DALLASFED

Economic Review

Federal Reserve Bank of Dallas
May 1985

Money in a Deregulated Financial System

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A growing number of economists believe that money would disappear in an unregulated financial system. They argue that legal restrictions and the regulatory system are responsible for the existence of money as a distinct asset. In particular, they predict that there would be no demand for non-interest-bearing financial assets like currency in an unregulated financial system.

In a less dramatic vein, a case has been made that the long-run effects of deposit deregulation will erode the central bank's ability to control monetary growth. This would have serious implications to the extent that monetary control is a necessary ingredient to a stable economy.

In 1980, Congress took the initiative in deregulating deposits by passing legislation providing for the elimination of interest rate ceilings on depository accounts. As a result, new types of deposits paying market interest rates were introduced. Before this action, however, the Federal Open Market Committee (FOMC) had announced a change in operating procedure. Greater emphasis was placed on control of reserves in order to control the monetary aggregates better. Deposit deregulation might thus have made control of the monetary aggregates impossible at the very time that the FOMC had come to emphasize controlling these aggregates.

The plan of this article is as follows. The first part examines the central-banking literature on monetary control in a deregulated environment. While it appears that the effects of deregulation thus far have been less dramatic than many expected, the issues raised in this literature are crucial for understanding how banks would operate in a deregulated environment. The remainder of the article examines the new literature on banking that has derived from the theory of finance. In the latter, banks are not viewed as creators of money but as pure financial intermediaries.

Since both sets of literature focus on the effects of paying competitive rates of interest on money, this article examines the issue in some detail. Analysis suggests that loss of monetary control is unlikely. This conclusion is buttressed by the historical experience of largely unregulated banking

The views expressed are those of the author and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System. The author expresses his appreciation to Lawrence H. White of New York University for his helpful comments on earlier drafts of this article.

systems.

The article also concludes that money would not disappear in an unregulated financial system. Support for this position derives from analyzing the essential properties of a medium of exchange and, especially, from considering money's role as the only perfectly liquid good. Yielding an explicit return eliminates neither money's distinctive properties nor the demand for its special services.

Deregulation and monetary control

Deposit deregulation not only radically changes the regulatory structure for banks but also significantly affects the conduct of monetary policy.[1] If deposits were fully deregulated, the central bank could no longer rely on disintermediation to control monetary growth or to influence real economic activity. If transaction accounts actually paid market rates of interest, monetary policy could not change the opportunity cost of holding transaction balances. (See Box A.)

The partial deregulation of deposits that has already occurred does not correspond exactly to this hypothetical case. First, deregulation is not complete. Second, banks are still required to hold reserves against all transaction accounts, which drives a wedge between the market rates earned on assets held by banks and the rates they can pay on transaction accounts.[2] Nonetheless, the hypothetical case certainly points to the *direction* in which the monetary system is evolving. (See Box B.)

Moreover, the payment of near-market rates of interest on Super NOW accounts gives them a savings feature heretofore lacking in transaction accounts; it blurs the distinction between transaction and savings accounts. Thus, use of M1 as a "temporary abode of purchasing power" is more attractive. Observers anticipated that the introduction of Super NOWs would lead to a once-and-for-all increase in the demand for M1.[3]

Complicating the January 1983 advent of Super NOW accounts, however, was the fact that in the previous month the money market deposit account (MMDA) had been introduced. MMDAs had a transaction feature: up to six third-party transfers could be made per month (three by check). In theory, then, MMDAs, which are a component of M2 but not M1, could have "robbed" M1 of transaction balances.

In other words, the effects of *all* the deposit deregulation on the demand for M1 were ambiguous. If money demand were less predictable, however, then setting the proper targets for the growth of M1 would be more difficult. These and other considerations influenced the FOMC in its decision in late 1982 to de-emphasize M1 temporarily in formulating monetary policy.[4]

Despite these concerns, the evidence accumulated thus far suggests that the worst fears have been far from realized. Most shifting of accounts apparently occurred *within* traditionally defined aggregates. The evidence suggests that MMDAs attracted funds mainly from other components of M2 while Super NOWs attracted funds chiefly from other components of M1. The comparatively small amount of shifting that took place between components of M1 and M2 appears to be nearly offsetting.[5]

The fact that the partial deregulation of deposits has had comparatively minor observable impact on the monetary aggregates by no means implies that concern over its potential effects was either misguided or exaggerated. Individuals may still be adjusting to the partial deregulation that has already taken place. And, as indicated above, the process of deregulating accounts at depository institutions is not over. (See Chart 1.)

Deposit deregulation is but one effect of an ongoing process of financial innovation. This process

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1. For purposes of this article, "bank" is used synonymously with "depository institution." A fuller treatment would consider other depository institutions (for example, savings and loan associations) more explicitly. Further, this article focuses on deregulation of deposits. Analysis of banks' expanded asset powers would require a separate paper.

2. For an analysis, see John P. Judd, "Deregulated Deposit Rates and Monetary Policy," *Economic Review*, Federal Reserve Bank of San Francisco, Fall 1983, 27-44, especially 28-29.

3. For a fuller discussion of the potential effects, see Judd, "Deregulated Deposit Rates and Monetary Policy."

4. Some analysts have argued that depository deregulation might lead to permanent instability in the demand for money. See Judd, "Deregulated Deposit Rates and Monetary Policy," 30-35. It should be noted that the FOMC has since returned to targeting M1.

5. See Frederick T. Furlong, "New Deposit Instruments," *Federal Reserve Bulletin* 69 (May 1983): 319-26; cf. Judd, "Deregulated Deposit Rates and Monetary Policy," 32-34.

Box A

The Regulated Banking System, 1934–1980

Most of the distinctive features of the U.S. banking system were firmly established by the Banking Act of 1933. Among other things, the act specified lines of commerce in which commercial banks could not engage (for example, underwriting securities). Of direct relevance here was the enactment of a system of regulated interest rates on bank accounts. Payment of interest on checking accounts was prohibited, as was the payment of interest on interbank deposits.[1] The Board of Governors of the Federal Reserve System was empowered to establish interest rate ceilings on savings accounts.

The Banking Act of 1933 mandated a sharp distinction between commercial banks, on the one hand, and other depository and nondepository financial institutions, on the other hand. Commercial banks were heavily regulated as to the activities in which they could engage. In return, however, they were given a monopoly on the creation of checking accounts. Two consequences of this regulatory system are noteworthy.

First, by sharply distinguishing between transaction and nontransaction accounts, the Banking Act of 1933 indirectly established an identifiable empirical counterpart to the theoretical concept of "transaction money" in economics. By effectively implementing the intent of the act, the Federal Reserve System prevented other types of deposits from acquiring a transaction or medium-of-exchange feature.[2] The Fed thereby delineated the category of deposit that should be added to currency to determine the supply of transaction money. The Banking Act of 1933 settled the issue of which deposits are transaction accounts for over 40 years.

Regulation Q facilitated monetary control in a second significant way. By selling a sufficient quantity of assets from its portfolio, the Federal Reserve System could push market interest rates further and further above the maximum allowable interest rate payable on bank accounts. This would raise the opportunity cost of holding money.

Let i denote a short-term interest rate and d denote the maximum allowable rate payable on the relevant deposit category (zero for demand deposits). The opportunity cost of holding funds in a given deposit category would be measured by $(i-d)$. As i increases relative to d, this cost rises. Individuals will tend to economize on their accounts at depository institutions.

The process in which agents withdraw funds from financial intermediaries and purchase financial assets directly is described as disintermediation. Individuals are not willing, however, to hold the same portfolios as do financial intermediaries. Not being able to pool risks, as do these intermediaries, individuals tend to buy highly liquid, risk-free assets like U.S. Treasury bills. Consequently, funds for mortgages and small businesses dry up, slowing economic activity. This sectoral contraction shows up as slower growth in nominal gross national product (GNP). (Had the analysis begun with market rates above Regulation Q levels, an expansionary monetary policy would have produced the opposite results.)

The conduct of monetary policy has thus been influenced by the regulatory structure. The policy question is how monetary control can be effected in a partially or fully deregulated environment.

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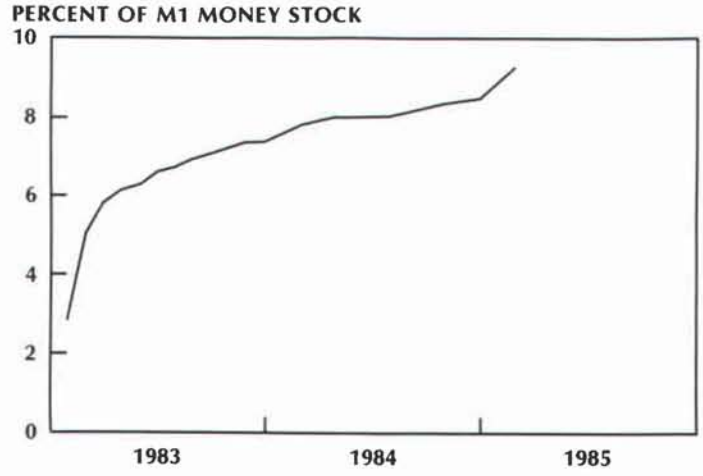
1. Payment of interest on bankers' balances helped integrate local banks into a national capital market by enabling large correspondent banks in money centers to bid for the funds of independent local banks around the country. The system was an effective though imperfect substitute for a system of national branch banking. See Eugene Nelson White, *The Regulation and Reform of the American Banking System, 1900–1929* (Princeton: Princeton University Press, 1983), especially 65–74. Critics like Congressman Carter Glass objected to the system's efficiency, for they did not want funds moved from local markets to money centers. See John H. Wood, "Familiar Developments in Bank Loan Markets," *Economic Review*, Federal Reserve Bank of Dallas, November 1983, 2–3.

2. Financial institutions in some New England states were eventually able to slip through one legal loophole. In 1972, state-chartered thrifts in Massachusetts and New Hampshire began offering accounts on which "negotiable orders of withdrawal" could be written (hence the acronym "NOWs"). These were essentially savings accounts on which checks could be drawn. Approximately one year later, Congress authorized NOW accounts for all depository institutions in these states. See Katharine Gibson, "The Early History and Initial Impact of NOW Accounts," *New England Economic Review*, Federal Reserve Bank of Boston, January/February 1975, 17–26. For the spread to other New England states, see Ralph C. Kimball, "Recent Developments in the NOW Account Experiment in New England," *New England Economic Review*, November/December 1976, 3–19; and Donald Basch, "The Diffusion of NOW Accounts in Massachusetts," *New England Economic Review*, November/December 1976, 20–30. When introduced, the national NOW accounts were modeled after these regional accounts.

Chart 1

Super NOW Accounts as a Share of M1



SOURCE: Board of Governors, Federal Reserve System.

has the potential for causing even more far-reaching changes in U.S. monetary institutions. The next section analyzes the direction in which recent innovations are taking the financial system.

Money and financial innovation

The effect of recent innovations is to move banks and nonbanks alike in the same direction. Their liabilities are (1) increasingly paying market interest rates and (2) increasingly not subject to reserve requirements. In the previous section, discussion focused on the first characteristic. In this section, attention will be paid to the second.

Though the two characteristics of deregulated financial liabilities are logically distinct, they are economically related. To pay competitive yields on their liabilities, firms will minimize their holdings of non-interest-bearing assets. Save for a brief interval in 1980–81, nonbank financial firms were under no requirement to hold non-interest-bearing reserves. As a result, money market mutual funds (MMMFs), for instance, have remained almost fully invested in money market instruments.[6]

In response to the development of MMMFs, banks offered "sweep" accounts at the retail level. Market forces thus moved banks and nonbanks alike to offer "zero-balance" transaction accounts. A deposit balance is created to be instantly extinguished. Bank money (deposits) as we know it disappears in the process, as do reserves and the central bank's ability to conduct conventional monetary policy.

Banks developed zero-balance accounts to evade the reserve requirements on transaction accounts. In the absence of these requirements, the incentive to adopt this subterfuge would be eliminated. While bank deposits would be restored to their traditional place, the tendency for banks to minimize their reserve holdings would not diminish. Moreover, in the process of circumventing reserve requirements and deposit regulations, bankers have undoubtedly acquired useful knowledge about minimizing the level of reserves held against given deposit balances.

Many of the forces moving the financial system toward a world of nonreservable deposits are also tending to minimize the use of currency. For in-

6. One author has found that money market mutual funds generally hold a positive but small percentage of their assets (less than 1 percent) in demand deposits at commercial banks; apparently these deposits are used to honor redemptions (Lawrence H. White, "Competitive Payments Systems and the Unit of Account," *American Economic Review* 74 [September 1984]: 707 n. 16).

Box B

A Chronology of Deposit Deregulation

Beginning in 1980, Congress took a more active role in setting the pace of deposit deregulation. Depository institutions had been buffeted by high and volatile interest rates and turbulent financial conditions for more than a decade. To a large extent, the financial turbulence resulted from the volatility of inflation rates. In addition, the breakdown of the old international monetary system of fixed exchange rates and its replacement by a system of flexible exchange rates put added burden on an already strained financial system. Finally, the October 1979 decision of the Federal Open Market Committee to place greater emphasis on controlling bank reserves (and less emphasis on interest rates) injected an additional element of uncertainty into financial markets.

Banks and other depository institutions were unable to adjust freely the interest rates paid on deposits as market rates changed. Member banks of the Federal Reserve System were governed by Regulation Q, with similar regulations restricting other federally insured depository institutions. Consequently, as market interest rates rose above the respective maximum allowable rates payable on deposits, depository institutions experienced outflows.

Before the introduction of money market mutual funds (MMMFs), individuals had only limited ability to invest in short-term, money market instruments. These instruments not only had high minimum denominations ($10,000 to $25,000 and higher) but also required a sophistication lacked by most small investors. Therefore, a natural limit on disintermediation existed for a time.

The 1972 introduction of MMMFs changed all this by radically altering the opportunities facing even the small investor. The MMMF is a highly liquid asset paying competitive interest rates. It has a transaction feature: investors can, in effect, place a sell order on their shares by writing a check. Further, the MMMF industry adopted an accounting procedure that stabilizes the value of a share at $1, making it a perfectly liquid investment for the individual.

In 1977, Merrill Lynch bundled an MMMF with a brokerage account and a line of credit supported by the equity in the account. The cash management account (CMA) gave its holder instant overdraft privileges.[1] With the growth of MMMFs and CMAs, 40 years of regulations on bank liabilities began to unravel.

In response to the development of MMMFs, banks offered "sweep" accounts at the retail level. Patterned after established wholesale money management practices, such accounts automatically invest all funds over and above a predetermined minimum in money market instruments.[2] Every night, the excess funds are "swept" into a portfolio of these financial instruments to earn interest. Since the funds are no longer in demand deposit accounts, interest can be paid on the funds and no reserves need be held against them.

The first major regulatory easing came with the 1978 introduction of the money market certificate. This 6-month small time deposit paid an interest rate equal to the 180-day Treasury bill discount rate established for the week in which the money market certificate was issued. While the minimum balance was hefty—$10,000—banks circumvented this minimum by lending depositors some of the deposit. The loan was secured by the deposit. This subterfuge was eventually institutionalized by a regulation controlling the amount and terms of the loan. In the main, however, the regulatory agencies were unwilling or unable to deregulate deposits generally.

Against this background, Congress passed the Depository Institutions Deregulation and Monetary Control Act in March 1980. In large part, this act was designed to accelerate deposit deregulation. The Depository Institutions Deregulation Committee (DIDC) was established to implement the orderly phaseout of interest rate ceilings. In this spirit, the act provided that all depository institutions could offer NOW (negotiable order of withdrawal) accounts to individuals and nonprofit organizations.

Unsatisfied with DIDC's progress in deregulating deposits, Congress passed the Garn-St Germain Depository Institutions Act of 1982. Among other things, the act authorized all depository institutions to offer a money market deposit account (MMDA) "directly equivalent to and competitive with money market mutual funds." The MMDA was offered effective December 1982. In the meantime, DIDC provided for the introduction of Super NOWs—transaction accounts for individuals paying market interest rates.

While the process of deregulating the nontransaction components of the money stock is nearly complete, deregulated transaction accounts still make up only a small percentage of total M1 (Chart 1). Clearly, there is a substantial potential for further deposit deregulation.[3]

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1. An overdraft is a loan made by the bank to cover a check for which there are insufficient ready funds in the account on which it is drawn.

2. These investments typically take the form of repurchase agreements, in which the bank sells a share in a pool of securities to the depositor with a promise to repurchase in 24 hours. Technically, the agreement is renewed each day, with the amount varying as deposits and withdrawals are made in the account.

3. Cf. Thomas D. Simpson, Staff, Board of Governors of the Federal Reserve System, "Implications for Monetary Policy of Changes in the Financial System" (Paper prepared for Brookings Panel on Economic Activity, Washington, D.C., 5-6 April 1984), 11-12.

stance, the development of "debit cards" enables individuals to transfer cash without using currency. It is perhaps fanciful to envision a world in which currency and coin are not used. But it is quite useful to inquire into the institutional features of that world. As we get closer and closer to it, presumably our financial institutions will begin to look more and more like those of the cashless, zero-balance financial system.[7]

Economists and policymakers are searching for a theory of a deregulated banking system. It turns out, however, that this is one of the rare instances of institutional change in which theory preceded fact. Though a once-obscure literature on a fully deregulated banking system has existed nearly 15 years, only the innovations of the last few years made clear how fundamental are the theoretical questions raised in it. In the next section, I analyze some of these issues.

Money in theory and practice

Money and prices. The classic reference in the new literature on money is a 1970 article by Fischer Black.[8] In this seminal piece, Black imagines the following:

> a world in which commercial banks and other financial institutions are free to offer checking accounts (and savings accounts) on any terms they might want to set, and in which there are no reserve requirements. Banks could pay interest on demand deposits, and might not choose to distinguish between demand deposits and time deposits. Since there would be no reserve requirements, there would be no reason for Federal Reserve open market operations.[9]

Black predicts that

> In such a world, it would not be possible to give any reasonable definition of the quantity of money. The payments mechanism in such a world would be very efficient, but money in the usual sense would not exist.[10]

At first blush, a world in which banks hold no reserves and the public uses no currency would seem to imply an infinite supply of money and an infinite price level. Or, more generally, the quantity of money and the price level would not be determinate. In Black's hypothetical world, however, reserves and currency disappear because money as a distinct asset no longer exists. The difficulty, as we shall see, is not that the price level tends to infinity but that money prices no longer exist.

In Black's model, there is complete depository freedom. Depository institutions, which he terms "banks," handle payments that are effected by check or electronic transfer. Banks make loans, and their income derives from the spread between the rates paid on deposits and those charged on loans. A loan is simply a negative bank balance—an overdraft.[11]

Black develops his analysis in the context of a simple model of financial evolution, which begins with a system of commodity money and ends in a moneyless world. He hypothesizes that early in this evolutionary process both real goods and financial liabilities functioning as the means of payment are priced in terms of a standard, abstract unit of account.

At this point, it must be noted that Black's terminology is misleading. His use of "banks" is mentioned above. While we are accustomed to thinking of banks as creators of money, there is no money in Black's model. Yet he calls nonmoney financial

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7. Grocery stores and gasoline stations are experimenting with machines that electronically transfer funds for a purchase from the vendee's to the vendor's account when a debit card is inserted. One can easily imagine usage spreading until cigarette and video-game machines would accept these cards. A new generation of pay phones already accepts credit cards. In 1986, French banks will begin introducing "smart cards," which can work in all these ways and more. See "French Banks Unveil Program to Circulate 'Smart' Credit Cards," *Wall Street Journal*, 6 March 1985, Southwest edition, sec. 2. The use of currency and coins will undoubtedly not disappear but might become minimal before the end of this century.

8. Fischer Black, "Banking and Interest Rates in a World Without Money: The Effects of Uncontrolled Banking," *Journal of Bank Research* 1 (Autumn 1970): 8-20.

9. "Banking and Interest Rates," 9. Despite the supposition of unregulated deposit creation, Black by no means assumes laissez-faire in banking. For instance, he specifies that "every bank will be required to have capital equal to a certain fraction of its loans" (p. 12).

10. "Banking and Interest Rates," 9. In addition, Black maintains that "neither the quantity theory of money nor the liquidity preference theory of money would be applicable" (p. 9). "Traditional monetary theories will be inapplicable; in fact, it will not be possible to define the quantity of money in meaningful terms" (p. 10).

11. "Banking and Interest Rates," 10-11. Black's description of a system of positive and negative balances is a virtual foretelling of the cash management account.

assets created by banks "money." Finally, he refers to the abstract unit of account as "dollars." So in a world without banks as distinctive institutions, without money and without currency, "banks" create "money" denominated in "dollars." In addition, Black's evolutionary story begins with a commodity money, which really is money proper, but it evolves into a financial asset that is no longer money but is still called by the same name.

Despite the verbal confusion, Black's analysis contains important insights. In what follows, I focus on the analytical issues shorn of some of the idiosyncrasies of the original article. I concentrate on Black's article because it remains the fundamental contribution in the literature.

Goods trade for financial assets, both measured by an abstract unit of account. A mutual fund of common stock is the paradigm financial asset serving as a means of payment. Since the fund's value fluctuates daily, the "money" price of goods (measured in the unit of account) must constantly be recomputed. In other words, we are in a barter world. Borrowing and lending of financial assets are now introduced. Banks emerge as administrators and guarantors (for a fee) of loans. In the final stage, banks also provide a means of payment. At this point, banks resemble the financial intermediaries with which we are familiar. Black concludes that

> In none of these...worlds was there any role for a central bank. And the only effect that the financial sector had on the real sector was that as we go to successively more efficient means of payment, we reduce the cost of making payments and release real resources for other uses. In none of these worlds was there any mechanism that would cause uncontrolled inflation in the absence of a central bank.[12]

Black's denial of a role for central banks follows from his position that central banks exist to enforce unnecessary regulations, regulations absent by assumption from his model. His second conclusion is a kind of neutrality proposition, one that beomes the focus of Eugene Fama's development of Black's framework.[13] Fama concludes that

> A competitive banking sector is largely a passive participant in the determination of a general equilibrium, 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.[14]

In other words, banks merely finance real activities, which are assumed to be invariant to the financing process.

Toward which world are we evolving? Is it Black's, in which money as we know it disappears? Or is it one in which the banking system is completely unconstrained in its creation of conventional deposits? If the latter, then the creation of additional money is virtually costless and the classical theory of money would apply.

> Cost of production was the Classical explanation of the long-run value of money (as well as of everything else) under the rules of the gold standard, and Classicists did not consider the substitution of discretionary management of the money supply. Classical thinkers saw no way, in the long run, to maintain the value of a costless currency. No one yet has proved them wrong on this point, and we appear presently to be—however reluctantly—in the process of proving them right.[15]

If the classical theory is correct, then some limitation on the ability of banks to create liabilities is necessary. The limitation may be natural, such as a resource cost under a commodity standard, or it may be artificial, as that imposed by central banks under a fiduciary or fiat standard. Without such a limit, however, there is no anchor for nominal values in an economic system. This issue is the focus, directly or indirectly, of most of the rest of this article.

Base money. If it were true that a largely unregulated banking system would be self-limiting in its production of liabilities, then the classical case for regulating banks would be undermined. Further, if we are evolving toward a system of zero-balance accounts, then central banks will no longer have anything to control. They would be both superfluous and ineffectual.

In analyzing Black's contention about the stability of unregulated banks, I ask three questions of his

12. "Banking and Interest Rates," 15.

13. Eugene F. Fama, "Banking in the Theory of Finance," *Journal of Monetary Economics* 6 (January 1980): 39-57.

14. "Banking in the Theory of Finance," 47.

15. Will E. Mason, "Winners and Losers: Some Paradoxes in Monetary History Resolved and Some Lessons Unlearned," *History of Political Economy* 9 (Winter 1977): 478.

model.

1. How are "dollar" prices determined?
2. In what are loans made?
3. How do banks settle among themselves?

Amazingly, Black's article provides no answer to any of these questions. Answering the first question is obviously important because Black incorporates a unit of account in his model. For example, the value of a deposit is its "dollar" price divided by the "dollar" price of a basket of goods. "Dollars" are, however, an entirely abstract unit of account in this system; "dollars" do not exchange against goods. Consequently, there is no market in which the "dollar" price of anything is established. Black's dollar prices are pure accounting prices; thus, changes in them have no economic or market function. They neither clear excess demands nor result in resource reallocation.[16]

As to the second question, it is never clear what assets are being borrowed. The reader is only told that "the borrower writes a personal note and gives it to the lender in exchange for certain assets."[17]

Black addresses but does not answer the third question when he observes, "There will be an active market in inter-bank funds."[18] To settle debits and credits of banks, clearinghouses must be able to transfer an asset accepted as a final means of payment. For instance, is the transfer of assets like that of gold or silver on a specie standard? That is, does the transfer force an expansion or contraction of a bank's operations? If not, what limitations are there?[19]

In principle, individuals could transact with a pure system of debits and credits operated by banks. Banks cannot do so, however, because the liability of one bank does not constitute payment to another bank but the promise of payment. The final means of payment cannot be the liability of another bank but must come from outside the banking system itself.

In the early stages of banking development, specie alone settled what a bank owed on net to other institutions. Moreover, the settlement process involved pairwise settlements between institutions. Clearinghouses arose to facilitate settlement and process interbank transfers, thereby economizing on transaction costs. Each member needed to settle with only one institution—the clearinghouse—and the settlement was for only the net amount of adverse clearings with all other members. Further, clearinghouses issued specie certificates to economize on specie transfers. Finally, clearinghouses themselves eventually issued certificates convertible into assets; these certificates at times circulated alongside legal-tender currency.[20]

At all times, what constituted final payment for commercial banks was neither the liability of another bank nor an asset whose quantity was determined by another bank. In normal times, it was base money: specie plus currency and, with the advent of central banks, deposits at the central bank. In modern parlance, it was and is base money.

I am making two points. First, the existence of reserves or base money is inherent in the very concept of competitive banking. And second, the quantitative limit on reserves restricts the ability of banks to create liabilities. This limit is not what Black and Fama suppose, but it reinforces their result that competitive banking can be a stable system.[21]

As a corollary, there must be a producer or supplier of reserves. The supplier need not be either a

16. "Empirical observation alone could not detect the, say, doubling of the accounting prices of all goods. In the market place we can observe only the manifestations of money, and hence real, prices" (Don Patinkin, *Money, Interest, and Prices: An Integration of Monetary and Value Theory*, 2d ed. [New York: Harper & Row, 1965], 16). Cf. White, "Competitive Payments Systems," 700.

17. Black, "Banking and Interest Rates," 15.

18. "Banking and Interest Rates," 11. Black never explains what constitutes "inter-bank funds."

19. To answer these questions, one must specify the operative monetary regime. On the importance of regimes in monetary analysis, see, in the September 1984 *Economic Review* of the Federal Reserve Bank of Dallas, Gerald P. O'Driscoll, Jr., "Expectations and Monetary Regimes," 1–11; John H. Wood, "The Search for a Monetary Policy Rule in an Uncertain World," 13–23; and W. Michael Cox, "What Is the Rule for Financing Public Debt?" 25–31

20. On private clearinghouses, see Gary Gorton, "Private Clearinghouses and the Origins of Central Banking," *Business Review*, Federal Reserve Bank of Philadelphia, January/February 1984, 3–12; cf. White, "Competitive Payments Systems," 705–6.

21. Black, in fact, argues that an autonomous limitation on bank reserves would be inefficient ("Banking and Interest Rates," 17–18); cf. Fama, "Banking in the Theory of Finance," 39–40, 47–48.

central bank or even a financial institution. In a world of commodity money, reserves are a produced good.[22]

The remaining issue is to establish a role for currency. Here the argument is more pragmatic and historical. First, with all the revolutions in the payments mechanism, there is no documented tendency for currency to be displaced. New depository accounts (including nonbank accounts) seem to be substitutes for existing types of accounts, not for currency. Debit cards still have a very small share of the payments market. Moreover, debit cards thus far seem to be better substitutes for credit cards and checks than for currency. And electronic funds transfers, which typically involve very large amounts, are almost surely substitutes for transfers by check, not currency.

It is a commonplace that the use of currency and coin is more economical for small transactions. In the economist's parlance, their use economizes on transaction costs. Moreover, every other means of transacting incurs costs not incurred when using cash. For instance, a check may be drawn fraudulently, or there may for other reasons be insufficient funds to pay the check upon presentment. The institution on which the check is drawn may even be insolvent. Further, any computer transfer involves potential loss through fraud or system failure. Cash alone avoids these costs. The mere advance of technology does not fundamentally alter the benefit-cost calculus for using cash.

The demand for precautionary holdings of currency has been even more invariant to institutional and technological change. Dale Osborne has reported on estimates of the size of these stocks:

> The public holds about $150 billion in currency, more than $600 for each man, woman, and child in the United States....Less than a third of this staggering sum appears to be in use as exchange media....[M]ost of it is apparently hoarded against civil disturbances, natural disasters, and nasty divorces....Since 1890, estimated hoards of all denominations have remained an almost constant 3 percent of yearly GNP.[23]

Unless these fundamental determinants of the precautionary demand for currency change, it is highly unlikely that its role in our monetary system will change. Over the same period, with all the technological and institutional changes taking place, currency in circulation has declined only one-third (as a percentage of GNP).

Finally, largely unregulated banking systems have existed in recent times.[24] In these "free banking" systems, currency was produced privately, banks could pay interest on demand deposits, and financial innovation occurred.[25] Moreover, the use of non-interest-bearing currency flourished. The tentative conclusion, then, must be that circulating money and a system of bank reserves will be part of a deregulated financial system.

The quantity of money. Black is adamant that the quantity of money in a competitive banking system could not be meaningfully defined.[26] Being able to measure empirically the quantity of money is not the same as being capable of defining money; and the definition of money is not the same as the concept of money.

The concept of money is ambiguous if not vague

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22. On this point, see Gorton, "Private Clearinghouses and the Origins of Central Banking."

23. Dale K. Osborne, "What Is Money Today?" *Economic Review*, Federal Reserve Bank of Dallas, January 1985, 13. In the original article the 1890 figure was misprinted as "1980." The stability of currency hoards over this period suggests that neither tax avoidance nor illegal activities can account for currency usage.

24. There is a growing historiography of "free banking" systems. The two most well-known free banking systems were the Scottish, in the 18th and 19th centuries, and the American, which began in the late Jacksonian period and ended with the Banking Act of 1863. On the Scottish system, see Lawrence H. White, *Free Banking in Britain: Theory, Experience, and Debate, 1800–1845* (Cambridge: Cambridge University Press, 1984). For some recent work on the American system, see Arthur J. Rolnick and Warren E. Weber, "Free Banking, Wildcat Banking, and Shinplasters," *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall 1982, 10–19; the modern classic work is Hugh Rockoff, "The Free Banking Era: A Reexamination," *Journal of Money, Credit, and Banking* 6 (May 1974): 141–67.

25. In the United States, for instance, both the thrift and life insurance industries arose in the 19th century to compete with commercial banks. And, of course, deposits supplanted currency as the primary means of payment. For the modern era, see John H. Wood, "Familiar Developments in Bank Loan Markets," *Economic Review*, Federal Reserve Bank of Dallas, November 1983, 1–13. Wood maintains, "The present American financial system was essentially in place by 1880" (p. 2).

26. Sometimes, however, it appears that money can be defined but its quantity is not determinate ("Banking and Interest Rates," 15, 19).

in this literature. It is not entirely surprising, then, that no meaningful definition of money would be apparent. And if money cannot be defined, it cannot be measured. Causation, however, does not necessarily run the other way: the mere fact that we cannot quantify our definition does not imply that we do not have one. Further, identifying the real-world counterpart of our concept of money is a process logically independent of developing the concept itself.[27]

It is not clear that measuring the quantity of money in the Black-Fama competitive banking system would be impossible, nor would it seem impossible to give a "meaningful" definition of money. For instance, there is no insurmountable obstacle to measuring a commodity money. Even in this case, however, Black complains that "a commodity used as means of payment also has other uses, and it may not be clear when it is to be counted as part of the money supply, and when it is to be counted as involved in one of its other uses."[28]

First, it must be noted that if this argument is accepted, there never has been a meaningful definition of money. Second, the problem here is surely not one of definition but of measurement. The classical economists, for instance, distinguish between specie in circulation and gold and silver devoted to nonmonetary uses. If measurement were sometimes difficult, this problem did not negate the important distinction that defined or delimited money and nonmoney.[29] Third, as the second point suggests, money always has close substitutes. So, too, do most other goods. Oranges and grapefruit are close substitutes at the margin. This does not, however, preclude distinguishing them.

At times, Black seems to suggest that money cannot be meaningfully defined because it is endogenously produced by private suppliers.[30] Most money supplies have been at least partly endogenous; certainly commodity money supplies were.[31] It is true that an endogenous money supply is subject to continuous variation. But at each moment it has a determinate size.

Not only, then, is the disappearance of outside money unlikely, but a deregulated banking system introduces no new analytical problems of defining money.

Interest on money

Black, Fama, and others have seemingly taken for granted that a deregulated banking system would or should evolve into a world without money. Fama associates financial sophistication and freedom in banking with a society

> so advanced that terms like money, medium of exchange, means of payment, and temporary abode of purchasing power have long ago fallen from its vocabulary, and all written accounts of the ancient "monetary age" were long ago recycled as part of an ecology movement.[32]

The central-banking literature explicitly links the monetary control issue to the payment of interest on money. If interest is paid on money, will money blend in with other assets?

The answer must surely be no. Again, monetary history and economic theory both support this conclusion. Limitations on the payment of interest are of comparatively modern origin. Moreover, developed countries similar to the United States (for example, Britain and Canada) never implemented such a highly restricted system and removed the deposit regulations they had sooner. There has been neither a noticeable lack of monetary control (vis-à-vis the United States) nor signs of the imminent disappearance of money as we have known it.

Even more telling, of course, is the fact that the Federal Reserve System operated between 1914 and 1934 without the relevant controls on deposits. Whether or not the Fed always consciously exercised control over the money supply, it never lacked

27. On this point, see Will E. Mason, "The Empirical Definition of Money: A Critique," *Economic Inquiry* 14 (December 1976): 525-38.

28. "Banking and Interest Rates," 15.

29. Mason, "Winners and Losers," 481.

30. Cf. White, "Competitive Payments Systems," 709-11.

31. "We could not take exogeneity as a defining characteristic of money. That our money is exogenous...would be a theorem, true today but not true at all times. Money was not exogenous when it was gold....[T]he acceptance of exogeneity as either a defining characteristic or a theorem true of all future moneys would mean that a system of privately produced money is a contradiction in terms. However hard the essentials of such a system may be to grasp, it does not appear to be self-contradictory" (Osborne, "What Is Money Today?" 13-14).

32. "Banking in the Theory of Finance," 55.

the control.

The theoretical argument goes to the concept of money itself. Certainly there are properties of money illuminated by analyzing it as just another asset in a theory of finance. The approach almost inevitably overlooks, however, the insights gleaned from treating money as a unique good with special properties. These properties explain why, even in competitive banking systems, money yields less interest than other highly liquid financial assets.

The more traditional theory of money emphasizes that money itself is the product of an evolutionary (unregulated) process.[33] Money has certain properties that are the product of neither regulation nor historical accident but reflect inherent characteristics valued in the marketplace. Prominent among these characteristics is money's liquidity.

Money is not simply highly liquid, as are many other assets, but is perfectly liquid. It trades in every market and need never be sold at a discount. In other words, money is the good circulating routinely as the medium of exchange and the entire stock of which can be spent ("sold") simultaneously.[34]

Experience of recent years indicates that even the most highly liquid, short-dated nonmonetary asset is subject to some price risk. It is for this reason that individuals are willing to incur substantial opportunity costs in holding money balances. Throughout monetary history, in highly regulated and substantially unregulated monetary systems, people have demanded absolutely liquid assets. This demand has been evidenced in the continued large holdings of non-interest-bearing currency.

Money yields less than a market interest rate because it also yields *nonpecuniary* services. Indeed, it is money's *nonpecuniary* services that distinguish it from nonmoney financial assets, which yield only a pecuniary return.[35]

Put another way, if money were to yield market interest rates, then its *total* return would be higher than for any other asset. For money would yield both a pecuniary return equal to that on highly secure, short-dated assets *and* a nonpecuniary return of "liquidity" services.

The last point sheds light on the recent controversy surrounding the "legal restrictions theory of money."[36] This theory focuses on the apparent paradox that at one and the same time, individuals hold both non-interest-bearing government currency and interest-bearing government securities. Advocates of the theory identify legal restrictions on the use of interest-bearing government securities for media of exchange as the source of the demand for non-interest-bearing currency. The following stark prediction reveals the affinity between the legal restrictions theory and the Black-Fama approach:

> Laissez-faire means the absence of legal restrictions that tend, among other things, to enhance the demand for a government's currency. Thus, the imposition of laissez-faire would almost certainly reduce the demand for government currency. It could even reduce it to zero. A zero demand for a government's currency should be interpreted as the abandonment of one monetary unit in favor of another—for example, the abandonment of the dollar in favor of one ounce of gold. Thus, my prediction of the effects of imposing laissez-faire

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33. The classic presentation of this theory is in Carl Menger, "On the Origin of Money," trans. Caroline A. Foley, *Economic Journal* 2 (June 1892): 239–55. For a development of Menger's analysis, see Gerald P. O'Driscoll, Jr., and Mario J. Rizzo, *The Economics of Time and Ignorance* (Oxford and New York: Basil Blackwell, 1985), 191–98; cf. White, "Competitive Payments Systems," 703–6. Robert A. Jones presents a modern development of part of Menger's thesis in "The Origin and Development of Media of Exchange," *Journal of Political Economy* 84 (August 1976, pt. 1): 757–75; for a recent analysis of liquidity, see Robert A. Jones and Joseph M. Ostroy, "Flexibility and Uncertainty," *Review of Economic Studies* 51 (January 1984): 13–32. Also relevant is S. Herbert Frankel, *Two Philosophies of Money: The Conflict of Trust and Authority* (New York: St. Martin's Press, 1977).

34. Osborne identifies these two features as essential properties of a medium of exchange: "both the simultaneity and routine-circulation tests are essential in all systems; the former to identify a *stock* instead of velocity or a mixture of stock and velocity, and the latter to ensure that the stock is *money*" ("What Is Money Today?" 2).

35. See Benjamin Klein, "The Competitive Supply of Money," *Journal of Money, Credit, and Banking* 6 (November 1974): 425.

36. See Neil Wallace, "A Legal Restrictions Theory of the Demand for 'Money' and the Role of Monetary Policy," *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1983, 1–7; John Bryant and Neil Wallace, "The Inefficiency of Interest-bearing National Debt," *Journal of Political Economy* 87 (April 1979): 365–81; and John Bryant, "Analyzing Deficit Finance in a Regime of Unbacked Government Paper," *Economic Review*, Federal Reserve Bank of Dallas, January 1985, 17–27.

takes the form of an either/or statement: either nominal interest rates go to zero or existing government currency becomes worthless.[37]

The argument presented here denies the thesis of the legal restrictions theory by questioning its assumption of "a paradoxical pattern of returns among assets."[38] Non-interest-bearing currency has an implicit yield of convenience and liquidity services; its implicit rate of return will, in equilibrium, equal the explicit pecuniary rate of return of highly liquid, interest-bearing government assets.

Some monetary assets may yield explicit interest. No asset yielding interest at the competitive rate, however, could routinely circulate as the medium of exchange; were it to do so, it would in fact earn a supracompetitive return (as emphasized earlier). More to the point, assets yielding explicit interest (a pecuniary return) at the competitive rate could never provide absolute liquidity. These assets would be subject to a price risk not heretofore associated with routinely circulating media of exchange.[39]

To put the matter in the same stark terms as does Professor Wallace, my prediction is that under laissez-faire, there would be no tendency for either the interest rate to go to zero or non-interest-bearing currency to become worthless.

It is possible to trivialize the difference between money and nonmoney financial assets by suggesting that the use of money merely saves some transaction costs. These "transaction costs" are, however, the prohibitive costs of barter that are avoided in a monetary economy. Neither the legal restrictions theory nor theorists in the Black-Fama tradition have addressed how the costs can be avoided in their system.[40]

Conclusion

This article began by considering the problem of central bank control of the money supply in a partially deregulated environment. It then analyzed the stability of a monetary system in a world of substantially unregulated financial institutions.

One theoretical issue arose in the two sets of literature examined in this article: Will the payment of interest on money lead to either loss of monetary control or the disappearance of money itself? The answer in both cases is no. The answer is justified by theoretical, institutional, and historical analysis.

Deposit deregulation will not result in an unstable banking system. It will evolve in ways that we find unsettling and unfamiliar and that present challenges to the monetary authorities. For instance, central banks can no longer rely on disintermediation and credit crunches to influence monetary growth. We are not, however, in totally uncharted waters.[41] Neither bank reserves nor currency is likely to disappear in the near future. Moreover, there are inherent limits on the ability of private banks to create liabilities.

Deregulation may even highlight the central bank's role in controlling the growth of base money under the present monetary regime, which embodies monetary targets. It is in this way that a nominal anchor is provided in a system of pure fiduciary currency.

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37. Wallace, "A Legal Restrictions Theory," 4.

38. Wallace, "A Legal Restrictions Theory," 1.

39. Much the same point can be made about the equity-based medium of exchange in the analysis of Black and Fama (see note 40). Some categorize their theories as instances of the legal restrictions theory. Wallace refers to Fama (and Robert E. Hall) as providing "other discussions of the legal restrictions theory" ("A Legal Restrictions Theory," 1 n. 2).

40. The barter issue is sometimes acknowledged but never addressed in the literature. For instance, Robert L. Greenfield and Leland B. Yeager admit that although their proposed payments system, which builds on the work of Black, Fama, and Robert Hall, "is barter..., it is not *crude* barter" ("A Laissez-Faire Approach to Monetary Stability," *Journal of Money, Credit, and Banking* 15 [August 1983]: 307). They do not distinguish their presumably sophisticated barter system from "crude" barter, so we must presume it faces all the difficulties of any barter system. By way of solution, they merely predict, "The profit motive will surely lead competing private firms to offer convenient methods of payment" (p. 307). In this literature, these payments systems are typically equity-based (like MMMFs). White has pointed out that it is improbable that shares of an equity fund would ever become a generally accepted medium of exchange ("Competitive Payments Systems," 710).

41. Though Wood focuses on bank *assets*, particularly loans, this is the main point of "Familiar Developments in Bank Loan Markets."

Inflation and Permanent Government Debt

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> *Interest-bearing public bonds, which correspond to no government capital formation and which no taxpayer rationally expects to have to help retire..., have effects similar to those of the noninterest IOUs we call M* [money].
>
> —Paul A. Samuelson, *Economics*

At the start of the Second World War, the market value of privately held gross federal debt in the United States totaled $56 billion. During the war the average annual budget deficit jumped sharply to $42 billion, and outstanding government debt climbed to $220 billion. It is reasonable to presume that individuals viewed debt issued during the war as temporary, intended for future retirement. Following the war, however, significant budget surpluses did not arise to finance net debt retirement. To the contrary, budget deficits continued and have grown in magnitude. Privately held gross federal debt now stands at more than $1,300 billion.

It is not surprising, then, that attention in recent years has shifted toward matters involving public debt. Key among these is the question of government's long-term debt intentions. Is government debt temporary and implicitly backed by future taxes? Or has the government adopted a policy of permanent government debt, with no intention of future debt retirement? The question is crucial because a regime of permanent government debt is fundamentally different from a regime of temporary government debt.

This article focuses on the inflationary implications of permanent government debt. Specific attention is paid to two propositions: the Ricardian Equivalence Theorem—which claims that taxation and debt finance are equivalent—and the Quantity Theory of Money—which claims that the price level is related to the stock of money only (and not government debt). It is argued that both propositions are valid in a regime of temporary government debt but each is invalid with permanent government debt. In a regime of permanent government debt, taxation and debt finance are not equivalent, and a switch from current taxation to debt finance has inflationary effects much the same as those of a switch to currency finance.

Tests for the inflationary effects of government debt in the United States show that over the 1950–84 period the price level was determined as

The views expressed are those of the author and do not necessarily reflect the positions of the Federal Reserve Bank of Dallas or the Federal Reserve System.

much by the stock of privately held government debt as by base money. The results of Granger-Sims causality tests relating the price level to both money and debt, as opposed to money only or debt only, indicate that debt is as important an explanatory variable as base money over this period. Considering the frequency of budget deficits in recent years (23 of the past 24 years) and their comparatively huge magnitude, these results indicate that government debt is viewed as permanent, with the same inflationary implications as money.

The Ricardian Equivalence Theorem

The proposition that government bonds rolled over forever are like money, with potentially the same inflationary implications as money, is not new.[1] Strictly speaking, the argument is as old as the debate on the Ricardian Equivalence Theorem, which states that debt issuance on the part of government is equivalent to current taxation.[2] According to this theorem, the choice of debt finance as opposed to current taxation does not affect anything—not even the price level—because the issuance of government debt implies equivalent (in the present discounted-value sense) future tax liabilities.[3] In short, the theorem views government bonds as backed by taxes.

The classic exposition of this hypothesis is as follows:

> Besides valuing government expenditures as income, households may regard deficit financing as equivalent to taxation. The issue of a bond by the government to finance expenditures leads to future interest payments and possible ultimate repayment of principal. That is, it implies future taxes that would not be necessary if the expenditures were financed by current taxation. If a typical household were to save the entire amount that was made available to it by a switch from current taxation to deficit financing, the interest on the saving would meet the future tax charges to pay interest on the government bonds; the amount saved would be available to meet possible future taxes imposed to repay the principal of the government bonds.[4]

The economic implications of the Equivalence Theorem are clearly important and are well recognized. If debt finance and current taxation are equivalent, then "government debt will be absorbed without any real effects on the economy."[5] Switching from current taxation to debt issuance has no aggregate demand, interest rate, or even price effects when the two financing means are equivalent.

In recent years the assumptions underlying the Equivalence Theorem have been attacked by many parties and defended by many others. Supporters of the Equivalence Theorem contend that (1) individuals are rational in the sense of fully discounting their future tax liabilities and (2) government debt is temporary and fully backed by taxes.[6] If,

1. For a discussion of this proposition see, for example, Paul A. Samuelson, *Economics*, 8th ed. (New York: McGraw-Hill Book Company, 1970), 326–27; Carl F. Christ, "Patinkin on Money, Interest, and Prices," *Journal of Political Economy* 65 (August 1957): 347–54; Don Patinkin, *Money, Interest, and Prices: An Integration of Monetary and Value Theory*, 2d ed. (New York: Harper & Row, 1965); Marco Antonio Campos Martins, "A Nominal Theory of the Nominal Rate of Interest and the Price Level," *Journal of Political Economy* 88 (February 1980): 174–85; John Bryant and Neil Wallace, "The Inefficiency of Interest-bearing National Debt," *Journal of Political Economy* 87 (April 1979): 365–81; and Preston J. Miller, "Deficit Policies, Deficit Fallacies," *Federal Reserve Bank of Minneapolis Quarterly Review*, Summer 1980, 2–4.

2. The writing of David Ricardo from which the Equivalence Theorem has been drawn may be found in *The Works and Correspondence of David Ricardo*, ed. Piero Sraffa (Cambridge: Cambridge University Press, 1951), 4:185–87.

3. There is an effect on private savings, as outlined later.

4. Martin J. Bailey, *National Income and the Price Level: A Study in Macroeconomic Theory*, 2d ed. (New York: McGraw-Hill Book Company, 1971), 156.

5. See Roger C. Kormendi, "Government Debt, Government Spending, and Private Sector Behavior," *American Economic Review* 73 (December 1983): 994–1010.

6. Two other points of contention regarding the Equivalence Theorem are government capital formation and intergenerational bequest motives. With regard to the first one, the backing for public debt need not be taxes but could be profitable investment goods purchased with the proceeds from bond sales. Since there is little evidence, however, that the government is engaging in massive and highly profitable investment, this matter is not seriously considered here. With regard to the second point, Robert J. Barro demonstrates that "finite lives will not be relevant to the capitalization of future tax liabilities so long as current generations are connected to future generations by a chain of operative intergenerational transfers" ("Are Government Bonds Net Wealth?" *Journal of Political Economy* 82 [November/December 1974]: 1095). He assumes, however, that "the government may not reissue the bonds when they come due....and that the principal is paid off at the beginning of the next period by an additional lump-sum tax levy" (p. 1102). That is, Barro explicitly focuses on temporary government debt and does not consider permanent debt.

however, individuals do not accurately take account of their future tax liabilities or if the government follows a policy of permanent debt finance, then the theorem is invalid and government debt is not neutral.

In the past, it was largely assumed that government debt is in fact backed by taxes, and attention was focused on the question of whether individuals rationally perceive that backing. It was argued that if individuals are rational, they will recognize that government bonds are equivalent to future taxes.

> If the household has a definite consumption plan for the future, and if it knows the future tax effects of the shift from current taxation to deficit financing, then it will save all the disposable income it gets from the switch from current taxes to a bond issue.[7]

Furthermore,

> If future tax liabilities implicit in deficit financing are accurately foreseen,...[then] the behavior of the community will be exactly the same as if the budget were continuously balanced.[8]

The term "rational" has commonly been used to describe individuals who are "not confused or misinformed" but, on the basis of complete information, consistently discount their future tax liabilities.[9]

Note that government bonds are not net nominal wealth in this case; they are neutral.

> The assumption that government bonds are perceived as net wealth by the private sector is crucial in demonstrating real effects of shifts in the stock of public debt. In particular, the standard effects of "expansionary" fiscal policy on aggregate demand hinge on this assumption. Government bonds will be perceived as net wealth only if their value exceeds the capitalized value of the implied stream of future tax liabilities.[10]

It is important to point out that there are two very different problems regarding the capitalization of future tax liabilities. One is the issue of rationality, which questions whether individuals fully perceive their future tax liabilities. The other matter is government's debt policy, which is concerned with what in fact those tax liabilities are. If individuals are rational *and* if government debt is temporary, then "there is no persuasive theoretical case for treating government debt...as a net component of perceived household wealth."[11] If, however, individuals are "confused or misinformed" *or if government debt is permanent*, then government debt will not be perceived as backed by taxes, and government bonds will be net wealth since their value exceeds the capitalized value of future tax liabilities.

Temporary and permanent government debt

Previous studies have accepted the notion that government debt is backed by taxes and have questioned whether individuals are rational enough to perceive that backing. This section does the opposite by accepting individual rationality and questioning government's long-term debt intentions. Focus is on temporary and permanent government debt.[12] It is argued that the Ricardian Equivalence Theorem is valid in a regime of temporary government debt, provided individuals are rational, but is not valid in a regime of permanent government debt

7. Bailey, *National Income and the Price Level*, 156.

8. Bailey, *National Income and the Price Level*, 158. The government budget equation Bailey is implicitly using here is that of the Treasury alone, not the consolidated budget equation of the Treasury and the Federal Reserve. See note 28 for a discussion of the consolidated budget equation, and see the section on temporary and permanent government debt for a discussion of the budget equation distinction between permanent government debt and permanent deficit finance.

9. See Bailey, *National Income and the Price Level*, 157.

10. Barro, "Are Government Bonds Net Wealth?" 1095.

11. See Barro, "Are Government Bonds Net Wealth?" 1116.

12. In the earlier literature and in this article, the matter of temporary versus permanent is considered only for government debt (and not also for money). Recently, however, Bryant and Wallace, "The Inefficiency of Interest-bearing Natonal Debt"; Bruce D. Smith, "Money and Inflation in Colonial Massachusetts," *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1984, 1-14; and others have emphasized the importance of permanence as applied to both types of government paper. These models focus on government policies regarding the fiscal deficit or surplus, rather than specifically on government policies regarding its debt. These two types of policies are clearly not the same since budget deficits can be financed with the issuance of either debt or currency, and a regime of temporary deficit finance requires that the budget be balanced in the long run whereas temporary government debt requires only that debt issued during deficit be retired during surplus. Notice in the Patinkin model that money is viewed as always a component of private nominal wealth. This view may be reconciled in light of the recent work by treating all money as issued permanently; then, only the permanence of government debt is in question.

Box A

A Model of Temporary and Permanent Government Debt

Market	Condition for equilibrium	
Labor services	$Q(w) = N(w),$	$Q_w < 0, N_w > 0.$
Commodities	$F\left(y, r, \frac{M}{P} + \frac{kB}{P}\right) = y,$	$F_y > 0, F_r < 0, F_v > 0.$
Bonds	$B\left(y, R, \frac{M}{P} + \frac{kB}{P}\right) = \frac{kB}{P},$	$B_y > 0, B_R > 0, B_v > 0.$
Money	$L\left(y, R, \frac{M}{P} + \frac{kB}{P}\right) = \frac{M}{P},$	$L_y > 0, L_R < 0, L_v > 0.$

Definitions

w = real wage rate.

y = real income.

r = real interest rate.

M = stock of cash balances (base money).

P = price level.

k = fraction of outstanding government debt that is viewed by the private sector as not backed by taxes.

B = market value of privately held government debt.

$M + kB$ = nominal wealth of the private sector.

$v \equiv \frac{M}{P} + \frac{kB}{P}$ = real wealth of the private sector.

R = nominal interest rate.

NOTE: This model may be found in Don Patinkin, *Money, Interest, and Prices*, 2d ed. (New York: Harper & Row, 1965), 289–90.

regardless of the rationality issue.[13] The implications of both temporary and permanent government debt for determination of net wealth, aggregate demand, the interest rate, and the price level are outlined.[14]

Temporary government debt is defined as a regime in which government debt sold during a budget deficit is later retired (principal plus interest) during surplus.[15] Under this regime the issuance of U.S. Treasury paper to finance a current budget deficit requires a future budget surplus so that the principal may be retired and the interest paid. Treasury debt outstanding under this regime is backed government paper. It is backed by taxes.

Permanent government debt is defined as a regime in which government debt sold during a budget deficit is not retired later, nor is the interest financed with tax revenues from a budget surplus. Principal and interest are entirely deficit-financed—either rolled over or financed by printing currency.[16] Government debt issued under this regime is not backed by taxes.

> They [government bonds], like currency, are pieces of paper backed by nothing—not by tangible assets, not by future taxes....[T]hey are valued fiat paper that adds to the nominal wealth of the private sector.[17]

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13. In this section and throughout the article, it is assumed that the economy in question is closed. In an open economy, domestic budget deficits may be financed through external borrowing, without required reductions in internal private spending. This case is clearly reasonable when government debt is issued temporarily, but a regime of permanent government debt requires that the foreign economy as a whole run permanent current account surpluses.

14. Gerald P. O'Driscoll, Jr., advocates that "Ricardo in fact denied that taxation and public debt are equivalent. The 'Ricardian Equivalence Theorem' is, consequently, a misnomer, largely because Ricardo was not a Ricardian on this issue. Rather, Ricardo enunciated a nonequivalence theorem" ("The Ricardian Nonequivalence Theorem," *Journal of Political Economy* 85 [February 1977]: 207). As O'Driscoll points out (p. 209), Ricardo in fact said, "This argument of charging posterity with the interest of our debt, or of relieving them from a portion of such interest, is often used by otherwise well informed people, but we confess we see no weight in it" (*The Works and Correspondence of David Ricardo* 4:187).

15. Much of the early literature considered only models of temporary deficit finance or temporary government debt. Recently, however, a number of models have come forth to consider either permanent deficit finance or permanent government debt. Among those considering permanent deficit finance are John Bryant, "Analyzing Deficit Finance in a Regime of Unbacked Government Paper," *Economic Review*, Federal Reserve Bank of Dallas, January 1985, 17–27; and John Bryant and Neil Wallace, "A Price Discrimination Analysis of Monetary Policy," *Review of Economic Studies* 51 (April 1984): 279–88. See also Preston J. Miller, "Higher Deficit Policies Lead to Higher Inflation," *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1983, 8–19. Among those considering permanent government debt are Samuelson, *Economics*, 326–27; Patinkin, *Money, Interest, and Prices*; Bryant and Wallace, "A Price Discrimination Analysis of Monetary Policy"; and Neil Wallace, "A Legal Restrictions Theory of the Demand for 'Money' and the Role of Monetary Policy," *Federal Reserve Bank of Minneapolis Quarterly Review*, Winter 1983, 1–7.

16. It is also important to demonstrate that a regime of permanent government debt is feasible in the long run. In recent years, a number of studies have specifically considered the feasibility matter, and several models that have been developed show how government can run continuous budget deficits or how government debt can exist permanently. Rather than reviewing these models here or attempting to determine all possible scenarios under which permanent government debt is achievable, the feasibility of permanent government debt will be demonstrated by outlining one simple possible scenario.

    Specifically, suppose that the stocks of money and bonds each grow at a rate of 10 percent per year, forever. In this case the stock of money relative to bonds remains constant, and the model implies that the real interest rate remains constant and private nominal wealth grows at a rate of 10 percent per year. Assuming, for simplicity, that real income is not growing and that real government spending and taxes are constant, equilibrium is achieved with a 10-percent rate of inflation in wages and prices, a constant value of real cash balances, constant real government debt, and constant real private wealth. With real government debt and the real interest rate constant, real interest payments on the debt are also constant.

    This solution can easily be verified by noting that if y_0, r_0, P_0, and W_0 are equilibrium values of real income, the real interest rate, the price level, and the wage rate for $(M = M_0)$ and $(B = B_0)$ in the model, then y_0, r_0, $1.10P_0$, and $1.10W_0$ are equilibrium values for $(M = 1.10M_0)$ and $(B = 1.10B_0)$. Hence, even though nominal government debt is growing unbounded, real principal plus interest is not, and the economy's ability to finance the debt is not in question.

    It is important to point out that the primary factor responsible for preventing the unbounded growth of the real value of the debt or real interest payments is inflation. And the factor responsible for the inflation is the issuance of unbacked government paper (of both the Federal Reserve and the Treasury). In short, through its inflationary effect, permanent government debt erodes its own real value and thereby acts to prevent unbounded growth of the real debt of the government.

17. Miller, "Deficit Policies, Deficit Fallacies," 2.

The issue of whether government bonds are backed by taxes is clearly more general than the setting of any specific model. Nevertheless, the simple model contained in Box A, set forth early in the literature by Don Patinkin, is helpful for investigating the implications of temporary and permanent government debt.[18] It is important to keep in mind that the primary benefit of this early model is expository. The weaknesses of the model for illustrating the dynamic properties of ongoing government deficit policies are well recognized. Nevertheless, it contains the principal ideas underlying a regime of temporary government debt as well as one of permanent government debt.

The arguments on the left-hand side represent market demand functions, and those on the right-hand side represent market supply. The demand for labor is assumed to be inversely related to the real wage rate, whereas labor supply is positively related to the real wage rate. Aggregate commodity demand is positively related to real income and private real wealth but inversely related to the real interest rate. The demand for bonds is assumed to be directly related to real income, the nominal interest rate, and real wealth and to be proportional to the price level.[19] Finally, aggregate money demand is assumed to be directly related to real income and real wealth, inversely related to the nominal interest rate, and proportional to the price level.

Notice, in particular, that nominal wealth of the private sector consists of cash balances plus a fraction, k, of the stock of privately held government bonds. By definition, k is the fraction of outstanding government debt that is *perceived* as not backed by taxes. As defined by Patinkin,

> k is a constant (greater than zero and less than one) reflecting the degree to which individuals do *not* discount the future tax liabilities connected with government bonds.[20]

This definition of k focuses on the individual's *perception* of the backedness of government debt—that is, on the rationality issue. We may, instead, accept the notion that individuals are rational and focus on the *backedness* question. That is, following Samuelson, define k as the fraction of

> Interest-bearing public bonds...which no taxpayer rationally expects to have to help retire.[21]

The implications of both temporary and permanent government debt may then be determined easily by using the model.

Clearly, the Ricardian Equivalence Theorem claims that k equals zero. Substituting ($k=0$) into the model verifies that the issuance of government debt in lieu of current taxation does not affect aggregate demand, the interest rate, or even the price level in this case. Hence, the Ricardian Equivalence Theorem is valid in a regime of temporary government debt, provided individuals are rational.

A regime of permanent government debt corresponds to a value of 1 for k. The economic implications of permanent government debt may easily be determined by substituting ($k=1$) into the model. In this case, private nominal wealth consists of cash balances plus private holdings of outstanding government debt. An increase in the stock of privately held government bonds adds to nominal wealth, stimulates aggregate demand (until a new equilibrium is established), and drives up the price level. The model clearly illustrates that permanent government debt is not neutral; in particular, it is inflationary.[22]

> As is well understood, government can cause inflation by printing more money. It can also cause inflation by printing more bonds. Additions to the stocks of money or bonds, by increasing the total amount of nominal wealth, increase private demands for goods and services. The increased demands, in turn, push up the prices of goods.[23]

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18. See Patinkin, *Money, Interest, and Prices*, 289-94, for a presentation and discussion of this model.

19. The bond demand function is an "excess" demand function; that is, it is the demand for bonds by the private sector in excess of the private supply of bonds. The variable B represents the market value of outstanding government bonds, rather than the number of bonds outstanding.

20. *Money, Interest, and Prices*, 289.

21. *Economics*, 326.

22. The result that permanent government debt is inflationary is not unique to the setting of this particular model. See Bryant, "Analyzing Deficit Finance in a Regime of Unbacked Government Paper," for example, for an analysis of the inflationary implications of unbacked government paper in an overlapping-generations model. Note also that money is not neutral with permanent government debt. In particular, an increase in the stock of money has interest rate effects when part of government debt is permanent.

23. Miller, "Deficit Policies, Deficit Fallacies," 2.

The Quantity Theory of Money

This section considers the Quantity Theory of Money under both temporary government debt and permanent government debt. It is argued that the Quantity Theory is valid in a regime of temporary government debt, provided individuals are rational, but is not valid with permanent government debt regardless of the rationality issue.[24]

According to the crude Quantity Theory, "prices must always be proportional to the amount of money—so that doubling M must exactly double P."[25] It is easy to demonstrate that this proposition holds under a regime of temporary government debt, provided individuals are rational. This is the case because Treasury debt is perceived as fully backed government paper and is not net nominal wealth, and a switch to debt finance does not affect anything—not even the price level. Substituting ($k=0$) into the model verifies that net wealth consists only of money balances and that the price level is not affected by an increase in the volume of Treasury paper. Furthermore, doubling the stock of money exactly doubles the price level. Hence, the Quantity Theory holds.

With permanent government debt, however, this is clearly not the case. Substituting ($k=1$) into the model demonstrates that the price level is proportional to the stock of money *plus* permanent debt but is not proportional to the stock of money alone. Doubling the stock of money less than doubles the price level because the price level is also related to the stock of outstanding government debt. Hence, the Quantity Theory of Money is not valid in a regime of permanent government debt.

Although the discussion here is for the case where all government debt is permanent, the results may easily be generalized to the case where a portion of the debt (k) is permanent and a portion ($1-k$) is temporary. The basic result is unchanged—the price level is related to the stock of unbacked government paper, ($M+kB$)—and government bonds issued permanently "have effects similar to those of the noninterest *IOUs* we call M [money]."[26] Only in the case where all government debt is temporary ($k=0$) does the Quantity Theory hold. As expressed by Samuelson:

> believers in a crude quantity theory...*should* reformulate their theory to say:
> Doubling M *and* permanent public debt [kB] will, other things equal, double all Ps and leave all relative Ps, physical quantities, and interest rates unchanged in the new long-run equilibrium.[27]

Policy implications

In this section the policy implications of permanent government debt are addressed. It is argued that to the extent government debt is permanent, monetary policy is limited in its ability to control the price level. When a portion of the debt is temporary, however, monetary policy retains its ability to control the price level, but a larger open market exchange is required than that commonly recognized. Monetary policy retains a limited ability to affect the price level even when all government debt is permanent, but that effect is secondary and most of the power of monetary policy is lost.

To make the analysis as general as possible, both temporary and permanent government debt are considered. The exposition may be simplified by assuming that a portion, ($1-k$), of each unit of public debt is temporary and a portion, k, is permanent. That is, for each unit of public debt outstanding, the fraction ($1-k$) of the principal plus interest is financed by future taxes, and the fraction k is financed by debt issuance or money creation.

Consider now the effect of open market operations.[28] In particular, suppose that the Federal

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24. Of course, irrationality could be of a very peculiar type. Namely, individuals could perceive future tax liabilities even though they do not exist, in which case the Equivalence Theorem would still hold. That case is not taken seriously here.

25. See Samuelson, *Economics*, 326, for this statement of the Quantity Theory of Money.

26. See Samuelson, *Economics*, 326.

27. *Economics*, 326–27.

28. See Patinkin, *Money, Interest, and Prices*, 291–94, for a discussion of the effect of open market operations with permanent government debt. The budget equation of government used here is the consolidated budget equation of the Treasury and the Federal Reserve. The Treasury finances deficit spending of Congress with the sale of Treasury securities, a portion of which the Federal Reserve purchases by the creation of currency (base money). Hence, deficit-financed government spending ultimately involves some combination of increased holdings of Treasury paper plus Federal Reserve paper on the part of the private sector. Interest earned on Treasury securities by the Federal Reserve is also assumed to be returned to the Treasury.

Box B

Summary of the Implications of Temporary and Permanent Government Debt Determined from Using the Patinkin Model

Government Debt Is Temporary ($k = 0$)	Government Debt Is Permanent ($k = 1$)	A Portion of Government Debt Is Temporary, and a Portion Is Permanent ($0 < k < 1$)
Ricardian Equivalence Theorem Holds. Government debt is neutral. In particular, government debt is not inflationary. The interest rate is independent of the stock of outstanding government debt.	**Ricardian Equivalence Theorem Does Not Hold.** Government debt is not neutral. The issuance of government debt is inflationary and raises the interest rate.	**Ricardian Equivalence Theorem Does Not Hold.** Government debt is, in general, not neutral. The theorem holds only for the portion of government debt that is temporary and not for that which is permanent. The issuance of permanent government debt is inflationary and raises the interest rate.
Quantity Equation of Money Holds. More generally, the price level is related to the stock of money only and not to government debt.	**Quantity Equation Does Not Hold.** The price level is related to both the stock of money and government debt but not to money only.	**Quantity Equation Does Not Hold.** The price level is related to both the stock of money and permanent government debt but not to money only.
Monetary Policy Works. Open market exchanges of Treasury securities for base money are effective in controlling private financial wealth and the price level.	**Monetary Policy Works But Is Weakened by the Presence of Government Debt.** Open market exchanges of Treasury securities for base money are effective only to the extent they involve a capital gain or loss in private wealth.	**Monetary Policy Works But Is Weakened by the Presence of the Permanent Government Debt.** To achieve a given price effect, a larger open market exchange of base money for Treasury securities is required than if the debt were all temporary.

NOTE: Based on the assumptions that individuals are rational and the economy is closed.

Reserve purchases $1 worth of Treasury securities. The purchase has the effect, on the one hand, of increasing the volume of unbacked government paper by $1 as base money is created to buy the Treasury securities. On the other hand, k percent of the Treasury securities purchased were permanent and therefore unbacked by taxes. Hence, the net effect of the open market purchase is to increase the volume of privately held unbacked government paper by $\$(1-k)$, rather than the $1 commonly believed. A similar result follows for an open market sale of Treasury securities. Private nominal wealth falls by only $\$(1-k)$ when the Federal Reserve exchanges $1 in Treasury securities for $1 in money.

The presence of permanent government debt clearly inhibits the power of monetary policy to control the price level, but it does not render policy powerless. Without permanent government debt (for $k=0$), a $1 reduction in private nominal wealth may be directly achieved with the open market sale of $1 in Treasury securities; with permanent government debt, a $1 reduction may be achieved with the sale of $\$1/(1-k)$ in Treasury securities. Hence, monetary policy retains its ultimate ability to control nominal wealth and the price level, but larger exchanges of money for debt are required.

The choice of $1 for the money-bond exchange is motivated not only by convenience but also by the secondary effects that such a small exchange allows the analysis to disregard. In particular, the interest rate implications of exchanging $1 in bonds for $1 in money in the above examples have been ignored. The importance of the interest rate effect may be illustrated by considering the case where all government debt is permanent ($k=1$). Note that in this case, nominal wealth of the private sector is simply base money, M, plus the market value of privately held government debt, B—that is, $(M+B)$. Open market operations move M and B in opposite directions but not by equal amounts, since a change in the stock of interest-bearing paper (B) relative to non-interest-bearing paper (M) in the economy affects the interest rate.

Does an open market sale of Treasury securities, then, still constitute "tight monetary policy"? To answer this question, we need only focus on the interest rate effects of reducing the stock of money relative to bonds in the model. A reduction in M relative to B raises interest rates, which lowers the price of all outstanding government debt.[29] The resulting capital loss on outstanding government debt causes an overall loss of private nominal wealth.[30] This result may easily be verified in the model by noting that only a reduction in overall $(M+B)$ is consistent with new equilibrium following the open market sale of Treasury securities. Hence, open market sales of Treasury securities by the Federal Reserve still constitute "tight monetary policy," but their effect is clearly secondary and weakened by the presence of permanent government debt.

The inflationary effects of government debt, 1950–1984

This section provides empirical support for the hypothesis that government debt is inflationary by testing for the price effects of government debt in the United States over the 1950–84 period.[31] The procedure used was to apply Granger-Sims causality tests to examine the relationship between the price level and both money and debt and to compare the results with those from tests involving money only and debt only.[32]

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29. It should be noted that the interest rate effect of the money-bond exchange is not common to all models. See, for example, Bryant and Wallace, "The Inefficiency of Interest-bearing National Debt."

30. The effect on private nominal wealth of an open market sale of Treasury securities may be demonstrated mathematically by defining V as the par value of government bonds and P_B as the price of a government bond (per $1 of par value), so that B equals P_BV. An open market sale of ΔV units of Treasury securities at the unit price P_B involves a reduction in ΔM units of currency, so that $P_B\Delta V$ equals $-\Delta M$. Private nominal wealth equals $(M+kB)$, which equals $(M+kP_BV)$; hence, for $(k=1)$, increments to private nominal wealth may be written as $(\Delta M+P_B\Delta V+V\Delta P_B)$. The effect on private nominal wealth of the open market sale may then be written as simply $V\Delta P_B$, which is the capital loss on outstanding government debt.

31. Previous empirical studies have looked for aggregate demand effects or interest rate effects of government debt in order to assess the neutrality question. Data on the market value of Treasury debt reported recently by W. Michael Cox and Eric Hirschhorn, "The Market Value of U.S. Government Debt; Monthly, 1942–1980," *Journal of Monetary Economics* 11 (March 1983): 261–72, and by W. Michael Cox, "The Behavior of Treasury Securities; Monthly, 1942–1984," *Journal of Monetary Economics*, forthcoming, make it possible, however, to test directly for the inflationary effects of public debt.

32. The Granger-Sims procedure is used here because it permits tests of significance of groups of variables. See C. W. J.

The first step was to select particular regression forms with which to test the causes of inflation. By strict interpretation of the Quantity Theory of Money, the price level at a point in time is proportional to the stock of money available at that time. It is widely recognized, however, that money's effect on prices is not purely contemporaneous. Money may affect prices with a lag or even with a lead. Broadly interpreted then, the Quantity Theory claims that the price level is directly related to the quantity of money (only). Economists supporting this principle (whom I will call monetarists) regard inflation as purely a monetary phenomenon. This summarizes the specific hypothesis to be tested here and will be referred to as the monetarist hypothesis, H_m.

> H_m. *An increase in the outstanding volume of Federal Reserve paper is inflationary, but an increase in the volume of Treasury paper is not.*

The competing hypothesis, H_{mb}, is that both money and debt are inflationary. Specifically,

> H_{mb}. *An increase in the outstanding stock of either type of government paper (Federal Reserve notes or Treasury notes) is inflationary.*

Table 1 summarizes the results of all the regression equations. Rather than present the entire set of estimated coefficients and standard errors for each regression (approximately 130 statistics), the statistics reported will be limited to only those necessary for comparing the explanatory power of money and debt. Specifically, Table 1 reports the sum of squared errors (SSE) and the adjusted R^2 ($\bar{R}^2$) for each regression equation. By construction, the $\bar{R}^2$ statistics measure the percentage of variation in the price variable (adjusted for degrees of freedom) accounted for by the hypothesized explanatory variables. The higher the $\bar{R}^2$, therefore, the higher is the explanatory power of the hypothesized set of variables.[33] In contrast, SSE measures the unexplained variation in the price variable by squaring the residual (actual less predicted) values and summing these over all observations. The lower the SSE, therefore, the greater is the explanatory power of the hypothesized set of variables.

Equation 1 reports the results of the regression involving money only, equation 2 involves debt only, and equation 3 includes both money and debt. Including both money and debt makes it possible to conduct a direct test of the monetarist hypothesis. Clearly, equation 3 "nests" equation 1, in that it contains all the explanatory variables present in equation 1 plus the additional debt variables. Equation 1, then, is a restricted form of equation 3, the specific restriction being that the estimated coefficients on the debt variables are not significantly different from zero. This restriction may easily be tested by comparing the sum of squared errors for equation 1 (SSE1) with that for equation 3 (SSE3). The test is referred to as a joint F test, and the specific statistic is

$$\frac{(SSE1 - SSE3)/r}{SSE3/(n-k)},$$

where r is the number of restrictions in the money-only regression, n is the number of observations, and k is the number of explanatory variables in the unrestricted (money and debt) regression. Note that this statistic follows an F distribution and has a critical value of 2.01 for significance at the 95-percent level. Calculation of the statistic gives an actual value of 2.37. Hence, H_m is rejected in favor of H_{mb}.[34]

To gain a better appreciation for the weight of this finding, it is instructive to subject the money variables to the same rigorous test—that is, test H_{mb} against the hypothesis that only debt is inflationary, H_b. Specifically, consider the hypothesis

> H_b. *An increase in the outstanding stock of Treasury notes is inflationary, but an increase in the stock of Federal Reserve notes is not.*

Granger, "Investigating Causal Relations by Econometric Models and Cross-spectral Methods," *Econometrica* 37 (July 1969): 424–38, and Christopher A. Sims, "Money, Income, and Causality," *American Economic Review* 62 (September 1972): 540–52, for a detailed description of the procedure.

33. $\bar{R}^2$'s in this study are naturally low because a common trend was extracted from each series. With the trend left in (running levels against levels), the $\bar{R}^2$'s were all above .99, but the error terms were highly autocorrelated.

34. Specifically, the set of explanatory variables B_{t+2}, B_{t+1}, B_t, B_{t-1}, ..., B_{t-6} cannot be rejected as having insignificant predictive content.

Table 1

RESULTS OF CAUSALITY TESTS RELATING INFLATION TO THE GROWTH IN MONEY AND GOVERNMENT DEBT

	Explanatory variables[1]	SSE	$\bar{R}^2$
Equation 1 . . .	Money only	.001470	.345
Equation 2 . . .	Debt only	.001264	.437
Equation 3 . . .	Money and debt	.001201	.415
Equation 4 . . .	Money plus debt	.001260	.431
Equation 5 . . .	Money plus .59 debt	.001256	.432

Dependent variable

Inflation ($\dot{P}_t$) = growth rate of the consumer price index.

Independent variables

Money ($\dot{M}_t$) = growth rate of the St. Louis Fed monetary base.

Debt ($\dot{B}_t$) = growth rate of the market value of privately held gross federal debt.

Money plus debt ($\dot{W}1_t$) = growth rate of $M_t + B_t$.

Money plus .59 debt ($\dot{W}2_t$) = growth rate of $M_t + .59B_t$.

Specific explanatory variables, by equation

1 . . . $\dot{P}_{t-1}, \dot{P}_{t-2}, \dot{P}_{t-3}, \dot{M}_{t+2}, \dot{M}_{t+1}, \dot{M}_t, \dot{M}_{t-1}, \ldots, \dot{M}_{t-6}$.

2 . . . $\dot{P}_{t-1}, \dot{P}_{t-2}, \dot{P}_{t-3}, \dot{B}_{t+2}, \dot{B}_{t+1}, \dot{B}_t, \dot{B}_{t-1}, \ldots, \dot{B}_{t-6}$.

3 . . . $\dot{P}_{t-1}, \dot{P}_{t-2}, \dot{P}_{t-3}, \dot{M}_{t+2}, \dot{M}_{t+1}, \dot{M}_t, \dot{M}_{t-1}, \ldots, \dot{M}_{t-6}$, $\dot{B}_{t+2}, \dot{B}_{t+1}, \dot{B}_t, \dot{B}_{t-1}, \ldots, \dot{B}_{t-6}$.

4 . . . $\dot{P}_{t-1}, \dot{P}_{t-2}, \dot{P}_{t-3}, \dot{W}1_{t+2}, \dot{W}1_{t+1}, \dot{W}1_t, \dot{W}1_{t-1}, \ldots, \dot{W}1_{t-6}$.

5 . . . $\dot{P}_{t-1}, \dot{P}_{t-2}, \dot{P}_{t-3}, \dot{W}2_{t+2}, \dot{W}2_{t+1}, \dot{W}2_t, \dot{W}2_{t-1}, \ldots, \dot{W}2_{t-6}$.

1. Including three lags on inflation.

NOTE: All series are seasonally adjusted residuals, calculated according to the process described in the Appendix. Data were quarterly over the period 1950–84. Because of the lags involved in the estimation equations, all regressions were estimated for the first quarter of 1952 to the second quarter of 1984. See the Appendix for a complete description of the regression procedure used in testing the hypotheses.
SSE is the sum of squared errors.
$\bar{R}^2$ is the coefficient of determination adjusted for degrees of freedom.

This hypothesis is clearly the antithesis of H_m; it claims that debt is inflationary but money is not. Also, there is clearly an analogous nesting of hypotheses. In particular, equation 2 amounts to a restricted form of equation 3, with the specific restriction that the coefficients on the money variables are zero. Calculation of the *F* statistic gives an actual value of 0.56, which is substantially less than the value of 2.01 required for significance at the 95-percent level. Hence, H_b cannot be rejected. Strictly interpreted, the results of this test imply that money does not add any significant predictive content not already found in the debt variable. The purpose of considering this hypothesis, however, is not to cast doubt on the largely unquestioned role of money in affecting prices but, rather, to indicate the degree of rigor the test possesses. The results of the tests, therefore, should be more broadly viewed as implying that government debt is at least as good as money in explaining the behavior of the price level.

Among the regressions reported in Table 1 are two equations testing the specific hypothesis that money *plus* debt is inflationary. For each of these regressions, a nominal wealth variable is first created by adding money and a measure of government debt. The first nominal wealth variable, *W*1, is simply money plus all government debt. Hence, this measure of nominal wealth corresponds to the value of all privately held government paper. The second measure, *W*2, is money plus 59 percent of government debt. Using this fraction of debt is justified because over the 1950–84 period the principal on government debt was essentially rolled over and, on average, each $1 in interest was financed with only 41 cents in taxes.[35] Therefore, government debt may essentially be viewed as an infinite-lived consol on which 59 percent of the interest is deficit-financed. In terms of the above discussion, this constitutes a regime under which 59 percent of outstanding debt is permanent and 41 percent is temporary.

Equations 4 and 5 report the results of the regressions involving *W*1 and *W*2, respectively. The question of whether government debt is inflationary may be examined again by comparing the adjusted R^2's across equations 1, 2, 4, and 5. Note that in the regression involving money only, $\bar{R}^2$ is approximately .35 whereas for money plus government debt it is .43. Although the improvement may not appear substantial, debt alone actually outperforms debt plus money. Again, the purpose of this comparison is not to question the role of money in affecting prices but to call attention to the rigor of the examination to which the debt variable is subjected.

In light of the results of these tests, it is difficult to dismiss government debt as an important variable in explaining inflation. The tests indicate that over the 1950–84 period the price level was as much determined by the volume of outstanding interest-bearing government paper (debt) as by non-interest-bearing paper (money). Apparently, Treasury notes are viewed as unbacked government paper, with the same inflationary implications as money.[36]

Conclusion

It is commonly believed that an open market sale of Treasury securities by the Federal Reserve reflects "tight" monetary policy and that the sale reduces inflation. The argument is that by exchanging Federal Reserve paper for Treasury paper, the Federal Reserve reduces private wealth because money is a component of private nominal wealth but government bonds are not. The article here shows that this result is true under a regime of temporary government debt but not true with permanent government debt. When the Treasury adopts a regime of permanent government debt, Treasury

35. In "What Is the Rule for Financing Public Debt?" *Economic Review*, Federal Reserve Bank of Dallas, September 1984, 25–31, W. Michael Cox investigates the Treasury's rule for financing public debt over the 1950–81 period. The basic finding of the study is that government debt may be viewed as an infinite-lived consol (since the principal on public debt has continuously been rolled over) on which 41 percent of the interest has been tax-financed and 59 percent has been deficit-financed. This implies a value of .59 for *k*. Cox also finds evidence of a shift in the Treasury's interest-financing rule in the early 1970s. That case is not taken up in the empirical work here.

36. The results presented here are derived over the extended period 1950–84. Clearly, in recent years the relationship between government debt and inflation has not behaved as would be predicted by this study. Strictly speaking, the arguments here concerning the inflationary implications of permanent government debt are correct only for the case of a closed economy. The feeling is that this breakdown is temporary and due mainly to external considerations, such as the unprecedented current account deficit.

securities are unbacked paper, with inflationary effects much the same as those of money.

Put differently, government spending requires some type of "tax," and there are essentially only two taxes a government may levy on its citizens.[37] One is a direct tax (income tax, head tax, sales tax, and so on), and the other is an inflation tax. Continuous budget deficits call for the issuance of unbacked government paper—money or bonds—and involve an inflation tax regardless of whether the paper is Federal Reserve paper or Treasury paper.

Tests relating the price level to money and government debt in the United States indicate that over the 1950–84 period the price level was as strongly linked to the volume of Treasury notes as to Federal Reserve notes. Apparently, public debt is viewed by the private sector as unbacked paper, with price implications much the same as those of money.

37. Again, this argument is strictly correct only for the case of a closed economy. See notes 13 and 36 for a discussion of the open-economy considerations.

Appendix

Testing for Inflationary Effects of the Government Debt

Preparation of the data

As a first step, individual data series were chosen to represent the price, money, and government debt variables. Selection of the data series was based on two criteria. First, it was generally desirable to test the hypothesis over as long a period as possible. Second, to avoid spurious econometric problems, statistically comparable raw data series were needed. These criteria led to the selection of seasonally unadjusted monthly observations for each variable over the sample period 1950–84.

For the price level, the consumer price index was used. The monetary base was chosen as the appropriate money variable because it is the only part of money that is net wealth. Specifically, the St. Louis Fed monetary base was used since data are available back to 1950; for other measures of the base, data begin with 1959. For the government debt variable, a market value measure was required. Ideally, what is needed is the market value of privately held permanent government debt. The author has recently reported statistics on the market value of privately held gross federal debt, and that is the series used here.[1] The question of which part of the debt is permanent and which part is temporary is taken up in the text.

After selection of the data, quarterly averages of the monthly observations were calculated, and stationary representations of the three variables were sought. Because each series exhibited a clear upward trend, the data were transformed into growth rates. The resulting growth rate variables still exhibited a mildly upward drift; hence, each variable was regressed on time (and a constant), and the residuals retrieved. Each residual series showed a significant seasonal pattern, so the data were adjusted using seasonal dummies. The resulting seasonally adjusted residual growth rate series were selected as the stationary representations

1. The market value series reported by W. Michael Cox, "The Behavior of Treasury Securities: Monthly, 1942–1984," *Journal of Monetary Economics*, forthcoming, are the monthly market values of gross federal debt (marketable plus nonmarketable debt) held by the private sector.

of the price, money, and debt variables.

Specification of the regression equations

In selecting the specific forms of the regression equations to be used in testing the hypotheses, the current value of the price variable (*P*) was regressed against lead, current, and lag values of money (*M*) and debt (*B*), as well as against lag values of the price level. By including lag values of the price level, the regression equation is essentially being allowed to attribute as much as possible of the current behavior of the price level to past values of the price level. Any remaining power that money and debt have in explaining the price level may then be properly attributed to these variables. It is in this sense of incremental predictive content that the procedure is referred to as a Granger-Sims "causality" test.[2]

Extensive leads and lags on money and debt and lags on prices were first introduced and then individually eliminated until a significant loss in overall explanatory power of the regression (as measured by adjusted R^2) was encountered. This procedure resulted in the following regression structure: lags of three quarters on prices and leads of two quarters, a contemporaneous value, and lags of six quarters on both money and debt. At this stage the residuals indicated significant first-order autocorrelation, which, if untreated, would lead ordinary least squares to provide inconsistent estimates of the regression coefficients. Hatanaka's two-step "residual adjustment" procedure was used to correct the problem.[3]

2. For a discussion of this procedure, see C. W. J. Granger, "Investigating Causal Relations by Econometric Models and Cross-spectral Methods," *Econometrica* 37 (July 1969): 424–38, and Christopher A. Sims, "Money, Income, and Causality," *American Economic Review* 62 (September 1972): 540–52.

3. See Michio Hatanaka, "An Efficient Two-Step Estimator for the Dynamic Adjustment Model with Autoregressive Errors," *Journal of Econometrics* 2 (September 1974): 199–220. The Hatanaka procedure is the same as the usual autocorrelation correction except that an extra regressor (a lagged residual estimator obtained by the method of instrumental variables) is included. This procedure yields estimators that are asymptotically equivalent to the maximum likelihood estimators and, hence, are consistent and asymptotically efficient in the presence of normality.

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The *Economic Review* is published by the Federal Reserve Bank of Dallas and will be issued six times in 1985 (January, March, May, July, September, and November). This publication is sent to the mailing list without charge, and additional copies of most issues are available from the Public Affairs Department, Federal Reserve Bank of Dallas, Station K, Dallas, Texas 75222. Articles may be reprinted on the condition that the source is credited.