Money, interest rates, and Monetarist policy

Some more unpleasant Monetarist arithmetic?

This article examines the nature of money and banking and presents a simple model of the relation between interest rates and the rate of growth of the money supply. The Monetarist theory regarding this relation is flawed. Two interest rate regimes of recent U.S. history will be examined: the low interest rate regime which lasted from World War II to 1965, and the high interest rate regime which began in 1966. The first regime was characterized by low inflation and interest rates, a moderate rate of growth of the money supply, effective interest rate ceilings, and quantity rationing in the financial sector. The second regime has been characterized by rising interest rates and prices, rapid growth of the money supply, increasingly ineffective interest rate ceilings (and their eventual abandonment), and increasing reliance in credit markets on price rationing rather than quantity rationing. The two regimes overlap, not coincidentally, with Minsky’s distinction between managerial–welfare capitalism and money manager capitalism (Minsky, 1988). I will argue that a fast rate of growth of the money supply does not cause high interest rates (through an expectational Fisher effect); rather, high interest rates cause rapid growth of the money supply. Furthermore, tight money policy and high interest rates are not consistent with slow growth of the money supply, or, more correctly, the combination of high interest rates and slow growth of the money supply can occur only in the presence of financial system crisis. Thus, theory and evidence will cast doubt upon Monetarist policy.

1. Monetarist theory and policy

According to Monetarists, the central bank controls the money supply

The author is Assistant Professor of Economics, University of Denver. He would like to thank Philip Arestis, John Caskey, Paul Davidson, Johan Deprez, Jan Kregel, and two anonymous referees for comments on an earlier version. Presented at the American Economic Association meetings, New Orleans, January 1992. The subtitle is borrowed from Sargent and Wallace (1981).
through its control over high-powered money (Brunner, 1968). They also purport to find a high correlation between the rate of growth of the money supply and inflation, which has led them to believe that money causes inflation. Thus, inflation is attributed to a central bank policy through which excessive reserves are created, allowing banks to create excessive money balances. When the nominal money supply is increased, this induces an adjustment process through which nominal prices rise and real variables (such as permanent income—to which the demand for real balances is linked) increase until excess nominal balances are eliminated (Friedman, 1989). Nominal interest rates also adjust to excessive nominal balances through an expectational Fisher effect. Faster growth of the money supply will raise expectations of inflation, and thus increase the markup over the real interest rate to obtain the nominal interest rate. Thus, “easy money policy” not only causes inflation, but it also raises nominal interest rates.

According to Monetarists, tight money policy will slow the rate of increase of nominal prices. Furthermore, to the extent that lower actual inflation leads to lower expectations regarding future inflation, tight money policy will also bring down nominal interest rates. Monetarists claim that free markets generate a long-run equilibrium independent of monetary factors. Because they believe the forces that move the economy to equilibrium are very strong even in the short run, they discount the necessity of countercyclical fiscal and monetary policy. While monetary policy might have real effects in the short run, long and variable lags make it very difficult to “fine-tune” the economy through the use of monetary policy. Thus, Monetarists have tended to advocate nondiscretionary monetary policy. For example, Friedman has called for a rule: the central bank should have the money supply grow at a low and constant rate. This can be achieved by close control over the growth of bank reserves (Friedman, 1989).

Monetarists have emphasized that the central bank should target monetary aggregates rather than interest rates. Thus, tight money policy

---

1 Sargent and Wallace (1981) show that if the central bank must finance part of the government’s deficit, it may not be able to control the money supply or inflation. If the interest rate required to induce the public to hold government bonds exceeds the rate of growth of national output, then the real stock of government bonds will rise relative to national output if the government runs a deficit. Since the private demand for government bonds is assumed to be finite, the central bank will be forced to take up a portion of the bonds. This makes it impossible for the central bank to adhere to a Monetarist constant growth rate rule, as it will have to abandon its targets for the base. This, according to Monetarists, would result in loss of control of the money supply and of inflation.
indicates that the central bank is attempting to slow the rate of growth of the money supply. This is accomplished as the central bank uses its three tools (discount rate, open market operations, and required reserve ratios) to constrain the growth of reserves (or excess reserves). Monetarists have no doubt that such tight money will, indeed, slow the growth of the money supply (Balbach, 1981; Brunner, 1968); this will then lower inflation directly, and interest rates indirectly. From the perspective of a Monetarist, it is very easy to determine whether a central bank has been pursuing tight money policy: one need only look at the rate of growth of the money supply. If this growth rate has been low, the central bank must have been pursuing tight money policy; if the growth rate was high, the central bank must have undertaken easy money policy.

This presents a problem for any empirical investigation into the effects of Monetarist policy, for if Monetarist policy fails to slow the rate of growth of the money supply, Monetarists can always deny that Monetarist policy was actually adopted. Thus, for example, Friedman denied that the self-proclaimed Monetarist policies of Volcker were in fact Monetarist (Friedman, 1984). Through such obscurantist arguments, Monetarists are able to distance their theory from any unfavorable real-world outcome. However, most economists recognize that tight money policy can be identified by increases in the discount rate, by increases of the required reserve ratio, through reserve constraint (decrease of open market purchases; greater scrutiny at the discount window), and through other constraints adopted by the central bank (such as other restrictions on private banks). As most economists recognize, the immediate impact of tight money policy is to raise short-term interest rates. Rather than adopting the convenient Monetarist ex post definition of tight money policy as a policy that lowers the rate of growth of the money supply (which assumes what remains to be shown), I shall follow the example of most non-Monetarists in defining tight money policy as an attempt to constrain the growth of bank lending which has an immediate effect on interest rates. I will then explore whether this policy can, in fact, slow the rate of growth of the money supply.

Whether or not the U.S. Federal Reserve Bank has accepted Monetarist theory, it has periodically adopted tight money policy in the apparent belief that this would reduce inflationary pressures. These bouts with tight money policy raised wholesale interest rates (the fed funds rate, market rates on large certificates of deposit, and so on). In the presence of Regulation Q, usury laws, and other types of constraints on financial institutions, tight money policy in the first regime did tend to slow the
rate of growth of the money supply, as Monetarists believe it would. During the second regime, however, tight money policy becomes increasingly ineffective at slowing growth of the money supply. For example, as interest rates rose during the Fed’s attempt at “practical monetarism” in the early 1980s, the rate of growth of the money supply actually increased. Furthermore, while nominal interest rates, the rate of inflation, and the rate of growth of the money supply were (weakly) correlated in the early postwar period, these empirical correlations disappeared later. Thus, in the second regime, Monetarist policy did not have the expected effect on either the rate of growth of the money supply or on nominal interest rates, nor did the empirical correlations upon which Monetarist theory is based hold up, especially during the 1980s. Interest rates and the rate of growth of the money supply are generally positively correlated, but inflation is not positively correlated with the rate of growth of the money supply, during the 1980s.

2. What do “financial intermediaries” do?

Financial “intermediaries” do not intermediate from depositors to borrowers, but from borrowers to depositors. It appears that each individual bank accepts deposits and makes loans, but the process must work in reverse at the aggregate level. Just as aggregate savings cannot finance investment, deposits cannot finance loans. In any modern capitalist economy, deposits are created as banks make loans when they purchase the IOUs issued by borrowers who wish to transfer purchasing power across time from the future to the present. In the process of making loans, deposits are created that allow surplus units to transfer purchasing power from the present to the future. Although at the individual level depositors provide finance to borrowers, these deposits exist only because borrowers were first willing to “buy now, pay later.”

Loan making and money creation are tied to deficit spending, profit expectations, and investment. Growth in a capitalist economy is a function of profit expectations: the latter determines forthcoming investment. Growth requires deficit spending, which, in turn, requires credit. Banks (broadly defined) accept the liabilities of deficit units and create

---


3 That is, deposits are created to allow “borrowers” to “buy now, pay later,” and these deposits become the assets of “surplus units” who are willing to hold bank liabilities. Moore (1988) prefers to call these depositors (or surplus units) “convenience lenders” to the banking system.
the monetary liabilities held by surplus units. At a point in time, the quantity of privately supplied money outstanding represents the quantity of liabilities of deficit-spender (including government) held by the banking system. As debtors retire debt out of income flows, or as surplus units use bank liabilities to directly purchase the long-term liabilities of deficit units (allowing them to retire short-term liabilities held by the banking system and issue long-term liabilities held by the nonbanking public), the money supply is destroyed.

Money is simply a debt, or unit of account, that transfers purchasing power from the future to the present. Anyone can create money, if one's liabilities are accepted (Minsky, 1986). In a capitalist economy, banks play the essential role of determining which liabilities are accepted. Those agents with unacceptable liabilities are necessarily credit-constrained. To some extent, banks can use price rationing in addition to quantity rationing, as higher interest rates can compensate for riskier loans. Reliance on price rationing alone, however, is not optimal due to moral hazard and uncertainty. Higher interest rates can lead to adverse selection and adverse incentive. Furthermore, because the future is uncertain, banks can never know what interest rate would adequately compensate for risk of default (Dow and Saville, 1988). Banks use rules of thumb regarding collateral, market share, net worth, and leverage ratios of the borrower, as well as bank leverage ratios, in establishing the quantity and price of credit granted. Finally, higher rates leverage prospective income flows of borrowers, so that as rates increase, the probability of default rises so that there may be no rate at which a bank can make a loan to a large class of potential borrowers.

Bank experimentation, competition, and innovation continually expand the sorts of liabilities deemed acceptable. Success leads to changing rules of thumb regarding prudent lender and borrower leverage ratios. The financial system evolves from a robust to a fragile situation as "liquidity" is reduced (Minsky, 1978). Borrowers' balance sheets become increasingly illiquid as payment commitments are closely ar-

---

4 See Kahn (1954) and Wray (1991a).
5 I am using the term "accepted" in the conventional sense of the term—rather than in the specific sense applied to an "acceptance house."
6 To some extent, these "rules of thumb" become codified as they are adopted by supervisory agencies. For example, until 1980, thrifts had to hold 5 percent equity against deposits, they could obtain no more than 5 percent of deposits from brokers, they were prohibited from making development loans for more than 75 percent of the appraised value of improved land, and they could loan an equivalent of no more than 100 percent of net worth to any single borrower (Mayer, 1990).
ticated with prospective income flows and the proportion of liquid assets to illiquid assets in the portfolio falls. Bank balance sheets also become illiquid as the ratio of high-powered money and safe assets (e.g., government bonds) to risky assets falls. If agents try to “make position by selling out position,” asset prices can plummet, inducing a debt deflation where liabilities and assets are written down (Minsky, 1991). As the economy recovers, an expansion can occur with a robust financial system unencumbered by high leverage ratios. In the presence of countercyclical government deficits, government guarantees, and central bank willingness to enter as a lender of last resort, however, debt deflations are avoided. Then the “purging” effect of deflations is absent so that debt continues to rise and the system becomes increasingly fragile.

Government guarantees have led to the development of “auction-like” financial markets where risk of default plays only a minor role. If the government promises to intervene whenever a borrower defaults, those who accept liabilities need not worry about such risks. Instead, the only consideration is the interest rate promised by the borrower so that credit is only price-rationed. The value of the services provided by banks as “expert judges” in determining who is creditworthy is diminished as banks face “disintermediation,” where nonbank financial institutions “intermediate” from lenders to borrowers. Although banks can always accept liabilities and create money, they find that the demand deposits they have created are lost as surplus units chase higher interest rates offered in “free” markets. Banks are forced to turn to wholesale markets (such as “hot money” brokered deposits) to recapture monetary liabilities, and are forced to pay market rates. Even though banks, in the aggregate, are able to purchase funds in wholesale markets (so that reserves are not lost at the aggregate level), the higher costs of doing so squeeze bank profits.

---

7 See Wojnilower (1987) for a discussion of the development of “auction-like” markets. Today, approximately one-third of all nonfederal government debt is backed by a government guarantee—much of this debt is guaranteed by various government-sponsored enterprises, which are implicitly backed by the Treasury (Stanton, 1991).

8 Nonbank financial institutions perform two functions: they may accept the liabilities of deficit spenders and issue “nonbank money” used by deficit spenders; or they may issue liabilities in order to obtain bank liabilities (Davidson 1978) refers to the first function as the “income generating-finance process,” and to the second as the “portfolio-change process.” It is this second process that is called “disintermediation,” whereby nonbank financial institutions “intermediate” bank money from their lenders (purchasers of their liabilities) to their borrowers (who issue the assets held by the nonbank financial institutions). At this point, individual banks must issue wholesale liabilities to capture reserves lost through adverse clearing drains resulting from the loss of retail deposits.
The development of auction-like markets has reduced the ability of the central bank to slow the rate of growth of the money supply by pushing up interest rates, and has increased systemic fragility. Furthermore, in a financial system in which credit is only price-rationed, the rate of growth of the money supply and the interest rate will be positively correlated.

3. A model of the relation between the rate of growth of the money supply and interest rates

Money, banking, and growth

Assume there is a single production period, arbitrarily defined as a "year," during which firms undertake and complete planned production and in which workers receive and spend wages. Other "classical" assumptions are: workers do not save; capitalists receive all profits; and capitalists do not consume, while the marginal propensity to buy bonds (out of profit income) is equal to one.9 Start the analysis at the "beginning of time," when capitalists own a stock of real assets and workers own labor power, and there are initially no debts or money.10 Further assume that capitalists hire workers by issuing short-term debt to banks. The latter issue their own liabilities that function as the means of contractual wage settlement. The debt issued by the firm will be destroyed when it retires its bank debt. At this point, the bank's liability likely will be retired also, destroying the bank money, except if the bank buys another new asset.11

Capitalist expenditures on the contractual wage bill in both the investment sector and the consumption sector return to consumption sector capitalists as sales receipts for consumer goods. These receipts are sufficient to retire all short-term bank debt incurred to finance the wage bill. Profits in the consumption sector must equal the spending on the wage bill in the investment sector (see Robinson, 1956). Since all profit

9 In other words, Davidson's "m" is equal to one (Davidson, 1978).

10 This is a very unrealistic assumption, but the simplification will help to clarify relations between interest rates and growth of money.

11 Of course, in this simple case, the quantity of debt created by the firm exactly equals the quantity of bank money, and this relation would hold (in the first period) if firms only issued debt to banks and if banks only purchased the debt of firms by issuing bank money. If we realize that the bank has issued its liability to buy the firm's IOU, it becomes clear that banks actually intermediate from borrowers to depositors. Bank liabilities become the means of contractual payment because they are accepted by buying firms and then function as money because they are also accepted by those who make contractual sales to the buying firms.
income is spent on long-term bonds issued to finance positions in capital assets (by assumption), all bank money can be destroyed at the end of the "year."\textsuperscript{12} The wage bill in the investment sector equals total investment spending, which equals spending on long-term bonds.\textsuperscript{13}

While profits in the consumption sector are equal to the wage bill in the investment sector, there are no profits in the investment sector. In a two-sector model in which the wage bill determines spending on output of the consumption sector, profits in the investment sector can be generated only by additional spending on investment sector output in excess of the wage bill. For example, if investment sector firms markup over their wage bill to obtain profits, then consumption sector firms must spend in excess of their profit receipts (equal to the wage bill in the investment sector). In this case, additional finance will be required (in excess of the finance of the wage bill) for the purchase of investment goods in order to ensure investment sector profits. That is, deficit spending financed by the banking system would be required to generate profits in the investment sector. Alternatively, a third sector could be added (either a government sector or a net export sector), in which case the wage bill in this sector would generate the profit income to be received in the investment sector (consumption sector capitalists would receive gross profits equal to the sum of the wage bill in the investment

\textsuperscript{12} Bank money is only used to finance the wage bill in this model. I am assuming that sales of investment sector output are made to those who sell long-term bonds to capitalists who have received profits and who, by assumption, save this in the form of long-term bonds. Thus, bank lending is not required to fund the purchase of investment sector output. However, if the marginal propensity to buy bonds out of profits is not equal to one, then some purchases of investment goods will have to be financed through additional bank lending. This would merely increase the quantity of money above that shown in the model below. See Deprez (1991) for a model in which short-term bank lending is used to initially purchase investment sector output until long-term bonds can be sold and short-term debt can be retired.

\textsuperscript{13} If some of the workers decide to save a portion of their income, consumption sector profits are reduced by an equivalent amount. In this case, capitalists do not receive sufficient gross profits to purchase the investment goods at cost or to retire the short-term debts of the investment sector. If, however, the savings of workers can be captured through the sale of debt to them, then accumulation can still be funded, bank money can be destroyed, and the debt of firms to banks can be retired (Graziani, 1990). If savers decide, however, to hold a portion of savings in the form of bank money, then firms cannot fund accumulation or retire debts to banks. Either the price of investment goods would have to fall (meaning that investment sector capitalists cannot cover the wage bill and cannot retire debt), or consumption sector capitalists would have to issue additional debt to banks. Thus, if workers do not save, then gross profits equal capital accumulation, and this equals the long-term indebtedness of consumption sector capitalists. If workers do save, then capitalist indebtedness is increased by an equivalent amount (above the level of capital accumulation).
sector plus that in the third sector, thus, profits equal to the wage bill in the third sector could be distributed to investment sector capitalists).\footnote{14}

In the following model I will ignore profits in the investment sector. While this is an "unrealistic" approach, it will simplify the exposition. In any case, the purpose of this model is to relate the minimum rate of growth of the money supply to interest rates. If we allow for additional borrowing to finance spending in excess of the wage bill of the investment and consumption sectors, the total amount of "borrowing" required would be that much greater than that shown in the model below.

There are two further complications that must be addressed. First, as production is normally an ongoing process, it is unlikely that firms would retire all short-term bank debt at the end of each "year." Instead, to maintain production flows, outstanding short-term debt would be renewed each period as a "revolving fund of finance." In this case, the money stock at the end of the period would equal total spending over the period on the wage bill, and the money stock would grow over time only if the wage bill and/or total production increases. Second, we have not accounted for interest payments on bank and nonbank liabilities. In order for firms to pay interest to banks without reducing their "revolving fund of finance," it is necessary for banks to lend, at the aggregate level, enough for firms to pay interest.\footnote{15} Thus, interest "payments" to banks must be carried on the books, so that capitalist indebtedness to banks will grow at the loan rate of interest (plus any growth of the wage bill).\footnote{16}

\footnote{14} That is, if profits are to be generated by consumption spending out of the wage bill paid in "n" sectors, only "n-1" sectors can be profitable. However, if one sector spends in excess of its receipts, all "n" sectors can be profitable. Thus, net deficit spending, financed by expansion of the banking sector, by at least one sector is required to ensure profits are received in every sector.

\footnote{15} It must be emphasized that this argument applies only to the aggregate quantity of lending. An individual firm need not borrow enough to pay interest if its sales revenues (for example) are sufficient to meet interest commitments. However, in the aggregate, banks must lend enough for firms to pay interest since it is the aggregate quantity of lending that determines whether interest obligations can be met and revolving funds of finance can be replenished at the individual levels. The model presented here follows in the tradition of "Circuit Theory" in that it identifies the quantity of lending required to finance a circuit. See Graziani (1990) for similar arguments.

\footnote{16} It might be objected that if borrowers can merely borrow to pay interest, and if interest is merely a bookkeeping entry, then borrowers are in some sense "getting something for nothing." It must be emphasized that interest is merely a monetary phenomenon at the aggregate level that has no impact on gross profit flows. Furthermore, borrowers are not "getting something for nothing," for their liabilities to the banking system are growing over time at a rate determined by the rate of interest (as shown below). This, of course, is no different from the case in which firms borrow to pay the wage bill: they receive labor power in exchange for a liability issued to the
Similarly, if banks must pay interest on their liabilities, this must be carried on the books of the nonbank public.\footnote{There is another alternative to carrying interest on the books: banks could lend enough to firms so that they could pay interest; if banks would always spend all interest receipts on consumption and investment goods, then capitalists would find that their revolving fund of finance would be replenished. If banks used a portion of interest receipts to pay interest on their own liabilities, the revolving fund of finance could be replenished only if the nonbank public spent all interest income (Graziani, 1990). It is simpler to assume that accrued interest is always carried on the books.}

Banks accumulate "capital" as they obtain the IOUs of nonbank firms by issuing their own IOUs. As long as the nominal value of their assets grows relatively to the nominal value of their liabilities, bank net worth increases. As long as bank debtors do not default, this is normally ensured because nonbank liabilities carry higher interest rates than do bank liabilities. However, if bank assets are longer term than their liabilities, rising interest rates can temporarily reverse this differential if the rate on bank liabilities rises above the average rate carried by bank assets. When this happens, bank net worth diminishes. Insolvency occurs if banks cannot raise the average return on assets sufficiently before net worth disappears.

\section*{A simple model}

Let $D$ represent bank deposits, on which interest at a rate of $R_D$ accrues. Firms obtain loans, $L$, to finance the wage bill $W$ and accrue interest at a rate of $R_L$. At the end of period one, the outstanding stocks of loans and deposits are:

banking system. As the revolving fund of finance grows over time due to growth of the wage bill and of interest commitments, the liabilities of firms that are held by banks grow. As discussed below, bank net worth increases if the loan rate of interest exceeds the deposit rate of interest. If banks could hold the deposit rate of interest constant and raise the loan rate of interest, their net worth would increase over time as the liabilities of firms to banks grew over time, as long as they lend enough to firms so they can "meet" interest commitments. The question might then arise: why don't banks double the loan rate of interest while holding the deposit rate of interest constant so they can increase the growth of their net worth? In the case of a monopolized banking sector with no competition from nonbank financial institutions, this certainly would be possible. In the presence of competition among banks for assets, and given competition with other types of financial institutions, this is not generally possible. Furthermore, the ability of banks to double the loan rate of interest will depend on the micro-level decisions of borrowers. While interest has no effect at the aggregate level on gross profits, the interest rate does set the standard return that must be attained at the micro level by any asset to be purchased, thus, affects the demand for loans and the level of spending at the micro level and thereby affects the aggregate profit flows. The determination of interest rates and of the differential between the loan rate and the deposit rate is beyond the scope of this article, except to the extent that Monetarist policy affects these.
(1) \[ L_0 = W_0 + R_L L_0; \]
(2) \[ D_0 = W_0 + R_D D_0. \]

As long as the interest rate on loans exceeds that on deposits, the net worth of the banking system has increased. The indebtedness of firms during the first year has increased by the amount of the wage bill plus interest on the total quantity of loans. Similarly, bank indebtedness has increased by the amount of the wage bill plus interest on bank money.

Between the first and second “years,” loans to firms will grow by any increase in the wage bill plus interest on the increase in the quantity of loans. Similarly, outstanding bank deposits will grow by the expansion of the wage bill, plus interest on the expansion of bank liabilities. If firms used a portion of receipts to meet interest commitments, they would find that their “revolving fund of finance” shrinks so that additional loans would have to be issued just to maintain the wage bill, unless bank receipts of interest are spent on consumption goods. Instead, assume that nonbank interest obligations are carried on the books of the banks, and that bank interest obligations are carried on the books of depositors. In this case, the outstanding quantities of loans and deposits at the end of period two are:

(3) \[ L_1 = L_0 + (W_1 - W_0) + R_L (L_1 - L_0) + R_L L_0; \]
(4) \[ D_1 = D_0 + (W_1 - W_0) + R_D (D_1 - D_0) + R_D D_0. \]

By subtracting equations (1) and (2) from equations (3) and (4), we may obtain the growth of loans and deposits over the two periods:

(5) \[ \Delta L = \left( \frac{1}{1 - R_L} \right) (\Delta W + R_L L_0); \]
(6) \[ \Delta D = \left( \frac{1}{1 - R_D} \right) (\Delta W + R_D D_0). \]

Thus, the growth of the money supply is determined by the interest rate paid on deposits, on the growth of the wage bill, and on the initial

---

18 For example, by subtracting equation (1) from equation (3), we obtain:

\[ \Delta L = L_0 - W_0 + \Delta W + R_L \Delta L. \]

By rearranging and substituting \((R_L L_0)\) for \((L_0 - W_0)\) from equation (1), we obtain equation (5) in the text. Equation (6) can be obtained through a similar manipulation.
quantity of deposits issued. Similar arguments apply to bank assets. The rate of growth of each is:

\[ \frac{\Delta L}{L_0} = \left( \frac{1}{1 - R_L} \right) (R_L + \frac{\Delta W}{L_0}); \]

\[ \frac{\Delta D}{D_0} = \left( \frac{1}{1 - R_D} \right) (R_D + \frac{\Delta W}{D_0}). \]

This means that the interest rates paid and the rate of growth of the wage bill set a minimum rate of growth to loans and deposits. Even if the wage bill does not grow, the minimum rates of growth are:

\[ \frac{\Delta L}{L_0} = \frac{R_L}{(1 - R_L)}; \]

\[ \frac{\Delta D}{D_0} = \frac{R_D}{(1 - R_D)}. \]

Equation (9) shows the minimum rate of growth of loans that must be made by the banking system to maintain the revolving fund of finance and to permit fulfillment of interest commitments by firms. This is the “required” rate of growth of loans. If banks refuse to allow their assets to expand at this rate, firms must reduce production. Banks cannot arbitrarily refuse to allow the money supply to grow at a slower rate than that indicated in equation (10), the minimum rate at which money will expand if banks only meet promised interest obligations. This is the “required” rate of growth of the money supply. If firms reduce the size of the revolving fund of finance by decreasing the wage bill, the actual rate of growth of the money supply can fall below the required rate. Also, the rate of growth of the money supply can fall if firms and banks default on their liabilities.

Thus, in this simple model, higher interest rates raise the required rates of growth of loans and of the money supply. Of course, the notion of “required” rates of growth is borrowed from the literature on growth, as developed by Domar, Robinson, and Kaldor. Sargent and Wallace (1981) recognized (as discussed in note 2) that the rate of growth of the money supply and interest rates may be linked—but for reasons much different from those explored here.

19 Linking the growth of money to growth of the wage bill is common in the literature on endogenous money. (For example, see Moore 1988.) However, so far as I am aware, endogenous money theorists have not linked money growth to interest rates.

20 Of course, the notion of “required” rates of growth is borrowed from the literature on growth, as developed by Domar, Robinson, and Kaldor. Sargent and Wallace (1981) recognized (as discussed in note 2) that the rate of growth of the money supply and interest rates may be linked—but for reasons much different from those explored here.
assumptions are relaxed, then the relation between interest rates and the rate of growth of the money supply becomes more complicated. For example, saving in the form of bank money (Davidson's m is less than one) will tend to increase the stock of money, given the rate of interest, because capitalist receipts will not be sufficient to replenish the revolving fund; thus, firms will have to borrow an additional amount equal to the liquid savings. On the other hand, consumption out of interest income would diminish capitalist indebtedness, and so would tend to reduce the required rate of growth of the money supply. Finally, if the average 'production period' were reduced, the outstanding money stock over any fixed (historical) period would decline.  

Monetarist policy and the rate of growth of the money supply

Monetarists believe they have found an empirical correlation between money and inflation, and they believe that the way to fight inflation is to slow the rate of growth of the money supply through tight control over bank reserves.  

Monetarist policy attempts to constrain the growth of reserves by pushing up the discount rate and other wholesale costs of reserves. This will normally lead to rising interest rates, due to competition for reserves and rising costs. The "required" rates of growth of deposits and loans, however, are functions of interest rates. If Monetarist policy forces interest rates higher, then maintenance of solvency requires a faster rate of growth of the money supply in the aggregate.  

Of course, there is no guarantee that required rates of growth will be achieved. Indeed, if the demand for loans at the individual level is a function of interest rates, then it is likely that rising interest rates will constrain actual growth rates below required rates, if the economy shrinks into a recession.

As discussed in note 12, if short-term credit is initially advanced to finance purchase of investment goods until long-term bonds are sold to permanently fund positions, the outstanding stock of money will be larger than that indicated in this model.

See the discussion below for the empirical correlation between money growth and inflation.

A Monetarist might object that the faster rate of growth of money would only be temporary, as defaults would eventually restore a long-run equilibrium position. However, this seems to be inconsistent with Monetarist policy since the constant growth rate rule is designed to minimize short-run instability. For example, Monetarists claim that the Great Depression was caused when the Fed reduced the money supply, causing banks to fail. Monetarist short-run policy is designed to stabilize the rate of growth of money at some low but constant rate and thereby prevent instability. The constant rate of growth of the money supply would not only eliminate real instability, but would also stabilize prices and reduce interest rates as soon as the policy was perceived to be believable.
Rising interest rates do not necessarily squeeze aggregate nonbank profits, as long as firms are able to continue to borrow to pay wage bills and interest (Graziani, 1990). That is, if firms do not try to reduce rates of accumulation in reaction to higher interest rates, then accumulation (at the aggregate level) can be maintained through expansion of bank and nonbank liabilities even as interest rates rise. If, however, firms react to rising interest rates by trying to reduce the aggregate wage bill, then profits will fall by any curtailment of wages in the investment sector. Even if the rate of growth of the wage bill falls to zero, loans to firms must grow at a rate determined by the rate of interest on loans. Individual firms may try to “economize” on loans by reducing inventories of intermediate and finished goods, by reducing the period between billing and payment, and by engaging in other “cash management” techniques. This can reduce the rate of growth of the money supply below the rate established by the interest rate (in equation [10]). Tight money policy, however, ceteris paribus, increases the required rate of growth of the money supply. If the actual rate does not achieve the required rate, defaults must increase.

Because bank liabilities are of shorter maturity than are their assets, rising interest rates will squeeze the interest rate differential between the rate earned on assets and the rate paid on liabilities. The only way that banks can protect net worth is to rapidly increase the average rate earned on assets. This can be done by increasing the rate of growth of the balance sheet. Thus, bank solvency conditions will require that the rate of growth of loans rise above the rate consistent with nonbank solvency. As banks try to grow their way to profitability, the rate of growth of the money supply will also rise as banks purchase assets by issuing bank money.

Thus, tight money policy can tend to increase the rate of growth of the money supply for both micro and macro reasons. At the micro level, higher interest rates encourage banks to grow faster. Higher interest rates also mean that firms must borrow more to cover interest commitments on the revolving fund of finance. At the macro level, accumulation and replenishment of the revolving fund require that the money supply grow faster as interest rates rise.  

Can tight money slow inflation? To the extent that inflation is caused by growth of nominal wages (or other input costs), then there will be a

---

24 It must be remembered that the revolving fund of finance generates income. As it declines, so does income so that it becomes increasingly difficult for agents to meet payment commitments. This increases the probability of default.
strong positive correlation between the rate of growth of the money supply and inflation—as can be seen in equation (8). If tight money policy succeeds in eliminating growth of the wage bill so that input costs stop rising, then it might slow inflation. However, tight money policy will destroy the relation between money and prices to the extent that inflation slows even as rising interest rates lead to a rapid rate of growth of money. Eventually, however, slower growth of the wage bill and "cash management" techniques can slow the growth of the money supply. This will be reinforced if the central bank abandons tight money policy as the economy slows, helping to bring down interest rates. Thus, the required rate of growth of the money supply will eventually fall as the economy stagnates. Alternatively, the correlation between money and prices will be restored as the rate of growth of the money supply falls when insolvency leads to default. That is, the empirical relation on which Monetarist policy is based may be restored only through a financial crisis.  

4. Money and interest rates in the postwar period

Let us exam two interest rate "regimes": the low interest rate regime of 1948–65, and the high interest rate regime of 1966–91.

The early postwar period

The early postwar period can be characterized as managerial—welfare capitalism (Minsky, 1988). The economy had a robust financial system, a variety of constraints on financial institutions, and support for unions,

25 According to Minsky and other Post Keynesians, inflation is also caused by attempts to increase the markup over the wage bill (and other input costs). At the aggregate level, it is the spending in excess of the wage bill in the consumption goods sector that generates aggregate profits. By marking up over the wage bill, each individual capitalist obtains profit, and at the aggregate level, this markup ensures that workers cannot purchase all the goods produced. However, profits can be realized in the aggregate only if spending on investment goods, spending on net exports, or government deficit spending is sufficiently high to maintain these markups. That is, it is the spending in the nonconsumption sectors that validates the markup over costs and generates capitalist profits. To the extent that this spending grows, given a level of spending on the wage bill (and other input costs), the markup may rise and profits can grow. Thus, inflation that is caused by rising markups is generated by spending in the nonconsumption sectors. If tight money policy tends to lower such spending, it will reduce the markup and allow inflation to subside. Of course, this is at the cost of capitalist profits. While government deficit spending is not likely to fall as tight money pushes interest rates higher, both net exports and investment may be adversely affected by high interest rates. Thus, to some extent, tight money policy lowers inflation by reducing the sorts of spending that generate aggregate profits. Many Post Keynesians believe that this is the primary mechanism through which tight money policy lowers the rate of inflation. This topic is beyond the scope of this paper.
rising wages, and growing levels of per capita consumption. Interest rate ceilings on bank and thrift deposits gave the central bank a quantitative constraint on bank lending. As market interest rates approached the deposit rate ceilings, banks found that they could not retain retail deposits. They were forced increasingly to rely on more expensive wholesale liabilities.\(^{26}\) Individual banks that faced real or perceived barriers to access such wholesale sources of funds would curtail lending.\(^{27}\) Of course, banks innovated to try to evade quantitative constraints. Interest rate ceilings were also gradually relaxed as the central bank allowed banks to pay higher rates on large certificates of deposit. Thus, while “disintermediation” at first played an effective role in forcing quantitative constraints on financial markets, by the end of the 1960s, quantitative constraints were already playing a smaller role.

In orthodox theory, bank reserves supposedly operate as the quantitative constraint on bank lending. In reality, they have never played the major role. First, if all banks are expanding at approximately the same rate, no bank loses reserves through the clearing mechanism (Wray, 1991a). Second, banks discovered methods of economizing on reserves, such as the use of repurchase agreements, the development of the fed funds market, and the development of liabilities with lower required reserve ratios (Minsky, 1957). Finally, for a variety of reasons, central

\(^{26}\) Wholesale liabilities were developed after the mid-1950s. Minsky (1957) linked “high and rising” interest rates after 1954 to the development of the fed funds market (1956), and to expansion of the use of repurchase agreements in mid-1956. He related these innovations to profit opportunities generated by the high interest rates, and showed how they allowed business activity to expand even without an expansion of bank reserves. He went on to predict that “financial changes will occur most frequently during periods of high or rising interest rates” (p. 172). These innovations were closely followed by the development of negotiable certificates of deposit (1961), by rapid expansion of the “Eurodollar” market in the early 1970s, and by innovation bordering on revolution in the late 1970s to the present (Wray, 1990; Wojnilower, 1987). As Minsky (1986) argues, the development of wholesale sources of funds allowed banks to shift from “operating on assets” to “operating on liabilities” so that a bank faced with potential customers would finance positions in loans by issuing liabilities (rather than by selling assets to obtain excess reserves). This means that retail deposits would not constrain the lending of any bank with access to wholesale markets; however, wholesale liabilities carry higher interest rates than do retail sources of funds.

\(^{27}\) “Disintermediation,” which involved substitution of retail deposits (such as demand deposits) for nonbank liabilities in the portfolios of the nonbank public, would not necessarily cause a reserve drain at the aggregate level. As long as the public did not exchange deposits for cash, the banking system as a whole would retain reserves as they lost deposits at the retail level, but found that these were replaced by wholesale sources (large certificates of deposits, or even deposits held by nonbank banks for clearing purposes) at the aggregate level. However, individual banks might experience a drain at the retail level that did lead to loss of reserves that were difficult to recapture at the wholesale level.
banks normally accommodate by supplying reserves that are legally required. In the United States, reserve requirements are always calculated after a lag (even with the switch to "contemporaneous" reserve accounting), so that deposits are history and banks must meet legal requirements. 28 If they cannot obtain reserves elsewhere, the central bank must provide them. Furthermore, central bank refusal to supply required reserves could induce crisis as banks tried to sell assets to obtain reserves. Of course, liquidation of assets in the aggregate can occur only through price deflation, which would cause bank insolvency. Thus, in practice, central banks are ultimately responsible for accommodating the need for reserves so that reserves are not the major quantitative constraint on lending. 29

The 1948–65 regime was a time when the rate of growth of the money supply was low, interest rates were low, and the financial system was robust. Before 1966, the rate of growth of M1 exceeded 5 percent in only one year, the rate of growth of M2 never exceeded 8.4 percent, the rate of inflation (as measured by the Consumer Price Index [CPI]) exceeded 3 percent in only two years, and the prime rate peaked at 4.54 percent in 1965. In contrast, after 1966, the rate of growth of M1 accelerated and hit 17 percent in 1986, the rate of growth of M2 exceeded 13 percent several times, the rate of inflation exceeded 3 percent in all but two years, and the prime rate was nearly 19 percent in 1981. 30

In the 1948–65 regime, then, the Monetarist belief regarding the

28 Even under contemporaneous reserve accounting, the base period over which reserve requirements are calculated precedes the "adjustment period," during which banks must increase (or may decrease) reserves to meet requirements, by several weeks. See Wray (1990) for a discussion of the process through which banks meet required reserve ratios.

29 This does not mean, however, that banks ignore their reserve position in loan-making activity. The ratio of assets to reserves is one among several variables that establish the price and quantity of loans to be made. Nor does it mean that the central bank always accommodates—central banks always use a combination of price and quantity constraints. While the central bank ultimately must operate as a lender of last resort, this does not mean that it cannot constrain the growth of reserves by, for example, reducing its open market purchases. As shown in Wray (1990), when the Fed does reduce provision of reserves through open market operations, this forces banks to the discount window. However, discount window lending does not completely make up for reserve constraint in open market operations. This is because banks economize on reserves (reduce excess reserves, encourage depositors to shift to liabilities with lower reserve requirements, and so on).

30 Unless otherwise noted, all data in this section were taken from the Economic Report of the President, February 1990. All data and correlations discussed in this section are available on request from the author.
relation between money and inflation appeared to be verified by the empirical correlations between these variables. There is, however, an alternative explanation for these correlations. Regulations (such as capital and collateral requirements), conservative management, memories of the Great Depression, cautious rules of thumb (regarding, for example, loan-to-equity ratios), and interest rate ceilings all tended to place ceilings on attainable rates of monetary growth. Furthermore, Regulation Q and generally accommodative Fed policy helped to constrain interest rates. Low interest rates, helped to maintain low “required” rates of growth of the money supply. Finally, relatively low (but steady) growth of the nominal wage bill also helped to maintain low rates of growth of the money supply.

In conclusion, monetary policy was somewhat effective at constraining the growth of the money supply in the first regime. As the Fed pushed market interest rates higher, banks lost retail deposits due to Regulation Q. Even if these returned to the banking system as wholesale funds, individual banks might find it difficult to make loans. To the extent that rising interest rates would lower the quantity of loans demanded, this would also help limit the rate of growth of the money supply. To some extent, conservative financial practices would make loan demand elastic with respect to interest rates. Thus, tight money policy would tend to slow the growth of the money supply—although this was not due to a simple “deposit multiplier” effect.

31 For the period 1948–65, the simple correlation of changes of the consumer price index and the rate of growth of M1 reached 0.33 if M1 is lagged one year. It is interesting to note, however, that the correlation was negative for contemporaneous and for twice-lagged values of the rate of growth of M1. Furthermore, the correlation over this period for inflation (as measured by the CPI) and interest rates (as measured by the commercial paper rate) was negative. This seems to be inconsistent with a Fisher effect, unless actual inflation is uncorrelated with expected inflation.

32 Regulation Q kept certain retail interest rates low. This also helped to keep unregulated (“market”) interest rates on other bank liabilities low because these were substitute “sources of funds” for banks. Low interest rates on liabilities made it profitable to lend at low rates. Thus, even though Regulation Q applied only to certain interest rates, it helped to constrain others so long as central bank policy was accommodative. Tight money policy would drive up the discount rate and the fed funds rate, causing unregulated interest rates on other wholesale liabilities to rise, and would ultimately cause loan rates to rise.

33 This is due not to lack of reserves, but to an inability to issue those types of liabilities preferred by the nonbank public. Again, reserves are destroyed only if the public exchanges bank liabilities for cash. Thus, banks can recapture reserves lost through a drain of retail deposits by issuing wholesale liabilities. However, if individual banks face real or perceived barriers to issuing the types of wholesale liabilities desired by the public, then their ability to make loans is limited.
The transition to the late postwar regime

The economy moved toward the second regime, of money manager capitalism, after 1965. During this period, huge flows of funds in wholesale markets (such as pension funds) chased high and rising market interest rates. Innovation and relaxation of regulation contributed to this, as did the central bank's periodic attempts to slow the growth of bank reserves. Reserves do not act as a very effective constraint on the growth of credit if banks are able to economize on reserves. Attempts at reserve constraint do raise interest rates, however, as competition in wholesale markets pushes up the cost of reserves. This, furthermore, increases individual bank incentive to grow more rapidly since the cost of liabilities will rise faster than banks can increase their average return on existing assets. For this reason, tight money policy encourages rapid growth of balance sheets if this is possible.

A "run of good times" naturally tends to produce a fragile financial system. The success achieved during the steady economic expansion from 1948 to 1965 encouraged greater risk taking. Firms were willing to borrow on smaller margins of safety, increasing debt-to-equity ratios, reducing liquidity ratios, and leveraging prospective income flows. Banks relaxed rules of thumb and lent on smaller margins of safety, leveraging their own balance sheets. Innovations in financial markets expanded the types of activities that could obtain credit and increased bank competition with nonbank banks. In order to maintain market share, banks were forced to expand into new areas. Expansion of the sorts of borrowers and activities deemed creditworthy increased fragility of the financial system. Furthermore, this increased the rate of growth of the money supply and reduced the ability of the Fed to influence its rate of growth.

As rates of growth of balance sheets increased, and as inflation started to increase, the Fed began a series of attempts to tighten policy, ostensibly to constrain inflation. These have been characterized as a series of "credit crunches" (Wojnilower, 1980; Wolfson 1986). By pushing

34 Of course, this problem is greater for thrifts than for commercial banks. However, one of the primary functions of most types of financial institutions is to issue liabilities of shorter maturity than that of the assets they hold. This means that rising interest rates will reduce profitability for most financial institutions. Recent expansion of the use of adjustable rate loans will tend to diminish this effect.

35 For example, the development of commercial paper markets reduced reliance upon banks for provision of short-term finance. However, banks were able to obtain a share of this market by providing backup lines of credit behind commercial paper. This increased the liquidity of the paper and generated fee income for banks.
market interest rates above ceiling rates, the Fed could cause disinter-
mediation at the individual bank level, causing some banks to cut off
credit to all but established borrowers. However, as innovation pro-
cceeded (and, later, as interest rates were deregulated), tight money
policy became increasingly less effective in constraining the growth of
the money supply. Instead, it merely tended to force interest rates to rise.
As demonstrated above, this raises the required rate of growth of the
money supply.

The price of credit is not normally an effective rationing device. Due
to moral hazard and uncertainty, banks will normally rely on quantity
rationing—but if they are trying to grow their way to profitability,
quantity constraints will be relaxed. Rising credit prices do not effect-
tively constrain the demand for credit. Moral hazard is, again, a partial
explanation. Rising costs of borrowing induce borrowers to substitute
risky projects and to undertake “Ponzi” schemes. Furthermore, interest
rates are rarely so high that they would discourage borrowing during
“whirldowns of optimism”—if a speculative boom has led many to
expect possible returns of 50, 100, or 1,000 percent, an interest rate of
even 20 percent is not an effective rationing device. Instead, it is
conservative management and risk-averse rules of thumb that constrain
the rate of growth of loans and of the money supply.

Rising interest rates leveraged income flows and brought borrowers to
the brink of default, that is, tight money policy helped cause a series of
time the Fed brought a portion of the financial system to the brink of
collapse, however, it took off its Monetarist hat and put on its lender of
last resort hat (Fazzari and Minsky, 1984). Each time the Fed intervened,
it validated new instruments and practices. This stretched liquidity
further, allowed greater leveraging through issues of liabilities, and
validated attempts to grow to profitability.

Thus, during the second regime, there was an upward “ratchet effect”
on the rates of growth of the money supply and on interest rates. As the
Fed lost what little control it had over the money supply, and as banks
and firms attempted to grow to profitability, those relations upon which
Monetarist theory was based broke down. The relations between money
and spending, and between money and inflation, fell apart in the 1970s
as velocity rose, and deteriorated further in the 1980s as velocity fell.

36 These financial crises are examined in detail by Minsky (1986), Giordano (1987),
and Wolfson (1986), with each laying at least part of the blame for the crises on tight
money policy.
The correlation between changes in the CPI and the rate of growth of lagged M1 even turned negative for the second regime (1966–89). The relations between narrow money (M1) and reserves also became variable (that is, the "deposit multiplier" became unstable) as banks engaged in reserve-economizing behavior whenever the Fed refused to accommodate the demand for reserves. That is, those empirical relations upon which Monetarist theory was based disappeared as the Fed periodically tried to implement Monetarist policy.

*The attempt at practical Monetarism in the second regime*

Beginning in 1979, the Fed attempted to implement practical Monetarism. It tried to target reserve growth and rapidly pushed the discount rate to nearly 12 percent during 1980 and above 13 percent in 1981. Prime rates rose above 20 percent for a period during 1981. Interestingly, however, both required reserves and excess reserves grew throughout the Monetarist experiment. Excess reserves more than doubled between 1978 and 1980 while required reserves grew by 10 percent during this period. The growth rate of M1 fell only slightly (from 8.2 percent in 1978 to 7.6 percent in 1979 and to 6.8 percent by 1980) and M2 actually increased (from 8 percent in 1978 and 1979 to 10 percent in 1981).

Financial institution profitability, however, fell during this episode. By 1982, two thirds of thrifts were insolvent, negative net worth of the industry reached $100 billion, and 85 percent of thrifts were losing money (Kaufman, 1990). Since bank assets are not so long term as those of thrifts, banks fared somewhat better. The earnings of banks, however, also fell. Previous to 1980, the number of bank failures had never exceeded more than ten in any year since the 1930s, with the exception of the deep recession of 1974–75. After 1980, however, the number of

---

37 Of course, many Monetarists deny that the Volcker–Greenspan Fed adopted Monetarist policy; as evidence, they point to the lack of Fed success at controlling the rate of growth of the money supply. As an anonymous referee commented, "Monetarists would be unmoved by the argument that tight money during the experiment in 'practical monetarism' from 1979 to 1982 failed to slow the growth of the money supply. Of course, it would be possible to argue that the 'Monetarist' operating procedure of targeting the growth of nonborrowed reserves (which also resulted in high interest rates) did not slow the growth of the money supply as expected. The Monetarist, however, will counter by saying that the monetary base is a more appropriate target, that the Federal Reserve was inappropriately attempting to smooth interest rate volatility, etc." As discussed above, such obfuscation makes it impossible to analyze whether tight money policy can slow the rate of growth of the money supply. The fact is that the Fed announced it would follow Monetarist policy, it announced monetary targets, it squeezed bank reserves, and it drove interest rates to record levels. All unbiased observers would conclude that the Fed was indeed pursuing Monetarist policy.
bank failures climbed steadily to more than 200 per year. By the mid-1980s, more than 1,500 banks (about 11 percent) were on the verge of failure (Brumbaugh and Litan, 1990).

As interest rates rose, banks and thrifts faced disintermediation at the individual level. Rather than pushing interest rates down, the Monetary Authorities decided to deregulate deposit rates. Innovations and deregulation effectively removed any quantity constraint on lending. Banks and thrifts were allowed, even encouraged, to attempt to grow their way to profitability. As a result, there were some forty thrifts that attained a growth rate of 1,000 percent or better in a single year (Sherrill, 1990, p. 599). Not surprisingly, rapid growth at the individual level led to rapid growth of the money supply: M1 grew at a rate of 8.5 percent in 1982 and at 9.6 percent in 1983, in spite of Reagan’s recession. By 1986, M1 grew at a rate of 17 percent. The rate of growth of M2 peaked in 1983 at nearly 12 percent, and remained high until 1987. Total commercial bank loans grew by 96 percent between 1980 and 1985 (compared with a growth of 67 percent between 1975 and 1980, or of 68 percent between 1970 and 1975) (Wray, 1990, p. 233). In contrast, nominal GNP grew by 47 percent between 1980 and 1985, while the price level grew by 29 percent.

According to Monetarist theory, rapid growth of the money supply causes high inflation and high nominal interest rates. In fact, inflation did

38 Relaxation of regulations on capital requirements also allowed thrifts to grow much faster. Before 1980, a thrift had to have 5 percent net worth relative to deposits. In 1980 this ratio was reduced to 4 percent, and it was reduced to 3 percent in 1982. Thrifts were also able to count "supervisory goodwill" (which could be obtained by paying more than market value for a thrift) and "appraised equity capital" (which could be obtained simply by finding an appraiser who was willing to reappraise property owned by the thrift at a higher value). Finally, thrifts were essentially allowed to write their own net worth by creating "net worth certificates." All of these schemes allowed thrifts to expand assets and liabilities relative to actual capital. See Mayer (1990).

39 As Mayer (1990) argues, if bank or thrift supervisors see that the deposit interest rate has risen above the interest rate on assets, they must tell the institution to seek higher yields at greater risk.

40 For example, Vernon Saving and Loan grew from $83 million in deposits in 1982 to $1.3 billion in 1986; and Sunbelt Savings grew from $90 million to $3.2 billion in four years (Waldman, 1990, p. 53). During 1984, saving and loan deposits grew by 20.3 percent nationwide (while bank deposits grew by only 5 percent). The high-flying Texas thrifts grew even faster: by 32.4 percent in 1983 and by 37.7 percent in 1984 (Horvitz, 1990).

41 While M2 also shows some increase in its rate of growth between 1978 and 1981, the results are not nearly so clear. M2 had been experiencing rapid growth over most of the period after 1971. This is partially explained by disintermediation, in which banks lost retail deposits that had to be recaptured in wholesale markets.
not increase as the rate of growth of M1 exploded in the mid-1980s. Post
Keynesians argue that inflation can cause rapid growth of the money
supply, since spending must be financed. The money supply grew rapidly
in the mid-1980s in spite of disinflation, however, because high interest
rates raised the required rate of growth of bank and nonbank balance sheets.

Tight money policy will lower interest rates, according to Monetarists,
as inflationary expectations subside. However, according to the analysis
above, tight money raises interest rates, and maintenance of high interest
rates is equivalent to maintenance of a rapid rate of growth of the money
supply. Monetarist policy was to push up interest rates and lower the
rate of growth of the money supply, but these goals are mutually
exclusive if there is no effective quantity constraint on bank lending.
Deregulation, which was advocated by Monetarists, removed such
constraints and ensured that Monetarist policy could not lower the rate
of growth of monetary aggregates.**

The development of huge stocks of managed money played an impor-
tant role in the failure of the Monetarist experiment. Innovation and
changing perceptions of prudent behavior made this managed money
available for capture by a wide range of institutions. Deposit brokers
quickly attracted these funds as they created “hot money” markets in
which any institution willing to pay the price essentially faced an infinite
supply of deposits—which means that it could always issue liabilities
to finance positions in assets without worrying about a clearing drain.
At the individual institution level, asset growth would be constrained
only by credit standards set by the institution itself. With the creation of
jumbo CDs, explicit government insurance stood behind the brokered
money, removing any concern about the viability of the borrowing
institutions. Only prices could constrain the rate of growth of bank assets,
to the extent that loan demand is interest-elastic.

In textbook Keynesian thought, rapid growth of the money supply will lower interest rates. This ignores the feedback effect of rapid growth of bank balance sheets on the interest rate. As banks rapidly expand their portfolio, they leverage equity and safe assets and eventually exceed ratios deemed prudent. Further expansion requires revision of such rules of thumb, or higher returns on assets. Given rules of behavior, then, expanding portfolios will eventually place upward pressure on interest rates. Thus, as the money supply grows rapidly, interest rates need not fall, and may even rise. Since prices do not effectively constrain credit demand, rising interest rates and rapid growth of the money supply are consistent.

In 1981, the Federal Home Loan Bank Board dropped the regulation that thrifts could obtain no more than 5 percent of deposits from money brokers. With an investment of only $2 million in equity, a thrift owner could obtain $1.3 billion in brokered deposits under the relaxed rules on capital (Mayer, 1990).
In the aggregate, the availability of brokered deposits would be constrained by the rate of growth of the money supply, broadly defined. This, in turn, is essentially constrained only by the rate of purchase of assets by the banking system (broadly defined). The development of "auction-like" markets constrained only by prices, combined with the high interest rate policy of the Monetarist Fed ensured rapid growth of bank assets and of the money supply. The rate of growth of the money supply would fall only after insolvent institutions were closed (combined with any effect of high interest rates on loan demand).

Rapid growth in an attempt to grow to profitability may work for a few banks, but cannot work in the aggregate. First, as Wojnilower (1987) argues, as banks and thrifts try to grow rapidly, competition for assets pushes the return on assets lower, squeezing bank profits. Furthermore, many of the attempts to grow out of insolvency failed because the assets purchased did not generate required income flows. As Mayer (1990) argues, one or two financial institutions may "grow to profitability," but the system as a whole cannot because the supply of creditworthy borrowers is limited. On the other hand, the number of those who believe they can make it at high interest rates always exceeds the number who actually can. Thus, banks and thrifts were able to find willing borrowers by lowering credit standards sufficiently, but this necessarily led to disappointment. Attempts at Ponzi finance eventually failed when regulators shut down the institution or when money brokers cut off the supply. Indeed, most of the very rapidly growing institutions were closed.\textsuperscript{44} Failure of virtually all of the thrifts (and of many of the banks) at the upper end of the growth distribution ensured that the rate of growth of the money supply would fall—by 1989, M1 was growing at a rate of less than 1 percent. Given that interest rates were still high (the prime rate was nearly 11 percent in 1989), this extremely low rate of growth meant that many more institutional failures would be necessary if it is true that interest rates and the required rate of growth of the money supply are positively correlated.\textsuperscript{45} Since income from bank assets cannot

\textsuperscript{44} Of the 34 high-flying thrifts cited by economist Bentson as examples of the benefits of rapid growth through diversification, 32 were insolvent by 1989 (Mayer, 1990). Alan Greenspan testified that Lincoln Savings and Loan and 17 other high-flyers were good examples of well-run thrifts—within three years, 16 of the 17 were insolvent, and the subsequent failure of Lincoln was among the most expensive. Mayer wonders why, in case after case, the thrift that won accolades as the most profitable or the best run would fail the following year.

\textsuperscript{45} There are some compensating factors that tend to reduce the required rate of growth of the money supply: slower growth in the stock market after October 1987;
be high enough in the aggregate to meet deposit liabilities (due to defaults), the government will be forced to take over bank and thrift liabilities.

Of course, tight money policy did eventually lower inflation; however, this result was not obtained by reducing the rate of growth of the money supply (which actually exploded precisely at the time that inflation subsided), but by raising interest rates, by destroying the conditions required for accumulation, by causing a deep recession, and by causing a crisis of the entire financial system. This is not the "transmission mechanism" through which Monetarist policy is supposed to operate. Indeed, it appears that the Fed is not able to reduce the rate of growth of the money supply through tight money policy except as this policy destroys the process of accumulation upon which capitalism is based.

As predicted, the empirical correlation between money growth and interest rates is strong and positive; indeed, this correlation is stronger than is that between inflation and the rate of growth of M1. For the period 1948–89, the correlation of changes of M1 with the commercial paper rate was 0.47, 0.59, and 0.67 for contemporaneous, one-year-lagged, and two-year-lagged values of money. According to the arguments presented above, the correlation between the rate of growth of the money supply and interest rates should be higher for the second regime than for the first.\textsuperscript{46} During the first regime, various regulations and conservative rules of thumb placed constraints on the rate of growth of bank balance sheets. Thus, rising interest rates tended to lead to "credit crunches" as banks cut off lending. However, innovations, relaxation of standards, and deregulation during the second regime effectively eliminated quantity constraints. Thus, in the second regime, rising interest rates should lead to rapid growth of the money supply. In fact, during the second regime, the correlation of changes of M1 with commercial

\textsuperscript{46} Of course, one of the critiques made of the application of econometric techniques to aggregate time series data is that functional relations do not remain constant due to institutional changes (see Keynes, 1973, p. 316). As discussed above, I have explicitly recognized that structural changes in the financial sector changed the money–interest rate relation over the course of the postwar period. The use of the year 1966 as the break between the two regimes is, of course, somewhat arbitrary. In reality, the money–interest rate relation was continually changing over the entire postwar period, for reasons discussed above. Thus, the correlations reported here should be taken as only a very crude indication of the relation, and as only a very weak test of the theory presented above.
paper interest rates was 0.24 if interest rates are lagged one year, and 0.42 if they are lagged two years; in contrast, the corresponding correlations for the first regime were only 0.04 and 0.15, respectively. Over the whole period, the correlation between the rate of growth of M1 and changes in the CPI is 0.26, 0.37, and 0.42 for contemporaneous, one year lag, and two year lag, respectively. The correlation disappears (or even turns negative) during the second regime (1966–89). While the correlation between inflation and the interest rate is strong for the whole sample and for the second regime, this correlation during the first regime is not so close; this is not surprising: as discussed above, various constraints helped to restrain interest rates so there seems to be no evidence of a “Fisher effect” during the first regime. Furthermore, the strong correlation between inflation and interest rates in the second regime may be a result of a complex interaction among inflation, interest rates, and the rate of growth of the money supply. To some extent, rising inflation and rising interest rates cause the money supply to grow faster. Thus, if this flimsy evidence is sufficient to support the widespread notion that “money causes inflation” and “inflation causes higher interest rates,” perhaps the stronger evidence that money growth and interest rates are correlated is sufficient to warrant an examination of the theoretical basis for this correlation.

6. Conclusions

The rate of growth of the money supply remained low in the first regime. At the individual bank level, quantity rationing arose as banks used various rules of thumb in determining appropriate leverage ratios and creditworthiness of customers. Ability of an individual bank to issue acceptable liabilities in order to finance positions in assets was also limited in the early period—although innovations gradually removed these restrictions. At the aggregate level, the limited supply of creditworthy borrowers (that is, those that would meet individual rules of thumb), various regulations concerning balance sheet ratios, and disintermediation (forcing banks to turn to expensive wholesale markets) whenever market interest rates rose above regulated ceilings all constrained the growth of the money supply. Gradually, however, innovations, revisions of rules of thumb, and deregulation removed such

47 The correlation between inflation and interest rates during the second regime could be due to central bank policy: as inflation rises, the Fed tries to push up interest rates.
barriers. The development of "hot money" wholesale markets generated an unlimited ability to finance positions in assets, and lower credit standards gradually eroded quantity rationing. The central bank lost its primary constraint on bank lending, disintermediation, when it removed interest rate ceilings.

This means that although the rate of growth of the money supply might have given some indication of the tightness of money policy in the first regime, it cannot serve as an indicator of tight money policy in the second regime, as tight money policy will tend to increase the rate of growth of the money supply. Tight money policy would merely push up interest rates, without reducing the willingness of financial institutions to expand the money supply. Indeed, high interest rates actually encouraged expansion of bank balance sheets as banks and thrifts tried to grow to profitability. However, rapid growth was made possible only by lending to the non-creditworthy. The rate of growth of the money supply will fall only after the economy stagnates, or after the Fed removes its "Monetarist hat."

A "Keynesian" alternative would include central bank attempts to push the interest rate down to 1950s levels, re-regulation, and slow growth of the money supply through restoration of quantity constraints. Low interest rates and slow growth of the money supply are consistent policy goals that do not necessitate institutional failures. As interest rates fall, bank profitability is restored and the need for rapid growth of assets is removed. However, enforcement of slow growth will probably require increased regulation and supervision of the asset side of bank balance sheets. While Monetarists concluded that attempts to constrain bank reserves would lower the rate of growth of bank liabilities, this policy clearly cannot succeed since rising interest rates force banks to grow quickly. Paradoxically, the only way to control bank liabilities is to focus on the asset side. By limiting the types of assets institutions may buy, and by codifying various rules of thumb (percentage of equity that may be loaned to any individual borrower, ratio of equity to assets, ratio of safe assets to risky assets, and so on), the monetary authorities can constrain the rate of growth of assets—which will necessarily constrain the rate of growth of the money supply. However, this cannot be done without debt deflation unless low interest rates are maintained.

REFERENCES


