FYI

Monetary Aggregates, Payments Technology, and Institutional Factors

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Approximately every six weeks, Federal Reserve officials meet in Washington to decide the near-term course of monetary policy. The Federal Open Market Committee can, for example, decide to change its federal funds rate target (alternatively, the stock of bank reserves) or maintain policy as it currently stands. What is the basis for this decision? Ideally, policy decisions are based on current and forecast economic conditions vis-à-vis some ultimate goals for the economy, such as price stability or some target for real (inflation-adjusted) economic growth. The economy's position relative to the Federal Reserve's goals would then largely determine both the direction and magnitude of changes in monetary policy at any given time.

Consequently, in settling on a policy choice the Federal Reserve spends considerable resources monitoring economic performance, often by analyzing data on the real economy and inflation. It is commonly believed, however, that there are potentially long lags between monetary policy actions and economic responses. If monetary policy is to be a prescriptive tool, variables that forecast the near-term paths of growth and inflation can be valuable in attempting to prevent undesirable macroeconomic outcomes. In formulating policy actions, policymakers must also determine how large a change in policy is necessary to correct foreseen deviations from their goals. Implicitly or explicitly, they must thus estimate the relationship between the federal funds rate and gross domestic product (GDP) or inflation, and such an estimation must arise from knowledge of the linkage between the Federal Reserve's policy instruments and its goals, that is, the channels through which monetary policy operates.

Basic economic theory suggests that an economy's stock of money can serve as both a forecast variable and an intermediate link between the Fed-

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eral Reserve's policy instruments and its goals. More precisely, the quantity of money in the economy is linked to national income and ultimately the price level. Thus, money should be useful in formulating monetary policy. The Federal Reserve defines monetary aggregates, composed of financial assets like cash and demand deposits, expressly for this purpose. Over time, some instability in the macroeconomic relationships between these monetary aggregates and national income has been observed, believed to be a response to changes in other economic variables. Since about 1990, for example, growth in the Federal Reserve's M2 monetary aggregate (see Table 1) has been much slower than expected. Given interest rates and growth in nominal output (described in current prices), the Board of Governors' model for M2 demand overpredicted growth in the aggregate by an average 2.5 percentage points each quarter from the beginning of 1990 through the end of 1993 (Sean Collins and Cheryl L. Edwards 1994). Some evidence suggests that this unexpected shortfall arose from the proliferation of alternative financial assets that resemble many components of the M2 money measure. Several studies (for example, John V. Duca 1993 and Collins and Edwards 1994) have examined the potential of some mutual funds as substitutes for M2 savings-type assets like certificates of deposit. In general, these studies argue that the increased liquidity of mutual fund shares and a steep yield curve (with long-term interest rates much higher than short-term interest rates) made stock and bond funds attractive alternatives to M2 savings instruments. In addition, many mutual fund companies and brokerages permit the electronic transfer of balances between banks and mutual funds as well as limited check writing, making these mutual fund balances look a lot more like money.

Because of these innovations, the current composition of M2 probably no longer completely reflects the choice of financial assets available to the public as means of payment and close payments substitutes. Thus, the aggregate's relationship with expenditure on goods and services may no longer be reliable or predictable. The implication is that M2 in turn may not now serve as a reliable link between policy instruments and policy goals, raising broader questions about the role of monetary aggregates in policy making. This article seeks to provide a rudimentary explanation for how the composition and character of payments assets can change endogenously in a dynamic financial system (that is, because of other factors inside the system), ultimately influencing the

macroeconomic relationships between monetary aggregates and economic activity.

Why Is Money Important?

Since the passage of Humphrey-Hawkins legislation in the late 1970s, the Federal Reserve has been given explicit responsibility for maintaining an environment of low inflation and high employment. The central bank cannot, however, control these quantities directly. Instead, the tool at its disposal is the ability to control reserve-market interest rates (federal funds

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Table 1
Current Measures of Money and Liquid Assets

M1 = Currency (of the nonbank public)
+ Demand deposits
+ Other checkable deposits, including NOW, Super NOW, and ATS accounts, credit union share drafts
+ Travelers' checks of nonbank issuers

M2 = M1
+ Savings and small-denomination time deposits at all depository institutions (including retail repurchase agreements)
+ Money market deposit accounts
+ General-purpose and broker/dealer money market mutual fund shares (including tax-exempt)

M3 = M2
+ Large-denomination time deposits at all depository institutions
+ Term repurchase agreements at commercial banks and thrifts
+ Institution-only money market mutual fund shares (including tax-exempt)
+ Term Eurodollar balances at depository institutions and MMMFs
+ Overnight repurchase agreements at commercial banks[1]
+ Overnight Eurodollar balances[1]

[1] As of February 1996

and discount rates) or the quantity of bank reserves that must be held by banks against many of their outstanding deposits, like checking accounts. The Federal Reserve is the monopoly provider of base money, defined as currency and bank reserves, enabling it to limit the quantity of cash and transactions deposits in circulation.

As indicated above, money is also directly related to the Federal Reserve's ultimate goals. In a developed economy, little national output is consumed by precisely the same individuals who produce it, requiring that individuals trade the goods they produce to satisfy their wants. Simple barter between two parties is always a possibility, but it requires that each party have exactly the item the other desires. In a large and specialized economy in which each individual conducts many transactions daily, this condition rarely holds and is certainly inefficient. Money is the mechanism that enables the complex purchase of all goods and services to take place most efficiently. To simplify, assume that only new goods and services are purchased each year. Then, in the most basic money model, if each dollar were used in only one transaction, the quantity of money would roughly equal the nominal output of goods and services. Moreover, if each dollar were used in any fixed number of transactions per unit of time, the quantity of money would be directly proportional to nominal output.

This relationship can be represented mathematically by the equation of exchange, $M \cdot V = P \cdot Y$, where M denotes the stock of money, V is the velocity of money (the number of transactions conducted using each dollar per unit of time), P represents the price level, and Y denotes real expenditures so that PY represents total nominal expenditures. If each dollar were used in only one transaction, velocity would equal one. And if each dollar were used in any fixed number of transactions per unit of time, velocity would be equal to some constant. If so, then changes in the quantity of money should be associated with proportional changes in nominal spending given payment habits that are fixed (that is, each dollar is spent a constant number of times per year). Furthermore, if the price level does not instantaneously adjust to changes in money (because of, for example, long-term wage contracts), changes in money could result in higher real economic growth. Since real growth in output is constrained ultimately by the supply of real resources, the change in the quantity of money will be equal in the long run to the approximate difference between nominal and real growth, which is measured as a change in the price level.

The direct relation between the quantity of money in circulation and both Federal Reserve instruments and objectives suggests that money would prove useful as an intermediate gauge for the central bank. Even if an aggregate is not targeted in a formal sense by adjusting monetary policy in response to the aggregate's divergence from its target path, the aggregate may be used as an information variable, providing signals on the effects of monetary policy or the paths of inflation and real growth. To be a useful intermediate target or information variable, however, whatever quantity is designated as money must be somehow related to the central bank's tools, and the velocity of this money must be at least predictable.

*M*oney versus Monetary Aggregates

The case for the quantity of money as an intermediate target or information variable for monetary policy has a solid theoretical foundation. The next step is to build a taxonomy for deciding precisely which assets constitute money. One hint for helping choose the appropriate composition of a monetary aggregate can be derived from theoretical relationships. Both the links between Federal Reserve instruments and money and between money and spending rely on the fact that money can be characterized as a financial asset that allows transactions to take place. Coins and currency pass this test. Balances held in checking accounts are also accepted in exchange for goods and services and are considered money using this criterion. These assets, however, possess another common characteristic: they serve as stores of value. As such, they allow wealth to be held in cash or as demand deposits without the immediate intention to spend it on goods and services. In this respect, though, currency and checking account balances resemble many other financial assets. Many of them, like most other bank deposits, can be transferred to demand deposits or currency quite easily and are frequently used as short-term alternatives because currency and checking accounts bear little or no interest. If these other assets are likely to be converted to payments media in the near term, should they not also be included in monetary aggregates?

As an added complication, some assets possess a mixture of both this savings characteristic and the transactions property. Savings deposits (a significant portion of which were formerly known as money market deposit accounts) can be used as a temporary

store of purchasing power. They can also be used to pay certain bills. Money market mutual funds frequently offer a yield at least as high as that on a savings deposit account, implying that they might be superior saving instruments. Yet, many of these funds also authorize assetholders to write a limited number of checks drawn on them, albeit with the requirement that the checks are for high minimum amounts, often more than $500. In sum, while some assets that serve as money can be clearly identified, others that possess some moneylike characteristics ("near-monies") defy precise classification.

Where Do Near-Monies Come From?

The relationships among these different types of assets are easier to understand when examined in the context of financial intermediation, where spending units (people, businesses, and the government) are separated into two groups: those who save part of their income and those who borrow. For the purposes of this discussion, also assume that these spending units are not permitted to trade with foreigners. If each spending unit chooses to spend exactly as much as it earns, there will be no savings and consequently nothing available for others to borrow. If, however, individual spending differs from individual income for any of the units, some will have a surplus of income over consumption that they will save. Other spending units desire a level of consumption that exceeds their income and will wish to borrow. The issuance of primary securities (financial claims held by a lender against the ultimate borrower) allows surplus units to transfer unspent income to deficit units in return for future principal and interest or dividends. Examples of primary securities would include equities, mortgages, loans, and bonds. This transfer of income allows some spending units to accumulate wealth over time in the form of financial assets while their counterparts amass debt. The outstanding stock of these primary securities then serves as a measure of both aggregate financial wealth and debt.

So far, spending units have been grouped only by their preference for consumption. Closer examination reveals that some spending units are risk-averse while others are risk-neutral or desire to take risks. Those who take more risks will, of course, demand additional compensation for doing so. Also, most spending units will ultimately want to exchange their accumulated wealth for consumption. Some will want to

make this substitution in the short term while others may want to hold savings instruments for many years. Among borrowers, many will place the proceeds from security issuance into investment projects, but these projects will have different probabilities of payoff, different time horizons, and different income streams. Moreover, some spending units will want to borrow to finance current consumption, making their unsecured debt (for example, credit card debt) more risky. These differences among savers and borrowers result in the proliferation of financial contracts differentiated in terms of risk, maturity, liquidity, and yield.

Improvements in payments technology and similar institutional changes also result in less stable relationships between existing monetary aggregates and the nominal expenditure on goods and services.

The financial system described above provides a reasonably good picture of the flow of funds in any developed country. It is still, however, incomplete. In an economy with many different spending units, the cost of acquiring information about the best partner for exchanging income (current purchasing power) for primary securities (representing future purchasing power) would be quite high. In addition, the type and quality of debt instruments would be limited by individual savers' tolerance of risk, maturity, and liquidity as well as their ability to absorb the high minimum denominations of primary securities (for example, $10,000 worth of Treasury bills) most efficient for borrowers to issue.

These inefficiencies provide for the existence of financial intermediaries, market-making organizations that purchase primary securities from ultimate borrowers and issue their own indirect debt to ultimate lenders. These intermediaries can exploit economies of scale (lower average costs associated with higher production) in both lending and borrowing: by serving as a clearinghouse for savers and borrowers and employing accumulated expertise in evaluating borrowers, they are able to lend current purchasing

power at a lower per-unit cost than the individual saver. By aggregating the funds they borrow, intermediaries can easily invest in primary securities with high minimum denominations. They can also channel borrowings into a wide variety of primary securities, providing diversification of risk. Since the probability of all savers showing up at once to demand repayment is relatively low, intermediaries also can hold a more illiquid portfolio than the individual investor. Financial intermediaries supply surplus-income spending units with variegated financial assets closely reflecting the degree of liquidity and risk they desire while making it less essential for the ultimate borrowers to issue them.

Examples of financial intermediaries include banks and other depository institutions (savings and loans, mutual savings banks, and credit unions), life insurance companies, pension funds, retirement funds, finance companies, money market funds, other mutual funds, and, broadly speaking, even the central bank. Some of the indirect debt issued by financial intermediaries takes the form of demand deposits, savings deposits, time deposits, mutual fund balances, and currency. In the last case, the Federal Reserve can buy Treasury debt (primary securities) in return for bank reserves (a central bank liability), which must be held by banks against many deposits. The public can swap these deposits for Federal Reserve notes (also a central bank liability), making currency an indirect security that is issued by the Federal Reserve and held by the public. Like the direct securities that back them, the various kinds of indirect securities enumerated above also differ somewhat in liquidity and risk but are similar in several respects. For example, they have a near-certain redemption value, meaning that spending units can be reasonably certain how much the financial claim will be worth when they choose to redeem it for current purchasing power. In addition, the cost of investing in these indirect securities is relatively low, and contracts can be purchased in denominations from very small to very large (see John Gurley and Edward S. Shaw 1960, 194). Thus, most spending units should be able to acquire them easily.

The Role of Technology and Institutional Factors

The evolution of a nation's financial system results in the creation of a variety of financial assets that spending units can hold in lieu of consumption or investment in real assets like land or machinery. These include primary securities and also indirect securities created by financial intermediaries. Together these claims form a multidimensional spectrum of financial assets, distributed according to liquidity, risk, and maturity. One corner of this distribution will be occupied by the most liquid, least risky financial assets, which have a low cost of investment and near-constant value and are easily redeemable, enabling them to serve as ideal temporary stores of purchasing power. In an economy with a developed financial system, these are likely to be indirect securities. Moving away from this corner in any direction may uncover a slightly higher-yielding financial asset but most likely a marginally inferior store of value in its liquidity, risk, or maturity.

Sifting through a group of these financial assets that serve as good temporary stores of value, several of them (like cash and demand deposits) serve as payments media, meaning they are generally accepted in exchange for goods and services. Some may be accepted as payment in a limited capacity (checks drawn on mutual funds, savings deposits) while others (certificates of deposit) are ready substitutes for payments media, perhaps bearing more interest. Still more financial assets (shares of stock, shares of many mutual funds) may be used as savings vehicles but are too risky, long-term, or illiquid to act as convenient substitutes for payments media.

What enables certain assets to serve as media of exchange and makes other assets easily substitutable for these payments assets? Technology and institutional factors in the form of laws and customs determine how we can pay for goods and services at any time. They also serve to limit the range of acceptable substitutes for payments media as temporary stores of value. For example, the combination of widespread belief in the value of Federal Reserve notes and legal tender laws makes currency usually acceptable as a means of payment in the United States. Similarly, legal restrictions prohibited the payment of interest on demand deposits and forbade thrifts' offering demand deposit accounts until the late 1970s (for a discussion of the theory underlying legal restrictions, see Neil Wallace 1983). Many passbook savings accounts at thrift institutions consequently were separated physically from customers' demand deposit accounts at commercial banks. These constraints made passbook savings deposits relatively poor substitutes for payments media when the use of money market deposit accounts was not extensive. And

without recent computer and telecommunications technology, the low speed and high cost of transferring savings deposits to a transactions account limited their use as media of exchange.

Just as technology and institutional considerations erect barriers among payments assets, temporary stores of value, and pure savings vehicles, changes in these factors can weaken these barriers or move them. Advances in payments technology or changes in regulation can enhance the ability of different financial instruments to serve as media of exchange. Other transactions media, such as credit cards or so-called stored-value cards, may also be introduced. In addition, changes in these factors can allow assetholders to more easily substitute erstwhile savings instruments for transactions media, weakening the distinction between them. In the 1970s, for example, high inflation provided a powerful incentive to minimize holdings of currency and demand deposits (which did not bear interest) resulting in innovative cash management techniques, like the use of overnight repurchase agreements. New technology made speedy, low-cost transfer of savings balances to transactions accounts and the transactions use of savings deposits possible. Changes in regulation followed in recognition of these developments, making their impact more widespread. In the early 1990s, the steep yield curve also encouraged the minimization of currency and demand deposits, interest-checking accounts, and other assets that bear a short-term rate of interest in favor of higher-yielding savings assets. With the steep yield curve, the ability to transfer balances via the telephone, and the capacity for limited check writing, many stock and bond mutual fund balances are now much better substitutes for traditional media of exchange.

Macroeconomic Consequences

Improving technology and shifting institutional factors result in new payment methods or close money substitutes over time. They have also created hybrid assets with savings and transactions properties of varying degrees, like savings deposits or mutual fund balances. Consequently, sharp distinctions between monetary and nonmonetary financial assets are no longer as readily observable as they once were. Like plate tectonics, these forces can be expected to continue reshaping the financial landscape, but in ways that are difficult to predict. Thus we cannot say ex-

haustively what money will look like at any point in the future, but history suggests that the set of assets qualifying as money will likely increase.

These developments present a problem for rule-based definitions used to construct monetary aggregates. Economic theory dictates that money comprises those assets that serve as media of exchange. Strictly adhering to this rule means that money includes stores of value that are generally only marginally useful as methods of payment. The above analysis also suggests that more types of financial assets will be included as time passes. Relaxing this restriction to include close money substitutes will make the definition of money grow inexorably wider. Since the Federal Reserve can limit only the supply of currency and some bank deposits, in either case the monetary aggregate becomes much more difficult to control and perhaps only as predictable as nominal expenditure itself.

Improvements in payments technology and similar institutional changes also result in less stable relationships between existing monetary aggregates and the nominal expenditure on goods and services. The equation of exchange allows us to equate a monetary aggregate to nominal expenditure, provided that this expenditure is made exclusively with financial assets inside that aggregate. With changing technology and shifting regulation, goods and services can be purchased with new kinds of payments assets, or even near-monies. Expenditures can increase at the same time the monetary aggregate remains unchanged, failing to capture these transactions. Reexamining the equation of exchange, PY can increase while M remains constant. To maintain the equality, velocity must increase sufficiently to offset gains in nominal expenditure. These observed changes in velocity will occur whenever the set of monetary or near-monetary assets shifts, a process that is likely to continue but difficult to predict.

While we cannot say precisely how velocity will change in the future, history suggests that it is likely to drift upward. As mentioned earlier, the M2 monetary aggregate substantially underpredicted growth in nominal national expenditure during the early 1990s. Measured ex post, velocity (mechanically defined as the ratio of nominal expenditure to M2) rose in an unpredicted manner. Relationships between money targets and economic activity have broken down before. In many respects, M2's problems parallel the breakdown in the relationship between the M1 aggregate and national income in the late 1970s. As indicated above, this breakdown occurred in the face of

Table 2
Monetary Aggregates Prior to 1980

M1 = Currency
  + Demand deposits at commercial banks

M2 = M1
  + Savings balances at commercial banks
  + Time deposits at commercial banks
  − Negotiable CDs at large banks

M3 = M2
  + Savings balances at thrift institutions
  + Time deposits at thrift institutions

M4 = M2
  + Negotiable CDs at large banks

M5 = M3
  + Negotiable CDs at large banks

Source: Thomas D. Simpson (1980).

technological and regulatory changes that encouraged the substitution of interest-bearing assets for traditional transactions balances like demand deposits. In particular, thrifts and credit unions gained the ability to offer negotiable orders of withdrawal (NOW) accounts and share drafts, providing payments services similar to those previously available only through demand deposits at commercial banks. Advances in technology enabled automatic transfers from savings accounts to demand deposit accounts, preauthorized bill payments, and telephone transfers, permitting what are now called savings deposits to function more like money. As a response to these developments, the

Conclusion

Economic theory suggests that the money stock is a useful link between Federal Reserve instruments and objectives in monetary policy. The quantity of money must be controllable, however, and the velocity of money be fixed or move in a predictable manner. Policy making requires a decision on which financial assets correspond to money in theory. Thirty years ago, it was relatively easy to sort financial assets into monetary and nonmonetary categories based on a strict medium-of-exchange basis or payments media plus close substitutes. Not coincidentally, growth in the old M1 monetary aggregate (consisting solely of currency plus demand deposits at commercial banks) was better correlated with growth in expenditure than it is today.

An examination of the financial system reveals that there is fundamentally little that distinguishes monies, near-monies, and nonmonetary financial assets among good stores of value. Preferences, technology, and institutional arrangements determine the boundaries among these assets, and changes in these factors have moved them. The proliferation of new payments assets, close substitutes, and mixed savings-transactions assets makes it difficult, if not impossible, to draw a line between what is money and what is not for monetary policy purposes. For the same reason, existing monetary aggregates can lose their ability to predict changes in national expenditure, and redefinition necessitates confronting the same issue. The addition of more financial assets to the monetary aggregates is unlikely to be a durable solution and will result in the decline in the share of the aggregate's assets that are directly linked to Federal Reserve policy instruments.

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