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The New System of Contemporaneous Reserve Requirements

R. ALTON GILBERT and MICHAEL E. TREBING

THE Board of Governors of the Federal Reserve System recently announced its decision to implement a version of contemporaneous reserve requirements (CRR) that will become effective in February 1984. This article describes both the regime of lagged reserve requirements (LRR) currently in effect and the new system of CRR, and explains why each feature of the new reserve accounting system was adopted.

LAGGED RESERVE REQUIREMENTS

Under the current system of reserve accounting, reserve maintenance periods—periods during which a depository institution's average daily reserves must equal or exceed its required reserves—cover seven days ending each Wednesday. An institution's required reserves for the current reserve maintenance week are based on its average daily deposit liabilities in the computation period two weeks earlier, as illustrated in exhibit 1. Assets counted as reserves in the current maintenance week include the average daily vault cash held in the computation period two weeks earlier, plus average reserve balances held in the current maintenance period. A depository institution must keep its average reserves within 2 percent of its required reserves to avoid incurring a penalty for a deficiency or losing credit for holding excess reserves.[1]

[1]A reserve deficiency up to 2 percent of required reserves in one maintenance week may be made up the next week without incurring a penalty. Excess reserves up to 2 percent of required reserves may be counted as part of reserves in the following week.

THE NEW CONTEMPORANEOUS RESERVE REQUIREMENTS

Length of Reserve Maintenance Periods

Reserve maintenance periods will be lengthened from one week to two weeks; they will cover 14 days ending every other Wednesday.

Required Reserves on Transaction Deposits

Under contemporaneous reserve accounting, there will be considerable overlap between the reserve computation and maintenance periods for transaction deposits. Required reserves in the current 14-day maintenance period will be held against the average level of transaction deposit liabilities over 14 days ending two days *before* the end of the current maintenance period (exhibit 1).

Required Reserves on Liabilities Other than Transaction Deposits

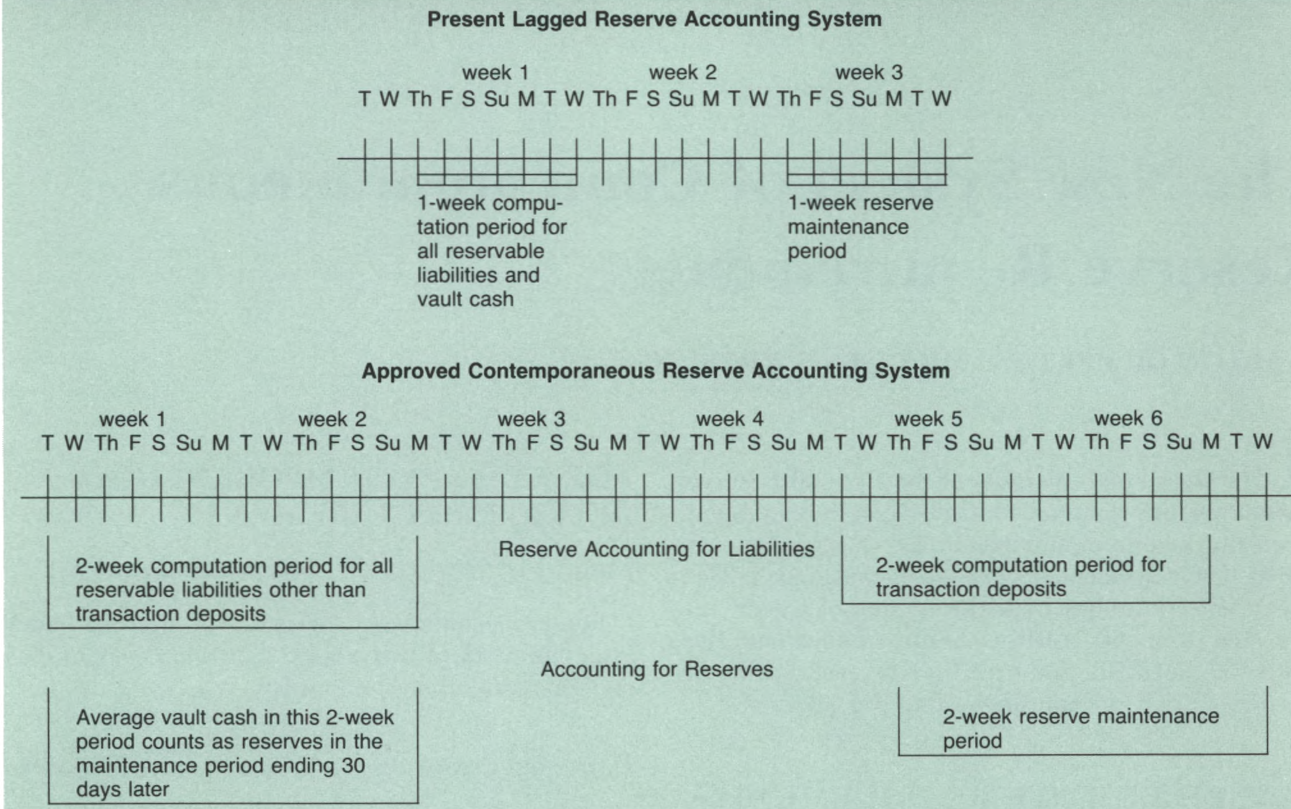
Required reserves against liabilities other than transaction deposits (nonpersonal time deposits and Eurodollar liabilities) will be based on average liabilities over 14 days ending 30 days before the end of the current maintenance period (exhibit 1).

Vault Cash

Vault cash counted as reserves will continue to be lagged under CRR. Thus, a depository institution's

Exhibit 1

Timing of Lagged and Contemporaneous Reserve Accounting Systems



Note: A "reserve maintenance period" is a period over which the daily average reserves of a depository institution must equal or exceed its required reserves. Required reserves are based on daily average deposit liabilities in "reserve computation periods."

reserves in the current maintenance period will include average vault cash held in the 14-day period ending 30 days before the end of the current maintenance period, plus its average daily reserve balances during the current maintenance period (exhibit 1).

Carryover Allowance

The carryover allowance specifies the amount of excess reserves in one maintenance period that a depository institution may use to meet its required reserves in the next maintenance period, or the amount of a reserve deficiency that may be held in the following maintenance period without incurring a penalty.

Each institution will have a minimum carryover allowance of $25,000. During the first six months of CRR, each depository institution will be allowed to carry over to the next maintenance period excess reserves or deficiencies up to 3 percent of required reserves, or $25,000, whichever is larger. In the following six months, the allowable percentage carryover will be 2.5 percent. Thereafter, it will remain at 2 percent, with the $25,000 minimum still in effect. This minimum carryover will exceed 2 percent of required reserves for institutions with required reserves below $1.25 million.

With two-week maintenance periods, a carryover allowance of 2 percent is effectively twice as large as a 2 percent carryover under one-week maintenance periods. To illustrate this, suppose an institution has information on its transaction deposits for each day of the computation period except the last day. Transaction deposits were $10 million until the last day, when they rose to $12 million. For simplicity, assume that the reserve requirement on transaction deposits is 10 percent. Since the institution does not know about the rise in transaction deposits on the last day, it holds average reserves of $1 million during the maintenance period (assuming no required reserves on liabilities other than transaction deposits). If reserve computation periods and maintenance periods covered only seven days, average reserves of $1 million would be 2.78 percent below required reserves of $1.0286 million. With 14-day maintenance periods, in contrast, the rise of transaction deposits to $12 million on the last day of the computation period would make the average reserves of $1 million only 1.41 percent below the average required reserves of $1.0143 million.

IMPLICATIONS FOR REPORTING ARRANGEMENTS BETWEEN THE FEDERAL RESERVE AND DEPOSITORY INSTITUTIONS

Under the current system of LRR, there is a one-week gap between the end of the period over which a depository institution calculates its deposit liabilities and the beginning of the seven-day period over which it holds the required reserves. During that intermediate week, each depository institution informs the Federal Reserve of its deposit liabilities and vault cash; the Federal Reserve, in turn, informs each depository institution of its required reserve balances before the beginning of each maintenance period.

Under the plan for CRR, the Federal Reserve will notify a depository institution before the beginning of each two-week maintenance period how much reserves it is required to hold against liabilities other than transaction deposits and the amount of vault cash it may count as reserves. Each depository institution then must monitor its transaction deposits during the current computation period for those deposits and hold the appropriate amount of reserve balances. After each maintenance period, the Federal Reserve will determine whether each institution's reserves were adequate.[2]

WHY IS THE TIMING OF CONTEMPORANEOUS RESERVE ACCOUNTING SO COMPLICATED?

The timing of reserve accounting under the new system of CRR is designed to strengthen the relationship between money growth and reserve growth by creating a nearly contemporaneous link between transaction deposit liabilities and the required reserves against those deposits. This section explains why each feature of the new reserve accounting system was adopted, and the system's role in binding short-run money growth more closely to the growth of total reserves of all depository institutions.[3]

Two-Week Maintenance Periods

It takes at least one day for banks to compile information on their deposit liabilities. The two days between the end of the reserve computation period for transaction deposit liabilities and the end of the maintenance period permits depository institutions to compile information on their deposit liabilities and to make the final adjustments to their reserve balances for each maintenance period.

Since there is a two-day lag between the end of the period over which depository institutions will measure their deposit liabilities and the end of the period over which they will hold reserves, the new system of reserve accounting is not exactly a contemporaneous one. If maintenance periods had remained one week under the new regulations, required reserves would

[2]The arrangements for determining compliance with reserve requirements are more complicated under the pass-through arrangement. Depository institutions that are not members of the Federal Reserve System may choose to hold their required reserve balances in their own reserve accounts at Federal Reserve Banks, or designate other institutions to hold the required reserve balances for them. Depository institutions that hold required reserve balances for other institutions are called pass-through agents. Under LRR, a pass-through agent receives a report from the Federal Reserve before the beginning of each settlement week on the required reserve balance of each institution for which it holds reserves. Under CRR, a pass-through agent will have to monitor the transaction deposits of the institutions for which it holds required reserves during each settlement period, and the Federal Reserve will determine after the fact whether the reserve balances held by the passthrough agent were sufficient, given the liabilities of the depository institutions for which it holds reserve balances.

[3]This paper does not discuss the effects of adopting CRR on monetary control. Whether money growth is actually more stable after CRR goes into effect will depend, in part, on the weight given to short-run monetary control in the conduct of monetary policy. For a theoretical analysis of the significance of reserve accounting for monetary control, see Daniel L. Thornton, "Simple Analytics of the Money Supply Process and Monetary Control," this *Review* (October 1982), pp. 22–39. The change in reserve accounting from LRR to CRR also has implications for reserve management by individual depository institutions, which are not discussed in this paper. See R. Alton Gilbert, "Lagged Reserve Requirements: Implications for Monetary Control and Bank Reserve Management," this *Review* (May 1980), pp. 7–20.

have been predetermined by prior deposit creation for two-sevenths of each maintenance period. By making maintenance periods two weeks long, each period for measuring transaction deposits overlaps six-sevenths of the period for holding required reserves against them. Consequently, required reserves are predetermined for only one-seventh of each maintenance period.

Increasing reserve maintenance periods from one week to two weeks creates the potential for large gaps to develop between reserves and required reserves unless depository institutions adjust their reserves to anticipated levels of required reserves frequently throughout the maintenance period. If depository institutions wait until the end of each maintenance period to adjust their reserve positions, the Federal Reserve is faced with two choices: 1) to allow large fluctuations in the federal funds rate near the end of maintenance periods (to force transaction deposits to the Fed's target levels), or 2) to adjust the supply of reserves to accommodate the levels of transaction deposits created by depository institutions. If the Federal Reserve chooses to keep total reserves on target, however, depository institutions will discover that they must keep their reserves close to the required reserves throughout each maintenance period, if they want to minimize their interest-rate risk.

Lagged Accounting for Vault Cash

Counting vault cash as reserves on a lagged basis facilitates the control of total reserves. The Federal Reserve does not know the amount of coin and currency held by depository institutions until these institutions file reports on their deposit liabilities and reserve assets. If the vault cash held in the current maintenance period counted as reserves in the current period, the Federal Reserve's errors in estimating current vault cash would lead to errors in the amount of reserves the Fed supplied. With lagged accounting for vault cash, the Federal Reserve will know, at the beginning of each maintenance period, the exact amount of vault cash to count as reserves.[4]

Lagged Accounting for Liabilities Other than Transaction Deposits

The reserve requirements on non-transaction deposit accounts would create potential problems for short-run monetary control if required reserves were based on the amount of those non-transaction liabilities in the current period. To determine the amount of reserves for the current period available to "support" transaction deposits, the Federal Reserve would have to estimate the required reserves on the non-transaction deposit liabilities. Errors in those estimates would create errors in supplying the desired amount of reserves available to support transaction deposits. With lagged accounting for non-transaction deposit liabilities, however, the Federal Reserve will know, at the beginning of each maintenance period, the required reserves on these deposits.

Wider Carryover Allowance

The purpose for widening the carryover allowance under CRR is to make reserve management easier for depository institutions. They may have difficulty from time to time calculating their transaction deposits quickly enough to determine exactly their required reserves by the end of the maintenance period. The carryover allowance permits discrepancies between their actual reserves and their required reserves in one maintenance period to be offset in the following period, within the limits described above. The maximum carryover allowance is initially set at 3 percent of required reserves, since difficulties in calculating required reserves on a contemporaneous basis are expected to be greatest during the first few months after CRR becomes effective.

Implications of the wider carryover allowance for the relationship between short-run money growth and reserve growth depend on whether depository institutions will have significant difficulty in estimating their required reserves, and how they will manage their reserve positions. Even if depository institutions can calculate their required reserves on a contemporaneous basis, they still might use the carryover allowance to avoid the costs involved in keeping their reserves equal to their required reserves. If depository institutions would use the carryover allowance to delay adjusting their reserves to required reserves, widening the carryover allowance will tend to weaken the short-run relationship between transaction deposits and reserves.

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[4]Lagged accounting for vault cash allows depository institutions to increase (decrease) their reserves temporarily by depositing vault cash in (withdrawing vault cash from) their reserve accounts. Control of total reserves by the Federal Reserve could be adversely affected if depository institutions adjust their reserve positions by depositing and withdrawing vault cash. Coats finds little or no evidence, however, that commercial banks have used changes in their vault cash as a method of reserve adjustment. See Warren L. Coats, Jr., "Regulation D and the Vault Cash Game," *Journal of Finance* (June 1973), pp. 601–07.

In contrast, suppose that depository institutions will have to estimate their required reserves under CRR, because of incomplete information on their transaction deposits near the end of the computation periods for those deposits. In particular, suppose that by the end of each reserve maintenance period, which is every other Wednesday, each depository institution has information on its transaction deposits through the prior weekend, but lacks information on transaction accounts for Monday, the last day of the computation period for transaction deposits. Each institution estimates transaction deposits on that Monday as the level over the prior weekend. To avoid penalities on reserve deficiencies or the unprofitable holding of excess reserves, each depository institution would keep its reserves equal to its estimate of required reserves, and use the carryover allowance to accommodate differences between estimates of required reserves and final values. An institution that has an increase in its transaction deposits on the Monday before the end of a maintenance period will end up with deficient reserves; it will not know about the rise in transaction deposits on the last day of the computation period, but will lend to other institutions any increase in reserves that resulted from the unexpected deposit inflow. An institution that had a reduction in transaction deposits on the last day of the computation period will have excess reserves, since actual required reserves will be less than the estimated level, and any loss of reserves due to the unexpected deposit outflow will be replaced by borrowing reserves from other institutions.

Under these conditions, widening the carryover allowance need not have adverse effects on the money-reserve growth relationship. Deviations of reserves from required reserves at individual institutions would not necessarily weaken the short-run money-reserve growth relationship, since those deviations would tend to be offsetting. The implications of the wider carryover allowance, therefore, will depend on whether it is wide enough to accommodate the errors that depository institutions make in estimating their required reserves on a contemporaneous basis, yet small enough to induce them to keep their reserves close to their estimates of required reserves.

CONCLUSIONS

The Federal Reserve has adopted a new system of contemporaneous reserve accounting that will become effective in February 1984. The new system of reserve accounting is intended to strengthen the relationship between transaction deposit balances and the total reserves of depository institutions. The timing of reserve accounting under the new system appears to be complicated. Each feature, however, was adopted to facilitate short-run monetary control, while making allowance for the difficulties that depository institutions will have in measuring deposit liabilities and holding required reserves on a contemporaneous basis.

The Fed and the Real Rate of Interest

G. J. SANTONI and COURTENAY C. STONE

> "The administration may choose to hide its head, ostrich-like, in the warm sands of economic dogma, but the rest of us must face the facts. We cannot tolerate these sky-high interest rates—rates that until recently would have been considered usurious. Congress must act to bring down these killer interest rates before they bring down our economy and the strength and security of our nation."[1]

DURING its last session, which ended on December 23, 1982, the 97th Congress considered several bills that were intended to achieve a "balanced monetary policy." Each bill proposed that the Federal Reserve focus its policy actions on the level of *real* interest rates as well as the quantity of money.

The Fed was to announce publicly its targets for real interest rates, much as it does now with its monetary growth targets. Senate Bill S.2807 specified "yearly targets for *positive real* [our emphasis] short-term interest rates." One House bill, H.R.6967, emphasized long-term interest rates and required the President of the United States to comment on every monetary policy action. Another House bill, H. R. 7218, required the Federal Reserve to "establish monthly ranges of targets for short-term interest rates, consistent with historical levels of *real interest rates* [our emphasis]. . . ." The initial Senate Concurrent Resolution 128, which was passed in modified form on December 23, 1982, asked "that the Board of Governors of the Federal Reserve and the Open Market Committee should take such actions as are necessary to achieve and maintain a level of interest rates low enough to generate significant economic growth and thereby reduce the current intolerable level of unemployment." Although the resolution does not specify the real rate per se, it is this rate that is relevant for economic growth.

The nominal and real interest rates shown in table 1 are typical of those that have provoked congressional concern. They were part of the supplementary materials accompanying Senate Bill S.2807. In this instance, the real interest rates are derived by subtracting the inflation rate from the various nominal (or market) interest rates for the years shown.

Two aspects of these real rate measures have caused widespread public concern. First, real rates were *negative* during certain years in the 1970s. Since the real interest rate presumably designates the interest rate received after netting out the impact of inflation, negative real rates indicate that individuals who loaned their savings at the nominal rates shown in table 1 ended up poorer as a result; borrowers, on the other hand, increased their wealth by borrowing at negative real rates. Second, and perhaps more politically significant, real rates allegedly have been "sky high" over the past few years. These high rates presumably have retarded economic growth and contributed to lower investment and higher unemployment. Although the bills that Congress considered differed in certain respects, they shared the same basic notions: that the Federal Reserve can influence real rates of interest significantly and that monetary policy should attempt to lower them.

There are several questions that immediately arise when considering the implementation and usefulness of real interest rate targeting for Federal Reserve policy. Which of the host of nominal interest rates should

[1]Remarks of Senator Robert C. Byrd, *Congressional Record-Senate*, August 3, 1982, pp. S9699–700.

Table 1

Nominal and Estimated Real Interest Rates: 1960–82

	Federal Funds Rate		90-day T-Bill Rate		Prime Rate		Aaa Corporate Bond Rate		New Home Mortgage Yield		Inflation Rate[2]
	Nominal	Real[1]	Nominal	Real[1]	Nominal	Real[1]	Nominal	Real[1]	Nominal	Real[1]	
1960	3.2	1.6	2.9	1.3	4.8	3.2	4.4	2.8	—	—	1.6
1961	2.0	1.1	2.4	1.5	4.5	3.6	4.4	3.5	—	—	0.9
1962	2.7	0.9	2.8	1.0	4.5	2.7	4.3	2.5	—	—	1.8
1963	3.2	1.7	3.2	1.7	4.5	3.0	4.3	2.8	5.9	4.4	1.5
1964	3.5	2.0	3.6	2.1	4.5	3.0	4.4	2.9	5.8	4.3	1.5
1965	4.1	1.9	4.0	1.8	4.5	2.3	4.5	2.3	5.8	3.6	2.2
1966	5.1	1.9	4.9	1.7	5.6	2.4	5.1	1.9	6.3	3.1	3.2
1967	4.2	1.2	4.3	1.3	5.6	2.6	5.5	2.5	6.5	3.5	3.0
1968	5.6	1.2	5.3	0.9	6.3	1.9	6.2	1.8	7.0	2.6	4.4
1969	8.2	3.1	6.7	1.6	8.0	2.9	7.0	1.9	7.8	2.7	5.1
1970	7.2	1.8	6.5	1.1	7.9	2.5	8.0	2.6	8.5	3.1	5.4
1971	4.7	−0.3	4.4	−0.6	5.7	0.7	7.4	2.4	7.7	2.7	5.0
1972	4.4	0.2	4.1	−0.1	5.3	1.1	7.2	3.0	7.6	3.4	4.2
1973	8.7	2.9	7.0	1.2	8.0	2.2	7.4	1.6	8.0	2.2	5.8
1974	10.5	1.7	7.9	−0.9	10.8	2.0	8.6	−0.2	8.9	0.1	8.8
1975	5.8	−3.5	5.8	−3.5	7.9	−1.4	8.8	−0.5	9.0	−0.3	9.3
1976	5.0	−0.2	5.0	−0.2	6.8	1.6	8.4	3.2	9.0	3.8	5.2
1977	5.5	−0.3	5.3	−0.5	6.8	1.0	8.0	2.2	9.0	3.2	5.8
1978	7.9	0.5	7.2	−0.2	9.1	1.7	8.7	1.3	9.6	2.2	7.4
1979	11.2	2.6	10.0	1.4	12.7	4.1	9.6	1.0	10.8	2.2	8.6
1980	13.4	4.1	11.5	2.2	15.3	6.0	11.9	2.6	12.7	3.4	9.3
1981	16.4	7.0	14.1	4.7	18.9	9.5	14.2	4.8	14.7	5.3	9.4
1982[3]	13.3	8.5	11.5	6.7	15.8	11.0	14.4	9.6	N.A.	N.A.	4.8

Interest Rates (in percent)

[1]The real interest rate shown equals the nominal rate minus the annual percentage change in the implicit price deflator.

[2]Annual percentage change in the implicit price deflator.

[3]Through third quarter of 1982.

be chosen as the one on which to focus? Which of the wide variety of price indexes should be used to obtain the inflation measure necessary to derive the real rate? What should policymakers do when different real rate measures yield different signals (compare the behavior of the real rate measures in table 1 for 1978 and 1979)? What should policymakers do when their real rate targets conflict with their monetary aggregate growth targets?

Although these questions are interesting, this article does not address them. Instead, the purpose of this article is to show that policy discussions based on real rate estimates derived in the manner shown in table 1 are fundamentally misdirected. First, these estimates are inaccurate. Second, the Fed's impact on them, whatever such measures actually represent, is different from that generally perceived.

THE LINK BETWEEN NOMINAL AND REAL INTEREST RATES

Nominal interest rates quoted in financial markets typically differ from real interest rates. Conceptually, the nominal rate of interest, i, can be thought of as the sum of two expected rates of change in value: the expected real rate of interest, r (which indicates the expected rate of change in the value of present goods that are converted into future goods), and the expected rate of inflation, $\dot{P}_e$ (which is the expected rate of

Table 2

Average Annual Growth Rates of M1 and Prices and Average Levels of Selected Nominal Interest Rates

	1954–66	1967–82[1]	Difference[2]
M1 growth	2.47%	6.37%	3.90%
Inflation rate	2.19	6.49	4.30
Aaa corporate bond rate	4.06	8.76	4.70
20-year Treasury security yield	3.78	8.12	4.34
Commercial paper rate	3.45	8.13	4.68
90-day Treasury bill rate	2.86	7.20	4.34

[1]Through III/82.
[2]Significantly different from zero at the 5 percent level.

change in the value of goods in terms of money). This relationship is shown in equation 1.[2]

(1) $i = r + P_e$

MONEY GROWTH, INFLATION AND NOMINAL INTEREST RATES

There is no question that monetary policy affects nominal interest rates. As equation 1 indicates, the expected rate of inflation is a major component of the nominal interest rate. In part, this expectation depends upon the expected rate of growth in the money supply. If people should suddenly expect that the Federal Reserve will increase the monetary growth rate permanently, the expected rate of inflation will rise, causing nominal interest rates to rise as well. The reverse holds if individuals should suddenly expect that the Federal Reserve will reduce the monetary growth rate. Thus, over long periods, we would expect that changes in prices and interest rates would be positively associated with movements in money growth.[3]

The data in table 2 are consistent with the proposition that prices, nominal interest rates and money growth move in the same direction over longer time periods. The average growth rate in M1 increased by about 4 percent between the two long periods shown. Hand in hand with this increase in money growth went higher inflation and higher average levels of nominal interest rates of about the same magnitude.[4]

While monetary growth and the nominal rate of interest are closely related in the long run through the link between monetary growth and expected inflation, it is the *short-run* link between monetary policy and the real rate of interest that chiefly concerns Congress. The question that naturally arises is, "Why is the real rate of interest of interest?"

[2]Equation 1 shows the widely used approximation of the Fisher equation. For an extended discussion, see Irving Fisher, *Appreciation and Interest* (Augustus M. Kelly, 1965). There are two caveats that should be called to the reader's attention. First, if there are taxes on interest income, the expected real rate in the Fisher equation measures the gross real rate, not the after-tax net real rate. Second, even barring taxes, equation 1 correctly describes the relationship underlying the nominal interest rate only if the expected rate of inflation is held with certainty, i.e., the price level expected in the future is held with certainty. If this is not the case, equation 1 is inaccurate and must be amended by introducing some measure of the "spread" in price expectations. For further discussion, see Levis A. Kochin, "The Term Structure of Interest Rates and Uncertain Inflation," (University of Washington, April 1981; processed). Again, we ignore this complexity; for the purpose of our criticism, the expected inflation rate is assumed to be held with certainty.

[3]For some recent studies on the relationship between money growth and inflation, see Keith M. Carlson, "Money, Inflation and Economic Growth: Some Updated Reduced Form Results and Their Implications," this *Review* (April 1980), pp. 13–19; Keith M. Carlson, "The Lag From Money to Prices," this *Review* (October 1980), pp. 3–10; John A. Tatom, "Energy Prices and Short-Run Economic Performance," this *Review* (January 1981), pp. 3–17; Dallas S. Batten, "Money Growth Stability and Inflation: An International Comparison," this *Review* (October 1981), pp. 7–12; Michael D. Bordo and Ehsan U. Choudhri, "The Link Between Money and Prices in an Open Economy: The Canadian Evidence from 1971–1980," this *Review* (August/September 1982), pp. 13–23; and Zalman F. Shiffer, "Money and Inflation in Israel: The Transition of an Economy to High Inflation," this *Review* (August/September 1982), pp. 28–40.

[4]For further discussion, see G. J. Santoni and Courtenay C. Stone, "What Really Happened to Interest Rates?: A Longer-Run Analysis," this *Review* (November 1981), pp. 3–14.

WHY DOES THE REAL RATE MATTER?

Technically, there are several ways in which the real rate of interest can be defined. Looked at one way, the real rate of interest is the net rate of increase in wealth that people expect to achieve when they save and invest their current income. Alternatively, it can be viewed as the expected reduction in wealth that individuals face when they choose to consume goods now instead of saving and investing; in this sense, it represents the relative cost or price of current consumption in terms of foregone future consumption.[5] As a consequence, the real rate of interest influences the proportion of present resources devoted to producing goods that will be consumed immediately instead of durable goods (capital goods) that will provide consumption goods in the future. The real rate of interest is a relative "price which links one point of time with another point of time."[6]

Only the Longer-Term Expected Real Rate Is Relevant

If the purpose of policy is to influence the behavior or actions of individuals, the real interest rate that is relevant is the longer-term expected real rate of interest.[7] It is easy to see why only the "expected" real rate is important. The actions that people take today are determined by their expectations about the future.[8] In and of themselves, the consequences of past decisions are irrelevant for current decisionmaking. History cannot be relived, nor can the present consequences of past decisions be undone. While we can learn much from past failures and successes, it is only the information that they provide about potential *future* outcomes that is relevant for current decisionmaking.

Because the distinction between "looking forward" and "looking backward" is so crucial in understanding economic behavior, economists have coined terms to differentiate between them. The relevant interest rate for guiding economic decisions (and the one that this discussion concerns) is the *ex ante* real rate—the one that is expected *before* decisions are made.[9] The interest rate that is irrelevant for current decisionmaking is the *ex post* real rate—the one that is obtained by looking back to see what actually occurred. By itself, it is nothing more than a historical datum.

It is equally important to recognize that changes in the longer-term expected real rates have a greater influence on resource use than do shorter-run, *ex ante* real rates. In the short run, for a variety of reasons, profitable resource reallocation is more limited or constrained than it is in the long run. Economists characterize this by referring to resource use being fixed in the short run, but variable in the long run. Thus, policy actions must influence the long-run, *ex ante* real rate if they are intended to have a significant effect on people's behavior.

Relative Price Impacts

For policymakers concerned with aggregate economic activity, the real rate is particularly important. Since all goods are more or less durable, that is, they yield streams of consumption services that last over varying lengths of time, the real rate of interest influences the relative price or rate of exchange between each good in the economy and every other good. A change in the real rate means that the whole spectrum of prices has changed.[10]

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[5]See, for example, Armen Alchian and William R. Allen, *Exchange and Production: Competition, Coordination, and Control* (Wadsworth Publishing Co. Inc., 1977), pp. 424–59; One of the first to adopt this view of the interest rate was Galiani who wrote in 1750, as cited in Eugen V. Bohm-Bawerk, *Capital and Interest* (Kelley and Millman Inc., 1957), pp. 48–50; Irving Fisher, *The Theory of Interest* (Kelley and Millman Inc., 1954), pp. 61, 339; Friedrich A. Hayek, *The Pure Theory of Capital* (The University of Chicago Press, 1941), pp. 168–69; Frank Knight, "Capital, Time, and the Interest Rate," *Economica* (August 1934), pp. 257–86.

[6]Fisher, *The Theory of Interest*, p. 33. See, as well, George J. Stigler, *The Theory of Price* (The Macmillan Co., 1966), p. 276.

[7]In reality, it is the after-tax, longer-term expected real interest rate that is relevant. We ignore the impact of taxes, because introducing them into the analysis would simply add complexity without affecting the substance of our criticisms of real rate estimations. However, the reader should be warned that, because taxes drive a wedge between the gross real rate and the relevant net-of-tax real rate, their impact must be taken into account if a useful measure of the expected real rate is to be obtained.

[8]". . . Every act of production is a speculation in the relative value of money and the good produced." Frank Knight, "Unemployment: And Mr. Keynes' Revolution in Economic Thought," *Canadian Journal of Economics and Political Science*, vol. 3 (1937), p. 113. For a complete treatment, see Fisher, *Appreciation and Interest*, pp. 1–100.

[9]"The rate of interest is always based upon expectation, however little this may be justified by realization. Man makes his guess of the future and stakes his action upon it . . . Our present acts must be controlled by the future, not as it actually is, but as it appears to us through the veil of chance." Irving Fisher, *The Rate of Interest* (The Macmillan Co., 1907), p. 213.

[10]Irving Fisher notes that, "Interest, if not explicitly, will implicitly persist, despite all legal prohibitions. It lurks in all purchases and sales and is an inextricable part of all contracts." *The Theory of Interest*, p. 49. See, as well, pp. 58, 325–81. For further discussion, see Hayek, *The Pure Theory of Capital*, p. 353; Knight, "Unemployment? And Mr. Keynes's Revolution in Economic Thought," p. 113; Milton Friedman, *Price Theory: A Provisional Text* (Aldine Publishing Co., 1962), pp. 245–66.

Employment Consequences

A change in the price of more durable goods relative to less durable goods, which is part and parcel of a change in the real rate, reflects underlying changes in relative demands for all goods and services. These demand shifts will produce significant changes in investment and job opportunities across industries. As a result, total employment may decline following a change in the real rate of interest until labor and resource use have adjusted fully to the new relative demand pattern.

Wealth Impacts

In addition, real interest rate changes produce wide-ranging wealth changes. To see how this operates, consider an example in which investment opportunities expected to repay $1.05 in one year, or $1.10 in two years, or $2.65 in 20 years are each "worth" $1.00 today; in each case, the rate of return or "the interest rate" is 5 percent.[11] If the interest rate suddenly and unexpectedly should rise to 10 percent, the present value of these particular future claims would all drop. In fact, they would decline in value to about $.96, $.91 and $.39, respectively. These are the new amounts that, if invested at 10 percent, would grow to the specified future amounts over the respective time periods.

In other words, increases in the real rate of interest, other things being the same, will reduce the *present* value of existing claims to future values, even though these future values remain unchanged. This means that unanticipated increases in the real rate of interest will reduce the wealth of all individuals who own such claims, with the more sizable reductions inflicted on those who own the more durable assets (those yielding the longer streams of expected future values). Owners of bonds, stocks, houses, land, etc., lose wealth when the real rate of interest unexpectedly rises.

The opposite occurs when the real rate of interest unexpectedly declines. In this event, people who own durable assets will find that their wealth has increased, with larger percentage increases going to those whose assets are more durable.

[11]The numerical examples use simple annual compounding—that is, the future amount due in year t is "deflated" by $1/(1+i)^t$ to obtain its "present value." Continuous compounding would produce only marginal differences in the numbers shown.

General Price Level Impacts

In certain circumstances, an unexpected increase in the real rate of interest directly influences the general price level as well.[12] Money is a durable good that yields a flow of services over time. Because an unanticipated rise in the real rate reduces the values of durable goods relative to those of nondurable goods, it also can reduce the price of money. Since the price of money is simply the inverse of the general price level, one possible result of an unexpected rise in the real rate is a one-time rise in the general level of prices—an increase that some people (but not economists) commonly call a "burst" of inflation.[13] Such unanticipated increases in the price level will produce unexpected and seemingly capricious wealth reductions, as well as wealth *redistributions* among people.

It is not surprising, given these consequences, that changes in real rates of interest are a matter of public concern. These changes produce fluctuations in the aggregate price level, unexpected changes in people's wealth and sizable impacts on employment and resource use.

THE REAL INTEREST RATE CANNOT BE DIRECTLY OBSERVED; IT MUST BE ESTIMATED

The real rate of interest, a key economic variable, cannot be directly measured or observed.[14] It is impossible to get exact firsthand knowledge of it.

The problem is that our direct knowledge of interest rates comes from the nominal rates that are deter-

[12]The example considered here is one in which there is a general shift in the public's time preferences toward present at the expense of future consumption. Other possible shifts, for example, an increase in the demand for money at the expense of other assets or an increase in the investment demand (due to new innovations), could have different impacts on both the real rate and the general price level than those described in the text.

[13]The terms "inflation" and "inflation rate" are subject to considerable variation in meaning. People generally take the rate of inflation to mean the rise in some price index between the dates that it is measured. On the other hand, economists often, but not always, refer to inflation as the *longer-term trend* movement in prices; thus, they distinguish between "the rate of change in the price index" from one period to the next and "the rate of inflation." For a recent discussion, see Lawrence S. Davidson, "Inflation Misinformation and Monetary Policy," this *Review* (June/July 1982), pp. 15–26. Although it grates on our economic sensibilities, we use the "rate of inflation" in its popular (non-economic) sense in the following discussion.

[14]From this point on, the term "*ex ante*" is deleted to simplify discussion. However, since we intend to analyze interest rates that affect behavior, references to "the rate of interest" refer to the *ex ante* interest rate unless otherwise noted.

mined in credit markets. As we discussed earlier, these typically are considered to represent the sum of the expected real rate and the expected rate of inflation that credit market participants anticipate for the period of a specific loan. Neither the expected real interest rate nor the expected inflation rate is directly observable—only their sum is a matter of record. When nominal interest rates fluctuate, it is not directly possible to determine whether movements in the *ex ante* real rate of interest, the expected inflation rate or some combination of both, is responsible. This problem forces researchers and policymakers to confront the issue of measuring the unseen.

Pitfalls in Estimating the Real Rate

There have been numerous attempts to derive estimates of the expected real rate of interest using the conceptual framework shown in equation 1. The general method of obtaining these estimates involves the following steps: (1) Estimate the unobservable expected inflation rate; (2) Subtract this measure from the observed nominal interest rate; and (3) Label the remainder "the real rate of interest."[15]

There is nothing inherently amiss with this procedure; it suggests simply that, in the opinion of the researchers, it is easier and more accurate to first estimate the expected rate of inflation directly, thus deriving estimates of the real rate of interest indirectly. The fruitfulness of this approach can be evaluated only by observing whether the derived estimates of the real rate of interest seem to make sense.

Typically, this procedure uses some weighted average of current and past inflation rates to estimate the current expected inflation rate for future periods. Thus, the procedure involves using an *ex post* real interest rate measure to estimate the desired *ex ante* real rate. This will yield accurate results only if the following conditions hold:

Exhibit 1
Estimating the Real Rate When Only the Expected Happens

	Year 1	Year 2	Year 3	Year 4
Beginning of Year:				
Expected inflation rate for year	10%	10%	10%	10%
Expected real rate for year	3	3	3	3
Nominal interest rate for one-year loans	13	13	13	13
Measured Inflation Rate:				
During this year	10	10	10	10
During previous year	10	10	10	10
Estimates of Real Rates:				
Nominal interest rate at beginning of year minus *this year's* inflation rate	3	3	3	3
Nominal interest rate at beginning of year minus *last year's* inflation rate	3	3	3	3

(a) The expected real rate of interest is constant,

(b) Economic policies, in particular monetary policy, are unchanged,

(c) There have been no significant "shocks" or structural changes affecting price levels, that is, no OPEC price changes, no major crop failures or bountiful harvests, etc.

If any of these conditions is violated, the procedure can seriously distort the estimate of expected inflation rate. As a result, estimates of the real rate of interest, derived by subtracting the expected inflation estimates from nominal interest rates, will be distorted as well.[16]

Exhibit 1 depicts a four-year period during which the three conditions listed above are all met. Since there are no *ex ante* real rate changes or other unexpected "shocks" to price levels, the actual rate of inflation is always equal to the expected rate of inflation. Consequently, estimating the real rate by subtracting

[15]Some examples include Albert E. Burger, "An Explanation of Movements in Short-Term Interest Rates," this *Review* (July 1976), pp. 10–22; John A. Carlson, "Short-Term Interest Rates as Predictors of Inflation: Comment," *The American Economic Review* (June 1977), pp. 469–75; Jan Walter Elliott, "Measuring the Expected Real Rate of Interest: An Exploration of Macroeconomic Alternatives," *The American Economic Review* (June 1977), pp. 429–44; Eugene F. Fama, "Short-Term Interest Rates as Predictors of Inflation," *American Economic Review* (June 1975), pp. 269–82; Martin Feldstein and Otto Eckstein, "The Fundamental Determinants of the Interest Rate," *The Review of Economics and Statistics* (November 1970), pp. 363–75; William P. Yohe and Denis S. Karnosky, "Interest Rates and Price Level Changes, 1952–1969," this *Review* (December 1969), pp. 18–38.

[16]The reader is warned to reread the admonitions that appear in footnotes 2 and 7. If future price expectations are not held with certainty and if interest income is taxed, the use of the Fisher equation to derive the real rate will not yield the relevant real rate of interest.

Exhibit 2

Unreal Estimates of the Real Rate: When the Unexpected Happens

I. Inflation in year 2 is higher than expected due to unexpected rise in the ex ante real rate during year 2

	1	2	3	4
Beginning of Year:				
Expected inflation rate for year	10%	10%	10%	10%
Expected real rate for year	3	3	4	4
Nominal interest rate for one-year loans	13	13	14	14
Measured Inflation Rate:				
During this year	10	15	10	10
During previous year	10	10	15	10
Estimates of Real Rates:				
Nominal interest rate at beginning of year minus *this year's* inflation rate	3	−2	4	4
Nominal interest rate at beginning of year minus *last year's* inflation rate	3	3	−1	4

II. Inflation in year 2 is higher than expected due to policy or supply "shocks" which do not affect the ex ante real rate

	1	2	3	4
Beginning of Year:				
Expected inflation rate for year	10%	10%	10%	10%
Expected real rate for year	3	3	3	3
Nominal interest rate for one-year loans	13	13	13	13
Measured Inflation Rate:				
During this year	10	15	10	10
During previous year	10	10	15	10
Estimates of Real Rates:				
Nominal interest rate at beginning of year minus *this year's* inflation rate	3	−2	3	3
Nominal interest rate at beginning of year minus *last year's* inflation rate	3	3	−2	3

either the current or the previous year's inflation rate from the nominal interest rate at the beginning of each year yields identical estimates. Moreover, these estimates are, in fact, equal to the actual (though unobserved) *ex ante* rate of 3 percent.

Consider, however, what happens when the unexpected occurs; two variations of this are shown in exhibit 2. The first example shows the impact on real rate estimation over a four-year period when the *ex ante* real rate unexpectedly rises from 3 percent to 4 percent at some point *during* the second year. As explained earlier, a rise in the real rate will produce a corresponding rise in current prices; as a result, the rate of inflation during year 2 is greater than was expected *at the beginning* of the year. Since the price level adjustment to the higher real rate is assumed to have been completed during year 2 (to simplify the analysis), the unusual rise in inflation is not expected to persist. As a result, at the beginning of year 3, the expected inflation rate remains equal to 10 percent; the nominal interest rate rises to 14 percent to reflect the rise in the real rate.

Notice the difference between the actual *ex ante* real rate change (from 3 percent at the start of year 2 to 4 percent at the start of year 3) and the behavior of the real rate estimates. The first measure suggests that the real rate declined in year 2; the second measure depicts a real rate drop in year 3. Moreover, both measures yield negative real rate estimates, an absurd result for purported estimates of the expected real interest rate.[17] It is evident that estimates of the real rate obtained using past or current inflation rates are unreliable when the real rate is changing. Not only is the direction of movement likely to be misjudged, but the estimates themselves may turn out to be silly.

Even if the real rate is not changing, typical estimation procedures will yield spurious movements in the purported real rate whenever policy shocks or general economic shocks occur. These shocks will produce episodes during which the actual inflation rate is different from the rate that was expected before the shock. For example, consider case II in exhibit 2, in which the

[17]A number of studies have obtained negative estimates of the real interest rate. Since we live in a world of productive but scarce resources, this is nonsensical, especially for the longer-term real rates. See W. W. Brown and G. J. Santoni, "Unreal Estimates of the Real Rate of Interest," this *Review* (January 1981), pp. 18–26, for an explanation that such results can arise from measurement errors inherent in current price indexes.

real rate is constant but some other event (e.g., an unexpected policy change or an OPEC price increase) produces higher inflation in the second year than is anticipated. Once again, as a comparison between the actual and the different estimates of the real rate indicates, the estimation procedure yields results that are wrong during periods when various shocks are affecting prices in unexpected ways.[18]

In summary, when nothing unexpected happens, the procedure can be used; when the unexpected occurs, as it usually does, the procedure yields strange results over short-run periods.

CAN THE FED CONTROL THE REAL RATE?

As the above analysis indicates, the interpretation of real interest rate estimates is extremely troublesome. This problem has not prevented real rate estimates, however questionable, from affecting policy discussions and debates. Consider, again, the real rate estimates in table 1 that were associated with Senate Bill S.2807. The negative values alone indicate that they suffer from the estimation problems cited previously. Nonetheless, these estimates have captured the attention of the public and policymakers alike.

Therefore, whatever qualms we may have about using these estimates of the real rate, it is clearly of interest to assess the relationship between Federal Reserve actions and changes in these estimates.[19] First, however, briefly consider the theoretical arguments regarding the relationship between monetary policy and the "true" real rate of interest.

Theoretical Considerations

There are two contrasting theoretical arguments concerning the influence of monetary policy on the real rate. Neither of these, however, is consistent with the intent of the bills that Congress was considering.

One major argument, termed the "neutrality of money doctrine," states that real economic variables—such as output, employment, economic growth and the real rate of interest—are not influenced permanently by money growth and, therefore, are essentially unaffected by monetary policy. Instead, money growth affects only nominal variables—the price level, the rate of inflation, and nominal interest rates (via the expected rate of inflation). Given this argument, the Federal Reserve has no permanent influence over the real rate of interest whatsoever.

A different theoretical argument, usually called the Mundell effect, states that permanently faster money growth will reduce the real rate of interest, at least temporarily.[20] This occurs because the permanently higher rate of inflation accompanying accelerated money growth initially reduces people's wealth. As a result of this loss, they decide to save more in an attempt to mitigate the wealth-reducing consequences of higher inflation. The increased supply of savings then results in a reduction in the real interest rate.

It is clear that neither of these theoretical arguments support the notion that the Federal Reserve can reduce the real rate of interest in a manner compatible with the purpose of the congressional bills. If the neutrality argument is valid, the Federal Reserve has no ability to control the real rate of interest at all. Attempts on the part of the Fed to do so would be, at best, unsuccessful; at worst, such attempts may be counterproductive to its anti-inflation efforts.

If the "Mundell effect" is valid, the Fed can reduce the real rate only by permanently increasing the rate of inflation and lowering the general level of wealth. Not only is this presumably *not* the intent of Congress, it directly conflicts with those parts of the bills that would make a lower real rate target subordinate to the goal of reducing inflation.

Empirical Considerations

There are several ways to assess the relationship between Federal Reserve actions and estimates of the real rate. Table 3 presents evidence on the correlation between M1 growth and the various estimates of the real rates that appear in table 1.

Two different correlation comparisons are shown in table 3. The second column shows the correlation coef-

[18]Of course, additional examples of unreal estimates of the real rate can be obtained by using some weighted average of past inflation rates instead of a single year's rate, by lengthening the adjustment time during which prices respond to unanticipated events and by considering the impact of changes in policy that affect the expected rate of inflation. These examples would merely provide further evidence of the problem with using this approach to estimating real rates.

[19]As a practical matter, if the Federal Reserve is required to target on the real interest rate, it will, no doubt, link the monetary growth rate to estimates of the real rate generated by employing a technique similar to the estimation attempts cited above.

[20]Robert A. Mundell, "Inflation and Real Interest," *Journal of Political Economy* (June 1963), pp. 280–83.

Table 3

Correlation Coefficients for Estimates of the Real Interest Rate and M1 Growth: Annual Data

	Correlation Between	
Estimated Real Interest Rate	Real Rate Estimates and M1 Growth[1]	Changes in Real Rate Estimates and Changes in M1 Growth[2]
Federal funds rate	.100	.008
90-day Treasury bill rate	−.110	.075
Aaa corporate bond rate	−.183	.023
Prime rate	.000	−.145
Mortgage rate	−.105	.001

[1]1960 to 1981, except for mortgage rate (1963–1981)
[2]1961 to 1981, except for mortgage rate (1964–1981)

Table 4

Influence of Monthly M1 Growth on an Aaa Bond Real Interest Rate Measure: February 1951 to November 1982

$$r = \text{constant} + \sum_{i=0}^{11} a_i \dot{M}1_{t-i}$$

	February 1951 to September 1979		October 1979 to November 1982	
	Coefficient	|t|	Coefficient	|t|
constant	1.4885[1]	2.068	1.0360	.801
a_0	−.00088	.388	.00840	1.014
a_1	.00171	.510	.03960[1]	3.419
a_2	.00170	.423	.03112	2.003
a_3	.00233	.542	.02719	1.502
a_4	−.00249	.553	.00901	.423
a_5	−.00160	.348	.01940	.863
a_6	.00292	.631	.02411	1.056
a_7	.00253	.556	.01446	.666
a_8	.00000	.001	−.00036	.019
a_9	.00074	.181	−.00499	.301
a_{10}	.00016	.045	−.01126	.888
a_{11}	.00025	.107	−.00178	.211
Σa_i	.00737	.221	.1549	.926
$\bar{R}^2$	.9826		.8662	
D-W	2.07		2.04	
RH01	1.27[1]	24.536	1.40[1]	9.838
RH02	−.28[1]	5.410	−.48[1]	3.373
NOB	344		38	
SER	.1548		.3899	

[1]Significantly different from zero at the .05 level.

ficients between the levels of the estimated real rates and the growth of M1; they range from −.183 to .100. The third column displays the correlation coefficients between changes in the estimated real rates and changes in the growth of M1; they range from −.145 to .075.

Nothing in table 3 demonstrates that the Federal Reserve can influence these estimates of the real rate by varying the growth of money on a year-to-year basis. Not only are the estimated correlation coefficients small, they are statistically indistinguishable from zero. There is no discernibly significant relationship between either the level of real rates and the growth of M1 or changes in real rates and changes in the growth of M1. If these real rate estimates actually were indicative of the "true" *ex ante* real rate, the results in table 3 could be interpreted as supporting the "neutrality of money" hypothesis.

A different test of the Federal Reserve's influence on real interest rate estimates (if not on the real rate itself) can be obtained by looking at the relationship between M1 growth and monthly estimates of the real interest rate. By doing so, we can assess the Federal Reserve's short-run ability to influence estimates of the real interest rate.[21]

Table 4 presents the results of assessing the impact of the current and past 11 months' M1 growth on one measure of real interest rates. The specific monthly real interest series used is one that this Bank utilized in the early 1970s until it became apparent that the estimates were questionable in the sense discussed earlier.[22] It is derived by subtracting the average annual rate of change in the seasonally adjusted consumer price index over the prior 36 months from Moody's Index of Aaa bond yields. As constructed, it represents an estimate of long-term expected real interest rates.

The relationship in table 4 was estimated over two different time periods.[23] The first regression estimation assesses the impact of money growth on the monthly real rate series from February 1951 through September 1979. The second estimation assesses the relationship between money growth and the monthly real rate estimate since October 1979, the month in which the Fed announced that it would focus more attention on money growth in implementing monetary policy. The two periods were analyzed separately to determine whether the Federal Reserve's action on October 6, 1979, has resulted in any significant change in the relationship between money growth and these estimates of the real interest rate.

The results shown for the February 1951 to September 1979 period indicate that current and lagged money growth have no discernible effect on the real interest rate measure. While the $\bar{R}^2$, which measures the proportion of the variation in the real rate "explained" by the regression equation (adjusted for the number of regressors used), is close to one, the "explanatory power" of the equation is derived from the *rho* coefficients that adjust for the existence of first- and second-order autocorrelation and from the constant term. None of the individual coefficients on M1 growth (which range from −.00249 to .00292) differs statistically from *zero*. Moreover, the sum of the coefficients on M1 growth, which is an estimate of the net impact of money growth over a 12-month period, is not statistically different from zero. Thus, during this period, the real rate was not affected discernibly by short-run money growth.

The second set of estimates, for the period since October 1979, yields results that are virtually identical to those from the earlier period. The "explanatory power" of the estimated equation is derived chiefly from the autocorrelation coefficients alone: the constant term is not statistically different from zero. Once again, money growth has essentially no effect on the real rate of interest. Although a_1, the coefficient that measures the impact of last month's money growth on this month's real interest rate is statistically significant—and *positive* at that—the sum of the money growth coefficients is not significantly different from zero. There is no net impact of short-run money growth on the real rate.

[21]Because there is some question about the Fed's ability to control M1 growth on a month-to-month basis, the regression relationship in table 4 was estimated using the monetary base growth in place of M1 growth. The results were virtually identical. For recent articles discussing the relationship between the monetary base and the money stock, see Anatol B. Balbach, "How Controllable Is Money Growth?" this *Review* (April 1981), pp. 3–12 and R. W. Hafer, "Much Ado About M2," this *Review* (October 1981), pp. 13–18.

[22]This Bank discontinued the use of these estimates in 1975 because the "series suggests that real (interest) rates have fallen substantially in recent months. There is no supporting evidence that this has happened." Internal memo, Denis S. Karnosky, Research Department, Federal Reserve Bank of St. Louis, 1975.

[23]The procedure used was generalized-least-squares regression. The equation was estimated correcting for first-order and second-order autocorrelation using a maximum-likelihood grid search procedure.

The overall impression that emerges from the results shown in table 4 is that the Federal Reserve is unlikely to be able to influence month-to-month movements in estimates of the real interest rate by varying money growth over short-run periods.[24] Money growth had no significant impact on these estimates prior to October 1979 and has had virtually none since then.

[24]The results reported here are similar to those derived recently from two alternative approaches to assessing the impact of monetary policy on quarterly real interest rates. R. W. Hafer and Scott E. Hein, in "Monetary Policy and Short-Term Real Rates of Interest," this *Review* (March 1982), pp. 13–19, looked at the relationship between quarterly estimates of the *ex post* real three-month Treasury bill rate and current and lagged levels of the "real" money stock (measured by the "real" monetary base). They found that an increase in the real money stock *reduced* their real rate measure in the same quarter but *raised* it in the next quarter by virtually the same amount with no subsequent impact. Thus, they conclude "there is no evidence of a long-run effect running from changes in real money balances to changes in real interest rates."

Keith M. Carlson, in "The Mix of Monetary and Fiscal Policies: Conventional Wisdom Vs. Empirical Reality," this *Review* (October 1982), pp. 7–21, finds that in general "monetary and fiscal actions do little to explain the movement of the real rate as measured by the Aaa bond rate minus inflation." When he assessed the impact of current and lagged growth in M1 (up to 20-quarter lags) on quarterly estimates of the Aaa real rate, he found that the monetary growth coefficients were *positive* and *significant* for the period from II/1959 to IV/1981; however, the $\bar{R}^2$ was small (from .04 to .06). As Carlson notes, the positive relationship "should probably not be taken too seriously, however, because of the problems inherent in measuring the real rate."

CONCLUSION

The expected real rate of interest is an important economic variable that, although directly unobservable, has a pervasive influence on the allocation of resources and on the distribution of wealth. Whether the Federal Reserve can control or influence the actual real rate is an unsettled issue. What is clear, however, is that discussions about the real rate and the Fed's influence on it have been misdirected. Because the most commonly used estimates of the real rate are subject to substantial errors, it would be a serious mistake to base policy actions on them.

In addition, the Federal Reserve cannot affect estimates of the real interest rate, whatever their validity. Thus, the passage of any bill requiring the Fed to set policy on the basis of real rate estimates would inevitably send it in pursuit of some monetary will-o'-the-wisp.

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