

22 Empirical Evidence on the Demand for Money

Here we examine the empirical evidence on the two primary issues that distinguish the different theories of money demand and affect their conclusions about whether the quantity of money is the primary determinant of aggregate spending: Is the demand for money sensitive to changes in interest rates, and is the demand for money function stable over time?

Interest Rates and Money Demand

James Tobin conducted one of the earliest studies on the link between interest rates and money demand using U.S. data.¹ Tobin separated out transactions balances from other money balances, which he called “idle balances,” assuming that transactions balances were proportional to income only, and idle balances were related to interest rates only. He then looked at whether his measure of idle balances was inversely related to interest rates in the period 1922–1941 by plotting the average level of idle balances each year against the average interest rate on commercial paper that year. When he found a clear-cut inverse relationship between interest rates and idle balances, Tobin concluded that the demand for money is sensitive to interest rates.²

Additional empirical evidence on the demand for money strongly confirms Tobin’s finding.³ Does this sensitivity ever become so high that we approach the case of the liquidity trap in which monetary policy is ineffective? The answer is almost certainly no. Keynes suggested in *The General Theory* that a liquidity trap might occur when interest rates are extremely low. (However, he did state that he had never yet seen an occurrence of a liquidity trap.)

¹James Tobin, “Liquidity Preference and Monetary Policy,” *Review of Economics and Statistics* 29 (1947): 124–131.

²A problem with Tobin’s procedure is that idle balances are not really distinguishable from transactions balances. As the Baumol-Tobin model of transactions demand for money makes clear, transactions balances will be related to both income and interest rates, just like idle balances.

³See David E. W. Laidler, *The Demand for Money: Theories and Evidence*, 4th ed. (New York: HarperCollins, 1993). Only one major study has found that the demand for money is insensitive to interest rates: Milton Friedman, “The Demand for Money: Some Theoretical and Empirical Results,” *Journal of Political Economy* 67 (1959): 327–351. He concluded that the demand for money is not sensitive to interest-rate movements, but as later work by David Laidler (using the same data as Friedman) demonstrated, Friedman used a faulty statistical procedure that biased his results: David E. W. Laidler, “The Rate of Interest and the Demand for Money: Some Empirical Evidence,” *Journal of Political Economy* 74 (1966): 545–555. When Laidler employed the correct statistical procedure, he found the usual result that the demand for money is sensitive to interest rates. In later work, Friedman has also concluded that the demand for money is sensitive to interest rates.

Typical of the evidence demonstrating that the liquidity trap has never occurred is that of David Laidler, Karl Brunner, and Allan Meltzer, who looked at whether the interest sensitivity of money demand increased in periods when interest rates were very low.⁴ Laidler and Meltzer looked at this question by seeing whether the interest sensitivity of money demand differed across periods, especially in periods such as the 1930s when interest rates were particularly low.⁵ They found that there was no tendency for interest sensitivity to increase as interest rates fell—in fact, interest sensitivity did not change from period to period. Brunner and Meltzer explored this question by recognizing that higher interest sensitivity in the 1930s as a result of a liquidity trap implies that a money demand function estimated for this period should not predict well in more normal periods. What Brunner and Meltzer found was that a money demand function, estimated mostly with data from the 1930s, accurately predicted the demand for money in the 1950s. This result provided little evidence in favor of the existence of a liquidity trap during the Great Depression period.

The evidence on the interest sensitivity of the demand for money found by different researchers is remarkably consistent. Neither extreme case is supported by the data: The demand for money is sensitive to interest rates, but there is little evidence that a liquidity trap has ever existed.

Stability of Money Demand

If the money demand function, like Equation 4 or 6 in Chapter 22, is unstable and undergoes substantial unpredictable shifts, as Keynes thought, then velocity is unpredictable, and the quantity of money may not be tightly linked to aggregate spending, as it is in the modern quantity theory. The stability of the money demand function is also crucial to whether the Federal Reserve should target interest rates or the money supply (see Chapter 19). Thus it is important to look at the question of whether the money demand function is stable, because it has important implications for how monetary policy should be conducted.

As our discussion of the Brunner and Meltzer article indicates, evidence on the stability of the demand for money function is related to the evidence on the existence of a liquidity trap. Brunner and Meltzer's finding that a money demand function estimated using data mostly from the 1930s predicted the demand for money well in the postwar period not only suggests that a liquidity trap did not exist in the 1930s, but also indicates that the money demand function has been stable over long periods of time. The evidence that the interest sensitivity of the demand for money did not change from period to period also suggests that the money demand function is stable, since a changing interest sensitivity would mean that the demand for money function estimated in one period would not be able to predict well in another period.

By the early 1970s, the evidence using quarterly data from the postwar period strongly supported the stability of the money demand function when M1 was used as the definition of the money supply. For example, a well-known study by Stephen Goldfeld

⁴David E. W. Laidler, "Some Evidence on the Demand for Money," *Journal of Political Economy* 74 (1966): 55–68; Allan H. Meltzer, "The Demand for Money: The Evidence from the Time Series," *Journal of Political Economy* 71 (1963): 219–246; Karl Brunner and Allan H. Meltzer, "Predicting Velocity: Implications for Theory and Policy," *Journal of Finance* 18 (1963): 319–354.

⁵Interest sensitivity is measured by the interest elasticity of money demand, which is defined as the percentage change in the demand for money divided by the percentage change in the interest rate.

published in 1973 found not only that the interest sensitivity of M1 money demand did not undergo changes in the postwar period, but also that the M1 money demand function predicted extremely well throughout the postwar period.⁶ As a result of this evidence, the M1 money demand function became the conventional money demand function used by economists.

The Case of the Missing Money. The stability of the demand for money, then, was a well-established fact when, starting in 1974, the conventional M1 money demand function began to severely overpredict the demand for money. Stephen Goldfeld labeled this phenomenon of instability in the demand for money function “the case of the missing money.”⁷ It presented a serious challenge to the usefulness of the money demand function as a tool for understanding how monetary policy affects aggregate economic activity. In addition, it had important implications for how monetary policy should be conducted. As a result, the instability of the M1 money demand function stimulated an intense search for a solution to the mystery of the missing money so that a stable money demand function could be resurrected.

The search for a stable money demand function took two directions. The first direction focused on whether an incorrect definition of money could be the reason why the demand for money function had become so unstable. Inflation, high nominal interest rates, and advances in computer technology caused the payments mechanism and cash management techniques to undergo rapid changes after 1974. In addition, many new financial instruments emerged and have grown in importance. This has led some researchers to suspect that the rapid pace of financial innovation since 1974 has meant that the conventional definitions of the money supply no longer apply. They searched for a stable money demand function by actually looking directly for the missing money; that is, they looked for financial instruments that have been incorrectly left out of the definition of money used in the money demand function.

Overnight repurchase agreements (RPs) are one example. These are one-day loans with little default risk because they are structured to provide Treasury bills as collateral. (Chapter 2 gives a more detailed discussion of the structure of this type of loan.) Corporations with demand deposit accounts at commercial banks frequently lend out substantial amounts of their account balances overnight with these RPs, lowering the measures of the money supply. However, the amounts lent out are very close substitutes for money, since a corporation can quickly make a decision to decrease these loans if it needs more money in its demand deposit account to pay its bills. Gillian Garcia and Simon Pak, for example, found that including overnight RPs in measures of the money supply substantially reduced the degree to which money demand functions overpredicted the money supply.⁸ More recent evidence using later data has cast some doubt on whether including overnight RPs and other highly liquid assets in measures of the money supply produces money demand functions that are stable.⁹

The second direction of search for a stable money demand function was to look for new variables to include in the money demand function that will make it stable.

⁶Stephen M. Goldfeld, “The Demand for Money Revisited,” *Brookings Papers on Economic Activity* 3 (1973): 577–638.

⁷Stephen M. Goldfeld, “The Case of the Missing Money,” *Brookings Papers on Economic Activity* 3 (1976): 683–730.

⁸Gillian Garcia and Simon Pak, “Some Clues in the Case of the Missing Money,” *American Economic Review* 69 (1979): 330–334.

⁹See the survey in John P. Judd and John L. Scadding, “The Search for a Stable Money Demand Function,” *Journal of Economic Literature* 20 (1982): 993–1023.

Michael Hamburger, for example, found that including the average dividend–price ratio on common stocks (average dividends divided by average price) as a measure of their interest rate resulted in a money demand function that is stable.¹⁰ Other researchers, such as Heller and Khan, added the entire term structure of interest rates to their money demand function and found that this produces a stable money demand function.¹¹

These attempts to produce a stable money demand function have been criticized on the grounds that these additional variables do not accurately measure the opportunity cost of holding money, and so the theoretical justification for including them in the money demand function is weak.¹² Also, later research questions whether these alterations to the money demand function will lead to continuing stability in the future.¹³

Velocity Slowdown in the 1980s. The woes of conventional money demand functions increased in the 1980s. We have seen that they overpredicted money demand in the middle and late 1970s; that is, they underpredicted velocity (PY/M), which rose faster than expected. The tables turned beginning in 1982; as can be seen in Figure 1 in Chapter 22, economists now faced a surprising slowdown in M1 velocity, which conventional money demand functions also could not predict. Although researchers have tried to explain this velocity slowdown, they have not been entirely successful.¹⁴

M2 to the Rescue? As we saw in Figure 1, M2 velocity remained far more stable than M1 velocity in the 1980s. The relative stability of M2 velocity suggests that money demand functions in which the money supply is defined as M2 might perform substantially better than those in which the money supply is defined as M1. Researchers at the Federal Reserve found that M2 money demand functions performed well in the 1980s, with M2 velocity moving quite closely with the opportunity cost of holding M2 (market interest rates minus an average of the interest paid on deposits and financial instruments that make up M2).¹⁵ However, in the early 1990s, M2 growth underwent a dramatic slowdown, which some researchers believe cannot be explained by traditional money demand functions.¹⁶ In the late 1990s, M2 velocity seemed to settle down,

¹⁰Michael Hamburger, “Behavior of the Money Stock: Is There a Puzzle?” *Journal of Monetary Economics* 3 (1977): 265–288. The stability of his money demand function also depends on his assumption that the income elasticity of the demand for money is unity. This assumption has been strongly criticized by many critics, including R. W. Hafer and Scott E. Hein, “Evidence on the Temporal Stability of the Demand for Money Relationship in the United States,” *Federal Reserve Bank of St. Louis Review* (1979): 3–14, who find that this assumption is strongly rejected by the data.

¹¹H. Heller and Moshin S. Khan, “The Demand for Money and the Term Structure of Interest Rates,” *Journal of Political Economy* 87 (1979): 109–129.

¹²Frederic S. Mishkin, “Discussion of Asset Substitutability and the Impact of Federal Deficits,” in *The Economic Consequences of Government Deficits*, ed. Laurence H. Meyer (Boston: Kluwer-Nijhoff, 1983), pp. 117–120; Frederic S. Mishkin, “Discussion of Recent Velocity Behavior: The Demand for Money and Monetary Policy,” in *Monetary Targeting and Velocity* (San Francisco: Federal Reserve Bank of San Francisco, 1983), pp. 129–132.

¹³This research is discussed in Judd and Scadding (note 9).

¹⁴See, for example, Robert H. Rasche, “M1 Velocity and Money-Demand Functions: Do Stable Relationships Exist?” *Empirical Studies of Velocity, Real Exchange Rates, Unemployment, and Productivity, Carnegie-Rochester Conference Series on Public Policy* 17 (Autumn 1987), pp. 9–88.

¹⁵See David H. Small and Richard D. Porter, “Understanding the Behavior of M2 and V2,” *Federal Reserve Bulletin* 75 (1989): 244–254.

¹⁶See, for example, Bryon Higgins, “Policy Implications of Recent M2 Behavior,” *Federal Reserve Bank of Kansas City Economic Review* (Third Quarter 1992): 21–36. For a contrary view, see Robert L. Hetzel, “How Useful Is M2 Today,” *Federal Reserve Bank of Richmond Economic Review* (September–October 1992): 12–26.

suggesting a more normal relationship between M2 demand and macroeconomic variables. However, doubts continue to arise about the stability of money demand.¹⁷

Conclusion. The main conclusion from the research on the money demand function seems to be that the most likely cause of its instability is the rapid pace of financial innovation occurring after 1973, which has changed what items can be counted as money. The evidence is still somewhat tentative, however, and a truly stable and satisfactory money demand function has not yet been found. And so the search for a stable money demand function goes on.

The recent instability of the money demand function calls into question whether our theories and empirical analyses are adequate.¹⁸ It also has important implications for the way monetary policy should be conducted because it casts doubt on the usefulness of the money demand function as a tool to provide guidance to policymakers. In particular, because the money demand function has become unstable, velocity is now harder to predict, and as discussed in Chapter 19, setting rigid money supply targets in order to control aggregate spending in the economy may not be an effective way to conduct monetary policy.

¹⁷For example, see Kelly Ragan and Bharat Trehan, "Is It Time to Look at M2 Again?" Federal Reserve Bank of San Francisco *Economic Letter* #98-07 (March 6, 1998).

¹⁸Thomas F. Cooley and Stephen F. Le Roy, "Identification and Estimation of Money Demand," *American Economic Review* 71 (1981): 825–844, is especially critical of the empirical research on the demand for money.