Should We Reduce the Role of Banks in the Monetary Policy Process?

By John F. Boschen

The growth rate of bank deposits is often considered an important monetary factor affecting inflation. As a consequence, regulatory control of the banking system's production of deposits is seen as critical to monetary policymaking.

An important part of the deposit control framework is the reserve requirement on transactions deposits. While the Federal Reserve's monetary control procedures do not ordinarily focus directly on the reserve-deposit linkage, reserve requirements play a crucial indirect role in determining the banking system's demand for reserves.[1]

Reserve requirements also impose costs on the banking system because reserves held at the Federal Reserve earn no interest. Because of these costs, it is important to determine whether deposit regulation is necessary for inflation control.[2]

This paper examines whether the Federal Reserve's regulation of bank deposit growth, by reserve requirements or other methods, is necessary to ensure price stability. Using the recent work of several economists, dubbed the New Monetary Economics, this paper argues that regulation of deposit growth may not be the only way to control inflation.[3] The first section

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[1] "Is the Fed's Money Policy Pointing to a Return of 70's-Type Inflation?" *The Wall Street Journal*, February 19, 1987; Daniel L. Thorton, "The FOMC in 1982: De-emphasizing M1," *Review*, Federal Reserve Bank of St. Louis, June/July 1983, pp. 26-35; and Henry C. Wallich, "Recent Techniques of Monetary Policy," *Economic Review*, Federal Reserve Bank of Kansas City, May 1984, pp. 21-30.

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[2] See Stuart E. Weiner, "Payment of Interest on Reserves," *Economic Review*, Federal Reserve Bank of Kansas City, January 1985, pp. 16-31, for a detailed discussion of these proposals. If deposit control is necessary, the issue would simply be to keep the costs for reserve requirements as low as possible. In this vein are proposals to reform the current reserve requirement system by paying interest on reserves.

[3] The New Monetary Economics is a term used by Robert Hall, "Monetary Trends in the United States and the United Kingdom: A Review from the Perspective of New Developments in

describes the traditional transactions approach to money and price level determination and summarizes the costs of involving banks in monetary policy through reserve requirements. The second section describes the New Monetary Economics and its implications for the role of banks in the monetary process. The third section discusses empirical evidence.

The transactions approach to price level determination

Banks have been viewed traditionally as producers of money because they issue demand deposits.[4] Demand deposits are special because,

in principle, they can be converted to currency on demand at the face value of the check or deposit account. As a result, checks drawn against demand deposits are a widely accepted means of payment in the United States.

The widespread use of demand deposits for transactions is the basis for including demand deposits in most standard transactions-based definitions of money. Indeed, demand deposits and similar checkable accounts comprise the largest component of the M1 money stock.[5] Checkable deposits at the end of 1987 were about 74 percent of M1, or $553.3 billion. Of the total M1 money stock, $256.7 billion was supplied directly by the Federal Reserve as the monetary base (currency plus deposits held as reserves) and the remaining $496.3 billion was "produced" by banks. Banks, therefore, created as deposit liabilities slightly less than two-thirds of M1.[6]

A transactions view of money suggests a connection between the growth in nominal deposits and increases in the general price level. Deposits are a major part of the payments system, entering many transactions where money is swapped for goods or services. Because deposits appear on one side of so many transactions, an increase in nominal deposits relative to the available supply of goods and services would imply a rise in the deposit price of goods and services. The price level stated in terms of, say, a standardized

Monetary Economics," *Journal of Economic Literature*, December 1982, pp.1552-56, and Tyler Cowen and Randall Kroszner, "The Development of the New Monetary Economics," *Journal of Political Economy*, June 1987, pp. 567-590, in referring to a literature that examines a variety of implications of legal restrictions on intermediation. Principal contributors to this literature are Fischer Black, "Banking and Interest Rates in a World Without Money," *Journal of Bank Research*, Autumn 1970, pp. 9-20; Eugene F. Fama, "Banking in the Theory of Finance," *Journal of Monetary Economics*, January 1980, pp. 39-57, and Eugene F. Fama, "Financial Intermediation and Price Level Control," *Journal of Monetary Economics*, July 1983, pp. 7-28; Robert L. Greenfield and Leland B. Yeager, "A Laissez-Faire Approach to Monetary Stability," *Journal of Money, Credit and Banking*, August 1983, pp. 302-315; Robert E. Hall, "Explorations in the Gold Standard and Related Policies for Stabilizing the Dollar," in *Inflation*, Robert E. Hall, ed., National Bureau of Economic Research, Chicago, 1982, pp. 111-123, and Robert E. Hall, "Optimal Fiduciary Monetary Standards," *Journal of Monetary Economics*, July 1983, pp. 33-50; Thomas J. Sargent and Neil Wallace, "The Real Bills Doctrine Versus the Quantity Theory: A Reconsideration," *Journal of Political Economy*, December 1982, pp. 1212-1236; and Neil Wallace, "A Legal Restrictions Theory of the Demand for 'Money' and the Role of Monetary Policy," *Quarterly Review*, Federal Reserve Bank of Minneapolis, Winter 1983, pp. 1-7. This literature has recently gained attention as a means of analyzing monetary questions in a deregulated banking environment.

[4] A good treatment of banks as creators of money is found in George G. Kaufman, *The U.S. Financial System*, Prentice-Hall, Englewood Cliffs, N.J., 1986. The historical role of reserve

requirements in generating revenue for the U.S. Treasury is presented in Marvin Goodfriend and Monica Hargraves. "A Historical Assessment of the Rationales and Functions of Reserve Requirements," *Economic Review*, Federal Reserve Bank of Richmond, January/February 1983.

[5] The M1 money stock is composed of currency, travelers checks, demand and other checkable deposits at depository institutions, and demand deposits at credit unions and thrift institutions.

[6] See statistical releases H.3 and H.6, Board of Governors of the Federal Reserve System, Washington, D.C., January 28, 1988.

deposit would go up.

A conflict between bank behavior and price level stability can arise if no external force limits deposit expansion. For example, in an unregulated and competitive banking system, individual banks may find that the opportunity costs to issuing additional demand deposits are negligible. In such cases, according to one influential economist, the late Harry Johnson of the University of Chicago, the "competitive banking system would be under constant pressure to expand the nominal money supply and thereby initiate price inflation. [Therefore] stability in the trend of prices requires social control over the quantity on money supplied by the banking system."[7]

As Johnson suggests, economic policy enters the banking domain because growth in bank-produced money is considered causally related to inflation. Since monetary policy is responsible for price level stability, most economists and policymakers consider regulatory control over deposits an unavoidable aspect of the monetary policy framework.[8]

In principle, reserve requirements, along with control of the nominal stock of reserves, represent the anchor that limits expansion of the deposit money supply.[9] Under the Federal Reserve's current operating procedure, reserve requirements serve mainly to peg the banking system's demand for the additional reserves needed to back deposit growth. The banking system must obtain an additional 12 cents in reserves for every dollar of new transactions deposits issued. As a result, the Federal Reserve can link deposit growth to growth in the banking system's reserve liabilities.

Impact of monetary control on the banking sector

Reserve requirements impose a cost on banks by requiring that part of the banking sector's portfolio be held as noninterest-earning reserves.[10] Because nonbank financial intermediaries do not face reserve requirements, the cost of holding reserves places banks at a disadvantage relative to other financial institutions. Given this disadvantage, banks can survive in the long run only if they can pass on the costs of reserve requirements to their customers. Banks will be able to pass on these costs if depositors and loan customers value the special services banks offer and if these services are not readily available at lower cost from competitors outside the banking system.

Banks traditionally have been protected from the intrusion of competitors in the deposit and loan markets in three major ways. First, legal restrictions have prevented nonbank financial intermediaries from offering demand deposits. Second, only banks and closely related institutions have offered deposits carrying FDIC or other similar government-sponsored insurance. Finally, in the loan market, banks have traditionally specialized in supplying financing services to commercial and industrial customers that do not have low-cost access to other forms of finance, such as com-

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[7] See Harry G. Johnson, "Problems of Efficiency in Monetary Management," *Journal of Political Economy*, September/October 1968, pp. 971-990 and especially p. 976.

[8] A good summary of this view from a policymaker's perspective on the role of monetary policy in inflation control is Roger Guffey, "The Federal Reserve's Role in Promoting Economic Growth," *Economic Review*, Federal Reserve Bank of Kansas City, February 1987, pp. 1-7.

[9] Under current law, depository institutions with transaction account deposits of $3.2 million or less are exempt from maintaining reserves. The institutions with higher transaction account deposits are required to maintain reserves equal to 3 percent of the first $40.5 million in transaction account deposits, net of the first $3.2 million, plus 12 percent of deposits over $40.5 million. Depository institutions must also meet a 3 percent reserve requirement on nonpersonal time deposits with a maturity of less than one and a half years.

[10] The discussion in this section draws heavily on the analysis in Eugene F. Fama, "What's Different About Banks?" *Journal of Monetary Economics*, December 1985, pp. 29-39.

FIGURE 1
**Effect of reserve requirements
on bank loans**

Interest Rate
i_ℓ, i_d
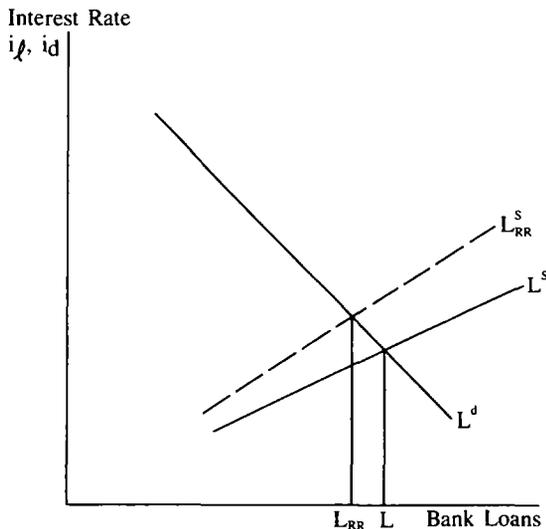
mercial paper or bond issuance.[11] As a result, advantages unique to bank deposits and bank loans have made banking customers willing to bear the cost of reserve requirements.[12]

Figure 1 shows the effect of reserve requirements on bank lending. The vertical axis measures both the bank loan rate (net of specialized monitoring fees charged by banks), i_ℓ, and the gross return paid on deposits, i_d. The gross return paid on deposits is the deposit interest rate plus unremitted service charges. The horizontal axis measures banking industry loans. The upward-sloping curve labeled L^s is the supply of loanable funds to the banking sector. The L^s curve is upward sloping because depositors must be paid higher gross returns to call forth more loanable funds. Without reserve requirements, L^s would be the cost curve for deposits raised by the banking sector. The downward-sloping curve, L^d, is the demand for bank loans. This curve slopes downward because higher interest rates on loans reduce the number of loan customers willing and able to borrow. Without reserve requirements, the amount of bank lending is determined at the intersection of the supply curve, L^s, and the bank loan demand curve, L^d.

With reserve requirements, a bank requires a higher return on assets to cover the unchanged cost of each dollar of deposits plus the added cost of maintaining idle reserve balances. As a result, banks solicit deposits and supply loans only if the loan rate they can charge is higher than the cost of obtaining depositors' funds. Consequently, the loan supply curve under reserve requirements, L^s_{RR}, lies above the loan supply curve without reserve requirements, L^s. The quantity of bank loans is then determined at the intersection of the loan demand curve, L^d, and the loan supply curve, L^s_{RR}.

The adverse impact of reserve requirements on bank loans is the difference between the level of bank loans when no reserve requirements are imposed, L, and the smaller level of loans when reserve requirements are imposed, L_{RR}. The distance between L and L_{RR} is the amount of loan activity either not undertaken or forced into the nonbank financial sector because of reserve requirements.

The New Monetary Economics

In contrast to the traditional view, the New Monetary Economics (NME) views banks as producers of financial services.[13] The economics of

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[11] Ben Bernanke and Mark Gertler develop a formal model of the role of specialized bank services in the loan market in "Banking and Macroeconomic Equilibrium," Social Systems Research Institute, University of Wisconsin, May 1986.

[12] John P. Judd documents the trend toward commercial paper borrowing by large nonfinancial corporations in "Competition Between the Commercial Paper Market and Commercial Banks," *Review*, Federal Reserve Bank of San Francisco, Winter 1979.

[13] This section draws on the discussions in Black, "Banking and Interest Rates in a World Without Money;" Fama, "Bank-

the banking industry essentially involves the same considerations as any other service industry. That is, the amount of bank services produced depends on the costs of production and the willingness of bank customers to pay for bank services. Indeed, treating banks simply as producers of money rather than producers of services can be misleading in understanding the economic role of banks. According to Eugene Fama, a principal contributor to the NME literature, "The banking system is best understood without the mischief introduced by the concept of money."[14]

The NME view of banking as a service suggests a potential distinction between deposit accounts as a means of payment and the monetary assets involved in price level determination. To ascertain the monetary assets relevant to price determination, it is useful to introduce the concept of the numeraire.

A numeraire is a commodity or asset in which prices of other goods and services are quoted. The best known example of a commodity numeraire is the classical gold standard that operated in the United States from 1879 until World War I. Under the gold standard, the dollar was simply a measurement equal to about 1/21 of an ounce of gold. Consequently, the "dollar" price of any other good, such as a railway ticket or loaf of bread, was easily and directly interpreted in terms of a fraction of an ounce of gold.

Under the gold standard, the "price level" was just the average price of all goods and services in terms of ounces of gold. The price level was determined by the supply of and demand for gold relative to the supply and demand conditions for other goods and services. If gold became more plentiful relative to other goods and services, then the prices of other goods and services rose in terms of gold and the economy experienced inflation. Indeed, the mining of new gold supplies was a principal cause of inflationary episodes under the gold standard.

According to Fama, the numeraire in the current U.S. monetary system is the dollar-denominated monetary base. Similar to the gold standard, the dollar price of other goods and services can be measured directly in terms of the monetary base.

With one important difference, the monetary base numeraire operates much like the gold standard. Similar to the gold standard, the price level under the current system is just the average price of other goods and services in terms of the monetary base. Also like the gold standard, the price level is determined by the supply of and demand for the monetary base relative to the supply of and demand for other goods and services. If the base becomes more plentiful relative to the stock of other goods and services, the price of other goods and services increases in terms of the base, and inflation ensues. The one important difference between the gold numeraire and the base numeraire is that the size of the monetary base is a policy tool determined by monetary policy goals, as well as by the public's demand for currency and reserves.

The NME distinction between the monetary base as numeraire and the money stock as transactions balances is crucial in considering the role of deposits. On the one hand, bank deposits clearly should be included in transactions monetary aggregates, since they are an important means of payment in the U.S. economy. On the other hand, the transactions use of deposits does not

ing in the Theory of Finance" and "Financial Intermediation and Price Level Control;" Greenfield and Yeager, "A Laissez-Faire Approach to Monetary Stability;" and Hall, "Explorations in the Gold Standard and Related Policies for Stabilizing the Dollar."

Also see James Tobin, "Commercial Banks as Creators of 'Money,'" in Banking and Monetary Studies, Dean Carson, ed., Irwin, Homewood, Ill., 1963, pp. 408-419, for a seminal treatment of the New Monetary Economics view of banks as producers of services.

14 Fama, "Financial Intermediation and Price Level Control," p. 44.

imply that they play a special role in determining the price level. In the NME view, bank liabilities, such as demand deposits, are best seen as entries in an accounting system in which the basic unit is priced at a fixed one-to-one exchange rate relative to the dollar. These accounting entries do not define the dollar itself. Because deposits are a means of payment but not a component of the numeraire, deposits play no singular part in determining the price level.

This analysis suggests a different role of banks in the monetary policy process. This role is best illustrated by contrasting Johnson's view that the banking system initiates inflation with a view expressed by Fama. According to Fama, "A competitive banking sector is a largely passive participant . . . with no special control over prices or real activity, which in turn means that there is nothing in the economics of this sector that makes it a special candidate for government control."[15]

Some policy choices under the NME

Under the NME, a numeraire—perhaps different from the existing base numeraire—must be chosen. One objective in this choice might be to separate, partially or completely, the bank-supplied transactions money stock from the numeraire. This separation may be desirable because the numeraire is more closely associated with the price level, while the transactions money supply is more closely associated with the services offered by banks.

The decoupling of the numeraire from the deposit liabilities of the banking sector would considerably reduce the traditional role of banks in the monetary policy framework. Since reserve requirements are a primary link between the monetary base and the liabilities of the banking

sector, practical implementation would entail the removal of reserve requirements on transactions balances. Removing reserve requirements would, of course, eliminate the demand for the required component of reserves. The NME encompasses several alternatives for maintaining price level control that do not rely on a demand for required reserves. Eugene Fama and Robert Hall provide two examples.

Fama's example. Fama has proposed that the supply of currency function as the numeraire in a financial system without reserve requirements.[16] His arguments in favor of a currency standard are the following. First, there is a well-established and stable real demand for the services of currency as a hand-held medium of exchange. Second, currency has a fixed nominal return of zero and, consequently, a fixed face value. Third, in principle, the Federal Reserve can control the nominal stock of currency in circulation with little or no error. Under the Fama proposal, deposits and similar accounts would continue to operate as a payments system, except that settlement between banks would no longer necessarily involve swapping central bank reserves.

In some respects, Fama's proposal is not a radical change in the current system. Although the elimination of reserve requirements on transactions balances would break the direct connection between the numeraire and bank-created transactions balances, the currency numeraire would also function as a major medium of exchange. Further, since the removal of required reserves would not eliminate the desire of banks to inventory vault cash to service demand deposits, there would still be a link between the total supply of demand deposits and Federal Reserve liabilities. Quantitatively, a currency numeraire would only modestly differ in nominal size from the monetary base numeraire. By the

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[15] Fama, "Banking in the Theory of Finance," p. 47.

[16] Fama, "Financial Intermediation and Price Level Control."

end of 1986, only 16 percent of the monetary base was held as noncurrency reserves.[17]

Hall's example. Robert Hall has made a more striking proposal involving complete separation of the numeraire from the banking system.[18] His proposal is based on a commodity standard in which the basic unit of value is composed of a group of industrial commodities. The unit itself would be denominated in dollars, much the way an ounce of gold was denominated in dollars under the gold standard.

Hall's proposal involves constructing the unit from a core group of standardized industrial commodities that have shown fairly stable value relative to the Consumer Price Index. Hall would use a specific weighted average of these commodities to construct the standard unit of value. He names this unit the ANCAP.[19]

In Hall's view, the current system of using reserve requirements on bank deposits to determine both the demand for nominal central bank reserves and the price level is an "accident of history."[20] In suggesting the ANCAP as the successor to the monetary base system, he tries to remove the banking sector completely from any special role in price level control.

Hall's proposed use of the ANCAP as the unit in which other prices are quoted is reminiscent of the gold standard. However, the ANCAP proposal differs in several critical ways from the classical gold standard. These differences highlight the issues involved in Hall's scheme. First,

by proposing a commodity bundle rather than a single commodity, Hall defines a numeraire with a more stable demand relative to other goods and services. Demand stability is necessary to make any numeraire scheme attractive. A commodity standard based on a single commodity, such as gold, might be subject to wide changes in demand, causing a widely fluctuating price level.

Second, Hall's scheme promotes long-run price stability by allowing for frequent changes in the scale of the ANCAP. This feature could correct for secular changes in the relative demand for the ANCAP and reduce secular deflation, one of the well-known problems of the gold standard. In a growing economy with a fixed stock of gold, the price of other goods and services tends to fall relative to gold, causing a general deflation. Hall deals with this problem by frequently rescaling the ANCAP (changing the volume of each product comprising the standard unit) by small amounts, thereby keeping the price of the ANCAP roughly constant.

Third, the central bank is not allowed to inventory (or contract for future delivery) stocks of the ANCAP unit or otherwise intervene in the ANCAP commodity markets. This feature would prevent the Federal Reserve from selling stocks of the commodity reserve—from engaging in open market operations—to validate a rise in prices. Hall's concern is that the central bank might respond to an initial inflation by postponing the downward readjustment of the price level needed to ensure long-run price stability. Readjustment could be postponed by drawing down reserves of the commodity standard instead of letting the commodity price standard work on its own to deflate the price level.

The ANCAP proposal is a good example of a policy designed to separate completely the numeraire from the transactions function of money. As such, it is the more controversial of the two proposed numeraires. Many economists believe the full benefits of a modern monetary system can

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[17] See *Federal Reserve Bulletin,* July 1981.

[18] See Hall, "Monetary Trends in the United States and the United Kingdom: A Review from the Perspective of New Developments in Monetary Economics."

[19] The term ANCAP stands for the commodities comprising the commodity standard. They are ammonium nitrate, copper, aluminum, and plywood.

[20] See Hall. "Explorations in the Gold Standard and Related Policies for Stabilizing the Dollar," p. 1553.

be obtained only when the principal means of payment and the numeraire asset are tied together.

Unresolved issues. At least two issues associated with the Fama and Hall proposals remain unresolved. First, there is considerable skepticism that greater economic efficiency would result from separating the numeraire from the means of payment. Second, more evidence is required to establish that the proposed systems would actually result in a more stable price level than the current monetary base system.

Recent critiques of the NME have noted that the payments system appears to work best when the numeraire and a major transactions medium are one and the same.[21] Transactions are more easily understood and carried out when the transacting medium is the good in which prices are quoted. A simple example illustrates the inefficiency caused by separation of the numeraire and the principal medium of exchange. Suppose the numeraire was Hall's standardized commodity group, the ANCAP, but that the principal transacting medium was a standardized deposit unit backed by high-grade stocks and bonds. The price of stocks and bonds—and, therefore, the deposit unit—would vary relative to the ANCAP numeraire. As a result, every transactor would have to keep track of the numeraire price of the goods involved, as well as the price of the standardized deposit unit terms of the numeraire.

An efficient payments system involves exchange media priced at a fixed rate in terms of the numeraire. Effective enforcement of the fixed rate of exchange depends on convertibility

to the numeraire at the fixed rate. However, since convertibility into a cumbersome unit like the ANCAP would entail significant shipping and storage costs, a competitive payments system would likely drop the ANCAP as the numeraire and price goods directly in terms of the standardized deposit or some more convenient item, such as currency.

The stability of the price level under alternative monetary systems—the second unresolved issue—depends largely on the supply and demand characteristics of the numeraire. For proposals such as Hall's, in which a commodity group is the numeraire, supply depends on conditions in the relevant industries producing the ANCAP commodities, and demand depends on the industrial use of these materials. Hall presents evidence that the ANCAP commodity price has had a relatively stable history. But there is no evidence that the price stability of the ANCAP commodities is a fundamental characteristic that will prevail in the future.

Fama's currency proposal also requires evidence that currency supply and demand is more stable than the monetary base supply and demand. Fama presents some evidence on this issue, and historical studies of currency use suggest a large and stable "hoarding" demand for currency.[22] However, much more detailed work on the currency stability issue is needed to fully assess his proposal.

Empirical evidence

Has nominal deposit growth been important in the inflation process? The answer would suggest whether relinquishing control of deposits would have price level consequences. The empirical evidence is limited, though one recent study by

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[21] The discussion is based on the analysis by L. H. White, "Competitive Payments Systems and the Unit of Account," *American Economic Review*, September 1984, pp. 699-712, and Gerald P. O'Driscoll Jr., "Money in a Deregulated Financial System," *Economic Review*, Federal Reserve Bank of Dallas, May 1985, pp. 1-12. Also see Bennett T. McCallum, "Bank Deregulation, Accounting Systems of Exchange, and the Unit of Account: A Critical Review," National Bureau of Economic Research, Working Paper 1572, March 1985.

[22] See Paul S. Anderson, "Currency in Use and in Hoards," *New England Economic Review*, Federal Reserve Bank of Boston, March/April 1977, pp. 21-30.

Fama presents some relevant findings.[23] Using U.S. inflation rate data over the 1954-76 period, Fama compares the performance of competing models of inflation in which deposit growth, monetary base growth, and the M1 growth rate are tried separately as the relevant monetary aggregate. To control for shifts in asset demand, each inflation model also includes a nominal interest rate variable and a measure of real activity.

There are two important findings from Fama's experiments. First, models that use monetary base growth as the monetary variable usually explain inflation movements more accurately than models using either deposit growth or M1 growth. Second, when deposit growth or M1 growth is entered into the inflation model simultaneously with monetary base growth, only monetary base growth has significant effects on inflation. Deposit growth makes no separate contribution to inflation.

While these findings are suggestive, more empirical studies are needed to draw firm conclusions. Also, because the inflation data set in the Fama study ended in 1976, there is no empirical evidence on the deposit-inflation relationship based on information from the most recent decade. The post-1976 period is particularly interesting for the issues at hand because it witnessed considerable swings in inflation and because the financial system underwent a significant transformation through the offering of a variety of new transactions accounts.[24]

Because there is little empirical evidence, particularly for the period since 1976, a set of empirical experiments are carried out similar to those Fama reports. Two versions of an empirical model of inflation are used in these experiments. The first model includes current and lagged monetary base growth, and current and lagged growth in the deposit component of M1. The second model uses currency growth in place of base growth, essentially separating M1 growth into its currency and deposit growth components. Both models control for the separate impact of interest rates and output growth on inflation. The first model is the one Fama used. The second model is a more favorable environment for finding a positive effect of deposit growth on inflation since, under this specification, deposit growth will likely pick up the impact of reserve growth on inflation. Separate coefficients are estimated on deposit growth and, depending on the model, either base growth or currency growth. Estimates of the model coefficients are obtained using U.S. annual data over the 1953-86 period. The estimates and the details of the estimation procedure are presented in the Appendix.

Overall, the empirical results corroborate Fama's findings. In the first model, the sum of coefficients on current and lagged monetary base growth is 0.64. In the second model, the sum of coefficients on currency growth is 0.68. Both estimates are statistically different from zero. These numbers mean that a 1 percent increase in the growth rate of either the monetary base or currency leads to about two-thirds of a percent increase in inflation. In contrast, the effect of deposit growth on inflation is not statistically different from zero. These results are consistent with Fama's estimate of a sum of coefficients of 0.66 on base growth and statistically unimportant coefficients on deposit growth.[25] Empirically at least, it appears that deposit money growth simply has

[23] Eugene F. Fama, "Inflation, Output and Money," *Journal of Business*, April 1982, pp. 201-231.

[24] For example, the NOW (negotiable order of withdrawal) account was made available on a nationwide basis in December 1980. Super-NOW accounts became available in January 1983. Quasi-transactions accounts, such as money market mutual funds, became widely used during this period while bank money market deposit accounts were introduced in December 1982.

[25] See Fama, "Inflation, Output and Money," Table 2, Model No. 14, p. 208.

not mattered much in the inflation process. Consequently, U.S. experience since the Korean War supports the proposition that deposit growth is not of special concern for price level stability.

Conclusions

The traditional view of banks in the monetary and price level control process is based on banks being producers of money. Control of the bank money supply is considered important in controlling the price level. In this view, reserve requirements limit the expansion of deposits. Thus, reserve requirements are useful in attaining macroeconomic policy goals, although they impose costs on the banking sector.

The traditional view has been challenged by recent models of money and prices in a deregulated banking environment. These new monetary models suggest that growth in commercial bank liabilities has no particular consequence for policy goals such as price level stability. In this view, the role of banks in the monetary policy process could be reduced with no adverse effects on price level control, principally by removing reserve requirements.

Specific proposals for monetary reform based on the New Monetary Economics are provocative. Although considerable further analysis is required, the New Monetary Economics provides insights into monetary policy issues in an increasingly deregulated financial environment.

Appendix

This appendix describes an empirical model of inflation. The model is used to estimate the extent to which bank deposit growth contributed to U.S. inflation over the post-Korean War period.

The standard inflation model relates inflation to nominal money growth in excess of growth in real money demand.[A1] Specifically,

$$(1) \quad INFL = MG^s - mg^d,$$

where INFL is the inflation rate, MG^s is the nominal money supply growth rate, and mg^d is real money demand growth.

The demand for money is negatively related to the opportunity cost of holding money and positively related to the level of economic activity. The opportunity cost variable is the 3-month Treasury bill rate. Economic activity is measured

as the current and once-lagged values of industrial production.[A2] Use of these two factors yields the empirical model of money demand growth,

$$(2) \quad mg^d = a_0 \, IP + a_1 \, IP_{-1} - a_2 \, TBR.$$

IP is current industrial production growth, IP_{-1} is once-lagged IP. TBR is the change in (the log of) one plus the 3-month Treasury bill rate, and a_0, a_1, and a_2 are coefficients. Substituting equation 2 into equation 1 yields

$$(3) \quad INFL = MG^s - a_0 IP + a_1 IP_{-1} + a_2 TBR.$$

Two versions of the above inflation model are estimated. In the first version, the monetary base growth, denoted as BG^s, and the growth in the bank deposits, denoted as DG^s, are entered in the

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[A1] See Robert J. Barro, *Macroeconomics*, Wiley, New York, 1987, 2nd edition, Chapters 7 and 8.

[A2] Fama also includes a one-period-ahead value of IP in his proxy for real activity.

model as competing measures of money growth, and the impact of each of these monetary variables on inflation is estimated. Placing these two measures of money growth into equation 3 for MG^s yields the first estimated model of inflation.

$$(4) \quad INFL = \sum_{i=0}^{1} gb_i \, BG^s_{-i} + \sum_{i=0}^{1} gd_i \, DG^s_{-i}$$

$$- \sum_{i=0}^{1} a_i \, IP_{-i} + a_2 \, TBR + e.$$

The coefficients gb_i, on current and lagged monetary base growth, and the gd_i, on current and lagged deposit growth measure the impact of each of these monetary variables on inflation.

The second version of the model estimates equation 4 with currency growth, denoted CG^s, substituted for monetary base growth. Both versions of the model are estimated over the 1956-85 period.[A3] The bank deposit growth rate is measured as the growth in the noncurrency component of M1. The estimated model that includes

the monetary base is

$$(5) \quad INFL = \underset{(2.6)}{.02} + \underset{(4.0)}{.64 \, BG^s} - \underset{(-1.7)}{.50 \, DG^s}$$

$$- \underset{(-3.4)}{.42 \, IP} + \underset{(2.5)}{.01 \, TBR}.$$

$R^2 = .78$
Durbin-Watson $= 1.9$,
Sample period $= 1956\text{-}85$.

The estimated model that includes currency growth is

$$(6) \quad INFL = \underset{(3.0)}{.02} + \underset{(5.8)}{.68 \, CG^s} - \underset{(-.42)}{.11 \, DG^s}$$

$$- \underset{(-5.1)}{.47 \, IP} + \underset{(4.4)}{.01 \, TBR}.$$

$R^2 = .85$,
Durbin-Watson $= 2.6$,
Sample period $= 1956\text{-}85$.

The coefficients reported for BG^s, DG^s, CG^s, and IP are the sums of the coefficients on the current and once-lagged values of these variables.[A4] The numbers in parentheses below the estimated coefficients are t-statistics. A t-statistic greater in absolute value than 2.0 indicates that the sum of estimated coefficients is statistically significantly different from zero.

[A3] The data are annual growth rates computed from last month in the year data points. The basic data set spans 1953 through 1985. The regression equation starts in 1956 because of differencing and the use of lagged data.

The model is estimated by a two-stage procedure to eliminate the simultaneous equations bias resulting from the appearance of IP and TBR in the model. The variables used in the first stage to estimate IP include current and one lag of the marginal tax rate on total income and the price of crude oil and two lags of IP, real exports, the inflation rate, and deposit growth. The variables used in the first stage to estimate TBR include current and two lags of deposit growth, current and one lag of the marginal tax rate on total income and the price of crude oil, and two lags of TBR and inflation.

[A4] The separate coefficients (and t-statistics) on current and once-lagged BG^s in equation 5 are 0.34 (1.7) and 0.30 (1.3), respectively. The separate coefficients (and t-statistics) on current and once-lagged CG^s in equation 6 are -0.14 (-0.6) and 0.82 (3.4), respectively.