

Inflation alone does not account for the sudden surge in currency. Evidence suggests that cash being held in hoards increased from 56 percent of total currency in circulation in 1960 to almost 70 percent in 1980.

Explaining the Cash Explosion

The amount of U. S. currency in circulation today amounts to \$121 billion, a four-fold increase over the \$30 billion circulating in 1960. In 1960 there was sufficient currency in circulation for each person in this country to hold \$162; today each of us could hold more than \$600 (Chart 1).¹

Let's examine the composition of this currency measure, by denomination. The most striking aspect is the spectacular increase in the value of \$100 notes outstanding: an increase from \$5.9 billion (18 percent of the value of all currency outstanding) in 1960 to \$49 billion (almost 36 percent of the value of all currency) in 1980 (Chart 2). In terms of value, the \$100 note actually replaced the \$20 note in 1978 as the largest denomination outstanding. Twenty dollar notes grew slightly less rapidly than \$100 notes.

The value of \$50 notes grew from 8.6 percent of the value of all notes and coins outstanding in 1960 to 10 percent of the total in 1980, while the stock of coins grew in importance from 7.4 percent of currency outstanding in 1960 to better than 9 percent in 1980. The relative importance of ten and one dollar notes declined from 1960 to 1980.

¹The difference between currency in circulation and the currency component of M1 is currently held in the vaults of commercial banks. This vault currency has increased in direct proportion to the public's increased demand for currency. The ratio of currency held by commercial banks to the currency component of M1 has varied within a four percentage point range from 1965 to 1980. This stability confirms that commercial bank holdings simply reflect the demand for currency by the population.



Chart 1. Total Currency in Circulation Outside Treasury and Federal Reserve Banks

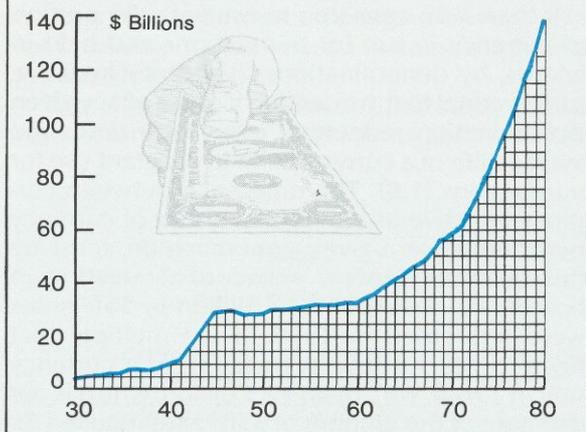
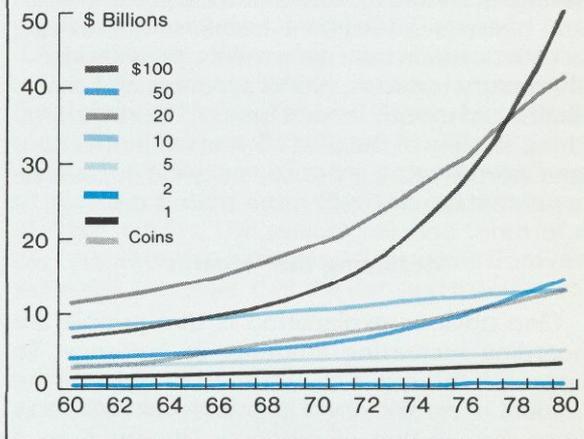


Chart 2. Currency Outstanding by Denomination



The Reasons Behind Currency Growth

Currency is demanded by the population for two reasons only, to facilitate cash transactions and to serve as a store of value. In recent years a number of studies have attempted to explain growth in currency demand.² The conclusions of this literature are less than satisfying, primarily because of the difficulties in obtaining good information on how people hold and use currency. People who use more currency for off-the-books tax avoidance or in illegal transactions, for example, are unlikely to admit to it. Few of us keep track of cash transactions.

Data on individuals' use of currency is scarce. Researchers are confined basically to analyzing the aggregate data on currency outstanding. Even this data is an estimate. We know how much currency has been issued, but no one

knows the proportion which has been destroyed or lost. Also, very little is known about the amount of our currency in foreign hands. In many countries, U. S. bills circulate as a second currency, and foreigners hold an unknown amount of bills as a portable hedge against economic or political turmoil in their own countries.

We know that business firms hold a relatively small portion of total currency outstanding. Most currency is held by individuals, and estimates of that proportion run as high as 90 percent.³

Currency as a percent of overall economic activity (measured by nominal GNP) fell from 5.7 percent of GNP in 1960 to 4.4 percent in 1980, for several reasons. Interest rates are higher, so holding currency costs more in terms of interest foregone. Also, a number of financial innovations have appeared as functional substitutes for cur-

²See for Example: Phillip Cagon, "The Demand For Currency Relative to Total Money Supply", National Bureau of Economic Research, Occasional Paper 62 (New York: National Bureau of Economic Research, 1958). George G. Kaufman, "The Demand For Currency", Board of Governors of the Federal Reserve System, Staff Economic Studies, (Washington: Board of Governors of the Federal Reserve System, 1966). J. Carl Poindexter, Jr., "The Currency-Holding Behavior of the Public and the Strength of Monetary Controls", Graduate School of Business Administration, Institute of Finance, New York University, *The Bulletin*, No. 67 (New York University, November, 1970). Robert D. Laurent, "The Growing Appetite For Cash", Federal Reserve Bank of Chicago, *Business Conditions*, (Chicago, Federal Reserve Bank of Chicago, April, 1971). Donald L. Kohn, "Currency Movements in the United States," Federal Reserve Bank of Kansas City, *Monthly Review* (Kansas City, Federal Reserve Bank of Kansas City, April, 1976). Paul S. Anderson "Currency in Use and in Hands", Federal Reserve Bank of Boston, *New England Economic Review* (Boston, Federal Reserve Bank of Boston,

March/April, 1977). Robert D. Laurent, "Currency and the Subterranean Economy," Federal Reserve Bank of Chicago, *Economic Perspectives* (Chicago, Federal Reserve Bank of Chicago, March/April, 1979). Norman N. Bowsher, "The Demand for Currency: Is the Underground Economy Undermining Monetary Policy?" Federal Reserve Bank of St. Louis, *Review*, Volume 62, No. 1 (St. Louis, Federal Reserve Bank of St. Louis, January, 1980). Peter Gutmann, "The Subterranean Economy," *Financial Analyst Journal*, November/December 1977. Edgar Feige, "The Irregular Economy: Its Size and Macroeconomic Implications," Social Systems Research Institute, Working Paper 7916. And Charles J. Haulk, "Thoughts on the Underground Economy," Federal Reserve bank of Atlanta, *Economic Review*. (Atlanta, Federal Reserve Bank of Atlanta, March/April, 1980).

³See Paul S. Anderson "Currency in Use and in Hoards", *New England Economic Review*, Federal Reserve Bank of Boston (Boston, Federal Reserve Bank, March/April 1977) p. 23.

rency: cash management services, negotiable certificates of deposit, authorization to offer savings accounts to state and local governments and businesses, telephone transfers from savings accounts, repurchase agreements, preauthorized third party transfers, NOW accounts and share drafts, and money market funds.⁴ The surprising thing, in view of the past 20 years of innovation and interest rates, is that currency did not fall (as a percentage of GNP) more than it did.

Measuring the "Hoards"

One obvious explanation is that people are hoarding increasing amounts of currency. To approach this question, we need to separate the amount of currency held for transactions purposes from the amount of currency "hoarded" as a store of value. One ingenious method for doing this was developed by Paul S. Anderson.⁵ He reasoned that every piece of currency in circulation could pass from hand to hand only so many times before it was worn out and had to be pulled from circulation and replaced by the Federal Reserve.

He further reasoned that one dollar notes were the least likely to be hoarded and the most likely to experience constant use in transactions. (To the extent \$1 bills are hoarded, the hoarded components below are underestimated.) He therefore calculated the average life of a one dollar note (1.81 years) by dividing the total number of one dollar notes redeemed in 1980 (\$1.77 billion) into the total number of one dollar notes outstanding at that time (\$3.26 billion). So the average one dollar note was replaced every 1.8 years.

The higher denomination bills use the same paper, and the durability of that paper has not changed significantly. This implies that every currency unit—\$5 bills, \$20 bills, or whatever—would also wear out in 1.8 years if it were used entirely in transactions. If higher denomination

bills last longer than 1.8 years, then the longer life must mean they were at rest, or hoarded, for the time in excess of 1.8 years.

It then is an easy step to estimate the portion of currency in use for transactions and held in hoards, by denominations. "Currency in active use" is equal to the quantity of notes of any given denomination redeemed every year times the average life of a currency unit in constant use for transactions (1.8). The difference between currency in active use and the amount of currency outstanding, in a given denomination, must be the quantity "not in active use"—resting in hoards. For example, \$1.4 billion in \$50 notes were redeemed in 1980. If we multiply that figure times 1.8 (the average life of a currency unit in 1980), we obtain \$2.5 billion, which is our estimate of the amount of \$50 notes required for transactions, not hoarding. The amount of \$50 notes actually in circulation was \$13.1 billion in 1980, which means that \$10.6 billion worth of \$50 notes (\$13.1 - \$2.5) were at rest, or hoarded. Similar calculations for each denomination yield the total amount of currency in active use and the total hoarded.

Table 1 shows the estimates for currency in use and currency in hoards calculated at five-year intervals for the period 1960 through 1980.

Table 1
Estimated Currency in Use and in Hoards
(in \$ Billions)

	Currency Outstanding	Currency in Use	Currency in Hoards	Cur. in Hoards as percent of Cur. Outstanding
1960	\$29.1	\$12.8	\$16.3	55.9%
1965	35.5	13.4	22.1	62.3
1970	47.7	20.0	27.7	58.0
1975	72.3	25.4	46.4	65.8
1980	117.4	36.2	81.2	69.1

During the period 1960 through 1980, the average length of life for a Federal Reserve Note was 1.7 years, so we used that figure for average transactions life rather than 1.8 (the 1980 figure).

Adding these calculations across denominations indicates that the percent of total currency at rest in the economy, or in hoards, increased to almost

⁴See Marvin Goodfriend, James Parthenos, and Bruce Summers "Recent Financial Innovations: Causes, Consequences for the Payment System and Duplications for Monetary Control." Federal Reserve Bank of Richmond, *Economic Review*, March/April 1980.

⁵See Paul S. Anderson, "Currency in Use and in Hoards", Federal Reserve Bank of Boston, *New England Economic Review*, March/April 1977, pp. 25-28.

70 percent of total currency in circulation in 1980, up from 56 percent in 1960. This suggests that the largest part of recent growth of currency is not a result of increased demand by the public for transactions, but instead increased demand for hoarding purposes.

This inference is further supported by similar calculations in Table 2, which suggest, sensibly,

Table 2
Estimated Currency in Use and in Hoards
by Denomination in 1980

	Currency in Active Use	Currency in Hoards	% of Denom. Hoarded
\$1	\$3,015,601.1	\$ 248,883.9	7.6%
\$2	72,743.0	596,792.0	89.1
\$5	3,785,512.4	548,310.6	12.7
\$10	7,290,349.7	3,823,569.3	34.4
\$20	15,241,055.9	22,933,160.1	60.1
\$50	2,448,805.8	10,622,279.2	81.3
\$100	4,379,183.0	42,374,940.0	90.6

that in 1980 the large denomination notes were the ones with the largest hoarding component. The higher denomination notes are easier to store (and possibly to hide) than lower denomination notes. Therefore, the demand for currency for hoarding purposes would more likely involve the use of high denomination notes. Except for the two dollar denomination, the percentage of a given denomination of currency hoarded, according to our calculations, increases as the size of the denomination increases, rising from only 7.6 percent of the one dollar bills to just over 90 percent of the \$100 bills. (The hoarding component of the \$1 bill in 1980 reflects our use of the 1.7 year average life over the 1960-80 span which is lower than the 1980 average life of 1.8 years.)

The only inconsistency is in the two dollar note denomination, 89 percent of which was hoarded. However, the public's limited acceptance of the two dollar note has limited the number of two dollar notes circulating for transactions. They are more attractive to collectors. Therefore, the estimate that 89 percent of the two dollar notes

outstanding are hoarded seems plausible. So Tables 1 and 2 suggest that currency hoarding is a major part of the answer as to why currency has grown rapidly during the 1960-80 period.

Our estimate of the component of currency in active use for transactions, relative to nominal GNP, actually declined from 2.5 percent in 1960 to 1.3 percent in 1980 (Table 3). The residual amount of hoarded currency, however, appears to have remained a relatively constant percentage of GNP, ending the period just one tenth of a percent lower than it started. It appears from our estimates, therefore, that the demand for currency

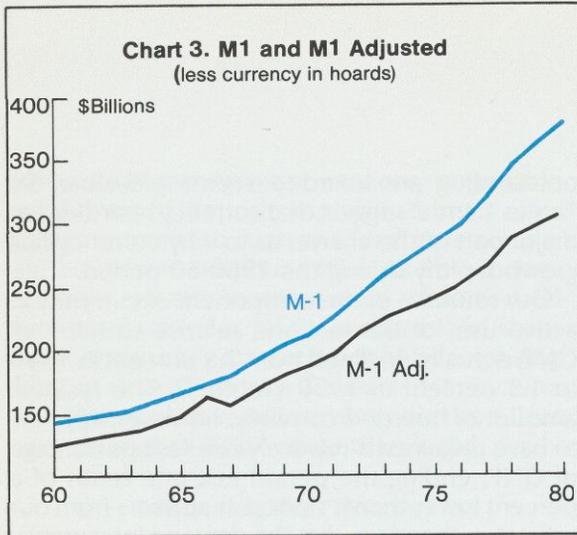
Table 3
Currency in Circulation and
Estimated Currency in Use and in Hoards
as a Percent of GNP

	Total Currency in Circulation	Currency in Active Use	Currency in Hoards
1960	5.7%	2.5%	3.2%
1965	5.1	1.9	3.2
1970	4.8	2.0	2.8
1975	4.6	1.6	3.0
1980	4.4	1.3	3.1

for transaction purposes has not kept pace with growth in GNP, while the demand for currency for hoarding purposes has grown at about the same pace as GNP.

Implications for Measuring the Money Stock

Currency outside banks is included in the M1 definition of the money stock. But the work in this article suggests that currency includes both an active and a hoarded component. The active component logically belongs in both M1 and M2, but the hoarded component should logically be excluded from M1, because M1 is a measure of transactions balances. The motives behind hoarded currency are probably more closely related to those of time and savings accounts than to currency in use for transactions. If this reasoning is correct, removing the hoarded com-



ponent of currency from M1 should increase the quality of the M1 series.

Chart 3 shows M1 and M1 adjusted (less currency in hoards) for the period 1959 through 1980. M1 adjusted tracks M1 very closely up to 1972, and from 1972 forward the gap between the two widens steadily. Since 1972 the directional change has been almost totally in a down-

Table 4. M1 and M1 Adjusted
(less currency in hoards*)
1960-1980
(in Billions)

Year	M1	M1 Adjusted
1960	141,358	122.943
1961	144,208	127.399
1962	147,842	131.080
1963	152,317	134.290
1964	158,267	139.936
1965	165,025	146.873
1966	172,558	161.322
1967	179,392	154.733
1968	191,967	168.357
1969	203,358	178.997
1970	211,042	186.134
1971	225,333	195.422
1972	241,467	212.429
1973	259,000	224.586
1974	271,850	231.658
1975	284,200	240.297
1976	299,258	251.271
1977	320,692	265.317
1978	345,342	287.290
1979	363,342	298.172
1980	379,758	307.443

*In making these calculations, we reduced our estimated of hoarded currency in circulation by the proportion of currency held outside banks, recognizing both the stability of the ratios of vault cash to currency and the fact that M1 excludes vault cash.

ward direction. This suggests that hoarded currency has become a larger and larger percentage of M1.

—David D. Whitehead