for all banks.

<sup>10</sup>We considered the possibility of adjusting for daily variation in the June all bank data to obtain estimates as of Wednesdays, the day of the weekly report. In view of the margin of doubt surrounding the all bank annual series (see App. B), however, the adjustment seemed too refined to be justified.

An interesting use of indexes of daily fluctuations in vault cash holdings for central reserve city, reserve city, and country member banks was devised in 1931 by Arynnes Joy Wickens in estimating all bank vault cash for the Committee on Bank Reserves of the Federal Reserve Board. Utilizing the daily data of member bank vault cash holdings compiled by the Federal Reserve Board for June 1930 (see note 6 above), she computed indexes on a Wednesday basis for each of the three classes of member banks. Call report figures for central reserve city, reserve city, and country member banks were divided by the appropriate index. Data for non-member banks exclusive of savings banks, largely estimated except for June dates, were adjusted by means of the daily index for country member banks at June calls; at other calls by estimated indexes. Savings bank data were not adjusted for daily fluctuations. A special adjustment was made for December call report figures because the proximity of the date to Christmas was of such great importance. Call date figures were thus reduced to a Wednesday series.

On the advisability of using an index of daily variability with the vault cash figures, see note 6 above.

The trustworthiness of our residual series cannot be measured objectively. Any errors in our estimates of vault cash are transmitted directly to the estimates of the currency holdings of the public. The percentage error is always less, however, for currency in public circulation than for all bank vault cash (in cases of identical dating of currency outside the Treasury and the Federal Reserve Banks and the vault cash estimates) because in every month the former greatly exceeds the latter. Errors in the vault cash series, furthermore, affect the residuals less and less as the proportion that currency in public circulation constitutes of currency outside the Treasury and the Federal Reserve Banks rises. From about 70 percent at the end of 1917 it rises to above 90 percent in 1944.

#### FEDERAL RESERVE BANK AND TREASURY CURRENCY HOLDINGS

Currency assets of the Federal Reserve Banks were derived, in general, by totaling figures for reserves, non-reserve cash (before May 1933), Federal Reserve notes held by issuing and other Federal Reserve Banks, Federal Reserve bank notes held by other Federal Reserve Banks, and gold held abroad. For years before 1923, when end-of-month data alone could be obtained, revised figures derived from the Treasury Circulation Statement were the basis for our series. Since then the weekly condition statement of the Reserve Banks has been the source of data for Wednesdays closest to the end of the month (a minor portion was obtained as of the end of the month January 1923-April 1929; see App. D).

Our series of Treasury currency assets, identical with 'Treasury Cash', now used in Federal Reserve analysis of the demand for Reserve Bank credit, excludes from total currency reported in the Circulation Statement as held by the Treasury the cash held for the Federal Reserve Banks, the reserve held against gold and silver certificates, and the gold redemption fund for Federal Reserve notes. From 1922 through 1944 Wednesday figures closest to the end of the month are shown; for earlier years, end-of-month figures. Treasury currency assets include only holdings of the Treasury Department in Washington, D. C. and of the mints and assay offices throughout the country—not of the federal government generally.

### 3 SIGNIFICANCE OF FLUCTUATIONS IN CURRENCY HOLDINGS

#### PUBLIC DEMAND FOR CURRENCY

Though the public's currency holdings, December 1917-December 1944 (see Table 2 and Chart 5), usually changed relatively little from month to month they exhibited longer swings which may be conveniently summarized under five subperiods:

1) 1918-22. Continuing a movement that began on the outbreak of