

**TERM-STRUCTURE SPREADS, THE MONEY
SUPPLY MECHANISM, AND INDICATORS
OF MONETARY POLICY**
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The conduct and interpretation of monetary policy has become more difficult in recent years. Through the decades of the 1960's and the 1970's, increasing reliance was placed on fluctuations in money growth as an indicator of monetary policy and its impact on future real income, and through changes in real income, its ultimate impact on prices. However, since the beginning of the 1980's the old relationship between fluctuations in money growth and subsequent changes in real income and prices appears to have deteriorated. This has led to a search for alternative indicators for monetary policy.

One set of alternative indicators recently gaining popularity has the form of term-structure spreads. This author presented a study that recommended the spread between a long-term treasury bond rate and the fed funds rate as a useful indicator of the thrust of monetary policy.¹ The greater the spread, the greater future real income growth. It was found that a simple form of this spread would have forecast real income growth better than the same simple form of a number of other plausible interest-rate based indicators and monetary aggregate growth rates. Other studies have also recently examined the empirical evidence and concluded that the spread between

a long-term and a short-term interest rate, either the same spread presented in the author's study or other spreads, could usefully serve as forecasters of future real income growth.²

The primary bases of these studies has been empirical. There has been relatively little exposition of a theoretical basis for the use of a spread, or even the choice among various specific spreads, as a forecaster of real income growth.³ Among other results, this emphasis on empirical evidence has left the impression that the use of a term-structure spread as an indicator is an approach quite apart and different from the use of monetary aggregate growth rates popular in previous decades and included in the current index of leading indicators.

This paper seeks to provide a foundation for the term-structure spread as an indicator of monetary policy within the same theoretical framework used to justify the use of money as a monetary policy indicator. The first section of the paper begins by briefly reviewing the role played by money in the history of economic thought and discussing two tenets that underlie the use of money as an indicator of the thrust of monetary policy. These two tenets are then used to discuss probable reasons for the recent deterioration of money measures as indicators of monetary policy and to suggest that the money supply mechanism might be a fruitful area in which to search for an alternative indicator of the thrust of monetary policy.

The second section of the paper examines the money supply mechanism and argues that the significance accorded to reserves in the money supply process is misplaced. Rather, the argument is made that an interest rate spread is really the mechanism through which money supply changes are produced. The discussion in this section also emphasizes the crucial, but often neglected, evidence provided by reserve accounting systems concerning the nature of the money supply mechanism.

The third section of the paper reconsiders a number of monetary policy debates of the past three decades in light of this interest rate view of the money supply mechanism. It is argued that advocacy of a reserve targeting procedure is really a desire for the federal funds rate to be set through a particular mechanism. This mechanism requires that the reserve accounting system satisfy certain conditions. The absence of these necessary conditions make it clear that the operating procedure adopted in 1979 could not have been the system desired by reserve targeting advocates. The interest rate view of money stock determination also gives a somewhat different view of the role of reserve requirements in the conduct of monetary policy and explains why, contrary to expectations, short-term demand deposit fluctuations increased after the adoption of the new operating procedure in 1979. Finally, it is argued that concentration on a reserves oriented mechanism of money stock determination leads to a much too pessimistic view of the possibilities of accurate short-run control of the money stock.

The final section presents evidence that the interest rate view of

money stock determination, while not recently prominent, has a long pedigree in the history of economic thought. The spread itself bears great similarity to the monetary mechanism advanced by Knut Wicksell in the early part of this century. This final section also examines how one's leanings toward a monetary policy or expectations interpretation of the yield curve dictates the particular form of the term-structure spread selected.

I.

The concept of money has played a prominent role in economic theory, since at least the end of the 18th century.⁴ Not only has the concept of money played a prominent role in the history of economic thought, but it is likely to continue to play a prominent role. Its appeal lies in its ability to elucidate the process of price determination as reflected in the popular expression that "inflation is caused by too much money chasing too few goods." Its primacy in the determination of prices can be grasped by considering whether inflation (i.e. a sustained rise in general prices) could even occur in an economy without money (e.g. a barter economy). As long as the determination of prices is a significant concern of economics, the concept of money is likely to continue to occupy a prominent position in economic theory.

The particular form of money that came to play an important role as an indicator of monetary policy's impact on the real economy in the decades of the 1960's and 1970's was fluctuations in the growth rate of real money

balances. An increase in the growth of real money balances indicated an increase in future real income growth, while a decrease in the growth of real balances indicated a decrease in future real income growth. It was this relationship that deteriorated in the early 1980's, and inspired the search that led to proposals that a term-structure spread be used as an indicator of monetary policy. In any science, when one theoretical approach is replaced by another, the replacement is seldom, if ever, built on an entirely new foundation. Usually, the new approach begins with the same foundation and differs by altering some of the superstructure. Given the prominence accorded the concept of money in the history of economic thought and the high probability that it will remain prominent, any successful new approach is likely to be consistent with at least some elements of the foundation that underlies the use of money as an indicator of monetary policy.

One of the principal tenets underlying the use of money as an indicator of monetary policy is the belief that the monetary authority has the capability of setting the nominal money stock independently of the long-run quantity of money the public desires to hold. It is not just that the monetary authority can set the money stock at whatever level it desires, but this may be a different level than the public desires to hold over the longer term under present economic conditions. Indeed, this ability to set the money stock off of the long-run demand curve for money is what gives monetary policy its power. It is precisely the attempt of the public to get back on its long-run demand curve that produces changes in real output and prices.

It may seem strange that the quantity of any good or service can be set at a point off its demand curve. The explanation lies in the distinction between the short-run and the long-run and the role of money as a means of transactions. The monetary authority and depository institutions take advantage of the role of money as a transaction medium to change the money stock by offering such appealing terms to potential transactions partners that they temporarily change their money holdings.

Consider, for example, how the monetary authority changes the level of reserves in the financial system. When a bond dealer sells bonds to the monetary authority and accepts money in exchange, it is unlikely that the bond dealer desires to permanently hold the increased level of money balances. Rather, it is more likely that the dealer has been offered an attractive price for the bonds and has decided to adjust his portfolio by selling the bonds and purchasing other assets with the funds. The dealer views the acceptance of money as an intermediate step until other assets are purchased. Likewise when deposits increase because a depository institution extends credit through the purchase of securities or the making of a loan, it is doubtful that the recipient intends to permanently hold the increased deposits. Rather the borrower takes credit in the form of money as an interim step to using the funds on whatever expenditures are planned.⁵

Those who have had an increase in their deposit holdings will move back to equilibrium by increasing their purchases in the future and passing the additional deposits to others. Of course, these additional transactions cannot eliminate the increased deposits but simply

redistribute them to other holders. Equilibrium is only finally achieved when the dollar volume of transactions increases sufficiently to make holders willing to hold the increased deposits permanently.

This capability of setting money independently of the demand for money explains both the power and lagged response of monetary policy. By moving the money stock away from the level that is demanded (consistent with current output and prices) the monetary authority produces an imbalance that is remedied through a change in expenditures leading to a change in real activity and/or prices. The time between the initial change in money and the ultimate equilibrium is the lag in response to monetary policy.

If the demand for money is not a factor in constraining the money stock that can be set by the monetary authority, it is the critical factor in the economic response to a change in the money stock. This is clear since, in the scenario above, the impact of a given money stock on future economic activity depends upon its relationship relative to the quantity of money demanded at current economic conditions. So a second tenet underlying advocacy of a monetary policy implemented through money stock control is that money demand be adequately predictable. In the jargon of economics this tenet was expressed as an assumption that "the demand for money is stable." That is, that the quantity of money demanded could be established sufficiently accurately as a function of other economic variables.⁶

The simplest demand function imaginable is one where the quantity of money demanded is just a fraction of the transactions desired (or the

level of income - serving as a proxy for transactions). This means that any acceleration or deceleration in the money stock will lead to a future acceleration or deceleration in income. Indeed, just this simple relationship served reasonably well until the late 1970's and changes in real money balances were included in the index of leading indicators.

Though simple changes in real money balances were used as an indicator of monetary policy, theory had long recognized that other factors could affect the demand for money and influence the relationship between money and income. One factor that had long been recognized was the influence of interest rates. Since interest payments were prohibited on many transactions-type deposits, changes in the level of interest rates affected the opportunity cost of holding these deposits. The higher the level of interest rates, the more expensive it is to hold non-interest paying deposits and so the lower the demand for transaction-type deposits.⁷

Another factor known to affect the demand for money is technological innovation. Any innovation that produces a more attractive method of performing transactions will cause substitution out of previously existing transactions balances. For example, the introduction of checking deposits reduces the demand for currency, while the introduction of credit cards reduces the demand for checking accounts.

In the period around 1980 a number of changes occurred that could have been expected to affect the demand for money. First, depository institutions were allowed to pay interest on transactions balances. Even

in the most stable of environments this would produce a disturbance to the demand for money. Depository institutions would establish new interest rates for transactions-type deposits on which interest had formerly been prohibited. As new interest rates are established, deposit holders would adjust their deposit holdings. This entire process would be stretched over time with a transition period of some volatility between the original demand for money and a different demand for money after the changes have been implemented.

In practice, the actual deposit deregulation process was even more complicated. First, not all deposits were deregulated - interest is still prohibited on demand deposits. This meant that to obtain interest on transaction-type deposits, new categories of deposits had to be created and depositors had to shift holdings to these new deposits. This process is much like that of a technological innovation. Second, the ceilings were eliminated in steps over a period of time, causing an extension and complication of the transition between the original and deregulated equilibriums.

A second factor that could have been expected to alter the demand for money around 1980 was a change in the behavior of interest rates. Over the period from 1950 to 1980, interest rates generally rose. Since 1980 interest rates have generally fallen. This latter move has reduced the opportunity cost of holding transaction-type deposits and other deposits whose interest rates have been held artificially low.

The combined effects of all these changes on the demand for various

combinations of deposits has been difficult to determine. One very likely outcome is that the demand for a very inclusive aggregate like M3 would increase. And in fact, growth in the ratio of Gross National Product to M3 appears to have declined since these changes.

In the face of these changes it became more difficult to interpret what a given change in the money stock implied for future income levels. Given that the problems appear to be arising from disturbances to the demand for money, it seems natural to examine the money supply process for alternative indicators of the thrust of monetary policy. The monetary authority has always been able to take actions that could affect the money stock independently of the demand for money. Theory suggests that movements in the money stock relative to the demand for money can serve as an indicator of the thrust of monetary policy on future income levels. In the past the demand for money has often been considered so stable that changes in the money stock were directly used as an indicator of monetary policy, essentially assuming that the demand for money was a function only of income. However, the creation of new deposit categories, the deregulation of interest rates and the sharp change in interest rate behavior in the 1980's produced changes in the demand for money which rendered simple movements in the money stock less effective as an indicator of monetary policy.

These changes in the demand for money disturb both the money stock and the impact of a given money stock on future income and prices. But there is no reason why these changes should affect the mechanism by which the monetary authority acts to change the money stock. It seems only natural

to examine this mechanism as the source of an alternative indicator of monetary policy. Indeed, it is basically such an approach that has led many advocates of money stock control to support a policy target such as the monetary base under present conditions.⁸ This approach moves the focus to an earlier stage of the money supply process - in this case, reserves - so as to simultaneously increase the monetary authority's control over the indicator, and insulate the indicator from demand disturbances. The next section argues that the money supply process operates not through reserves, but through an interest rate spread.

II.

How does the monetary authority affect the money stock? The standard money and banking textbook teaches the beginning student a two step process in which the monetary authority first changes the level of reserves in the system and thereby disturbs the level of excess reserves at depository institutions. These institutions then respond to the disturbance in their excess reserves by changing their asset holdings and the level of deposits in the system and transmitting smaller disturbances in excess reserves to other depository institutions. This process continues with each institution passing on an ever smaller disturbance to each succeeding institution until deposits in the system have changed by some multiple of the original change in reserves. In this view of the money supply process the monetary authority changes the money stock by initially changing the level of reserves and through the operation of a

"reserve multiplier" produces a change in the level of the money stock. There have been a number of studies of the money supply process that have estimated reserve multipliers that could ostensibly be used for purposes of accurate monetary control.⁹

However useful the money multiplier approach may be as a pedagogical device to teach students that depository institutions create money, careful consideration makes it clear that it cannot be an accurate description of the money supply mechanism. It simply does not make sense theoretically.¹⁰

Depository institutions change the money stock by exchanging assets (loans and investments) with the public. The reserve multiplier model treats each depository institution as an isolated, independent entity that mechanistically changes its asset holdings in response to its excess reserve position. In practice, there is available a market (the federal funds market) where depository institutions can change their reserve levels by lending or borrowing reserves and which allows them to maximize returns in a more realistic manner than assumed in the reserve multiplier model. This market transmits the pressures of the reserve market to all depository institutions, irrespective of their excess reserve positions, and the relationship between the fed funds rate and the marginal return available on loans and investments determines the changes in a depository institution's asset holdings and its impact on the money stock. The higher the funds rate (and expected future funds rates) relative to the rate depository institutions can earn on assets, the more institutions will sell assets and act to reduce deposits and money. Even a depository

institution with excess reserves will sell loans and securities and channel the funds into the fed funds market if the rate on fed funds is high relative to the rate available on assets. Even an institution with a reserve deficiency will purchase assets, creating deposits and money, and cover its reserve needs with fed funds purchases, if the fed funds rate is low relative to the rate available on assets. It is the relationship between the funds rate and the rate on bank assets, not the level of reserves, that determines changes in the money stock.

Evidence supporting the interest rate model of money stock determination can be observed in the behavior of individual depository institutions in the federal funds market. Many small institutions consistently sell funds, while many large institutions consistently buy funds in the market. The funds market allows institutions to concentrate on that side of the intermediation process in which they have a comparative advantage. Indeed, many large institutions are not only consistent buyers in the funds market, but buy an amount greater than their required reserves. If cut off from the market, they would not only be deficient, but actually be overdrafted in their reserve position. If these institutions responded to their excess reserve positions as in the textbook scenario, they would long ago have cut back on their asset holdings and reduced borrowings in the funds market.

It may seem that contrasting the reserves and the interest rate spread view of money stock determination is much ado about nothing. After all, both the quantity of reserves and the funds rate are factors in the market for reserves, where one is the quantity supplied and the other is the

price determined. Is the choice of one or the other not simply a distinction without a difference? There are compelling reasons to believe that there is a real difference between these two views.

First, the interest rate view does not offer the federal funds rate alone as the determinant of the money stock, but rather the relationship between the federal funds rate and rates available on longer term assets. So a rise in the federal funds rate will not necessarily result in a smaller money stock if rates on longer term credit rise even more. Similarly, if longer rates fall, it is possible to lower the federal funds rate and not produce an increase in the money stock.

Second, there is an historical episode that makes it absolutely clear that the two views are not equivalent. In October 1979 the Fed, which had been unsuccessfully trying to slow the economy by gradually raising the federal funds rate, switched to a policy it described as reserve targeting. Reserve targeting appears to require that the monetary authority set total reserves as a means of controlling money. However, the reserve accounting system in effect at the time was a lagged reserve system under which depository institutions' reserve requirements in the current week were based on their deposits two weeks previous. Under this system, depository institutions cannot change the level of required reserves set two weeks earlier and so the monetary authority must provide a level of total reserves at least equal to the level of required reserves. Under the textbook view of the money supply process this would seem to produce an insurmountable problem if the Fed desired a reduction in the money stock. There is no way the monetary authority can reduce

reserves below the level of required reserves set two weeks earlier.

In practice, actual policy targeted unborrowed reserves. This meant that even though the Fed had to provide a level of total reserves that was above the level it would have desired, it could run a contractionary policy by forcing up the fed funds rate. It did this by providing fewer reserves through the open market desk and forcing the system to borrow more of the required reserves through the discount window.¹¹ In this way the monetary authority raised the funds rate and produced a contraction in bank asset holdings and deposits in the current week so that reserves could be reduced two weeks in the future.

Reserve targeting under lagged reserve accounting strongly suggests that the money supply mechanism works through the interest rate view described earlier. It makes it absolutely crystal clear that the mechanism does not work through reserves as described in the textbooks. This episode also makes it clear that reserve accounting, while often thought to be a narrow and remote subject of little interest to anyone but technicians, can give very valuable clues to the nature of the money supply process.

III.

The interest rate spread view of the money supply mechanism gives a decidedly different view of, and new insights into, a number of the prominent monetary policy issues of recent decades. If monetary policy

impacts on the money stock through interest rates, can it make sense to argue for a policy conducted through targeting reserves? A policy of targeting reserves (whether understood by all its adherents or not), is perfectly consistent with a mechanism operating through interest rates. What advocates of reserve targeting are really proposing is an automatic mechanism to set the appropriate federal funds rate. Their real objection is not to the concept of interest rates playing a prominent role in determining the money stock, but rather to how the crucial fed funds rate is determined. They are skeptical of the ability of the monetary authority to know the right level of interest rates.

Advocates of monetary control through reserve targeting really have in mind an automatic mechanism for setting the correct fed funds rate. This mechanism operates through the interaction between the fed funds rate and excess reserves (i.e. the discrepancy between reserves and required reserves). A physical analogy would be a balance. The quantity of reserves that corresponds to the desired level of deposits is set by the monetary authority on one pan of the balance. Having set the quantity of reserves on one side of the balance, the monetary authority's task is done. The fed funds rate should then be determined solely by the difference (excess reserves) between the level of reserves supplied and the level of required reserves based on the level of deposits in the system. If deposits are low, so that required reserves are below the level of reserves supplied, the fed funds rate starts to fall. As the funds rate falls depository institutions respond by purchasing loans and securities, increasing deposits and required reserves and dampening the fall in the fed funds rate. The funds rate will continue to fall until

deposits have increased enough to move required reserves into balance with the level of reserves provided and the funds rate settles at the correct level. Conversely, if the current level of deposits is such that required reserves are greater than the level of reserves provided, the funds rate will rise, inducing depository institutions to sell assets, decreasing deposits and required reserves until they are in balance with the level of reserves provided and the funds rate settles at the correct higher level.

At times during the debate between reserve targeting advocates and interest rate targeting advocates it may have seemed that reserve targeting advocates were implying that a policy implemented through interest rates was inherently unstable. Much of this criticism was really directed at a perceived tendency on the part of the monetary authority to peg interest rates at a fixed rate. Reserve targeting advocates argued that rates should be allowed to move more freely and that a reserve targeting procedure would guide the rates to the right level. The interest rate model developed in the previous section suggests that what reserve targeting advocates really wanted was a system where the fed funds rate would automatically move with the rate of return on assets available to depository institutions. There is no inconsistency between reserve targeting and a prominent role for interest rates in the money supply mechanism. Indeed, it is even possible to view the money stock target as a guide that helps the monetary authority set the proper interest rate.

Given the view above of reserve targeting, it becomes immediately clear that the reserve operating procedure adopted by the Fed in 1979 could not have been the procedure that monetary control advocates were

seeking. Under the lagged reserve system in operation at the time there was no way for the system to operate like the balance described above and have changes in the current level of deposits interact with the fed funds rate. So there was no way of having the fed funds rate guide depository institutions to move current deposits to a level consistent with the level of reserves provided. The reserve operating procedure adopted in 1979 was, in fact, a different way of having the Fed determine the fed funds rate. Instead of the Fed determining a preselected rate directly through open market operations, the rate (which was not likely to be known beforehand by the Fed) was determined by the interaction of the level of unborrowed reserves supplied by the Fed through the open market desk and the behavior of depository institutions and the Fed's discount officers in determining the spread between the fed funds rate and the discount rate necessary to produce the requisite level of borrowed reserves.

In terms of the balance model of reserve targeting described earlier, there were really two problems with this new operating procedure. One was that it became clear that there were some times when the monetary authority could not set reserves low enough on one side of the balance. This was the problem described in the previous section and the reason why lagged reserve accounting drew increasing criticism after the adoption of the new operating procedure and was eventually changed. The second problem was that lagged reserves always prevented the new operating procedure from functioning like a true reserve targeting procedure because it prevented changes in the current level of deposits from affecting the fed funds rate. In terms of the balance analogy this problem meant that changes in current deposits could not change the level of required

reserves on the other side of the balance.

The description of what is entailed in a reserve targeting procedure gives some insight into the role of reserve requirements in monetary policy. The role of reserve requirements is to help set the fed funds rate in a system where policy is directed to controlling an aggregate and conducted through reserve targeting. Reserve requirements make sense only if policy is directed to control over an aggregate and policy is implemented through reserve targeting. Even if policy is directed to control over an aggregate, if the funds rate is being set in some other way than the reserve targeting mechanism described above, reserve requirements are superfluous to the conduct of monetary policy.¹²

This view of the money supply process as operating through the relative position of the fed funds rate and market rates also helps explain a surprising consequence of the new operating procedure adopted in 1979. When the new operating procedure was adopted it was widely thought that while short-term fed funds volatility would increase, short-term volatility in the money stock would decline. This expectation arose because the old system of pegging the federal funds rate was thought to amplify the effects of shifts in the demand for money into even larger changes in the money stock. For example, if there were an increase in the demand for money, there would be an increase in both money and interest rates. Under the old interest rate targeting procedure, the monetary authority would respond by increasing reserves, thereby lowering the fed funds rate back to the target level and increasing deposits still further. Thus the interest rate targeting regime was thought to buy

interest rate stability at the expense of increased deposit volatility.

The new operating procedure of 1979-1982 did increase fed funds volatility as expected, but it also increased weekly deposit volatility. The reason for this can be explained by the interest-rate spread view of the money supply mechanism described earlier. What advocates of money stock control wanted from increased funds rate volatility was a system where a change in the interest rate on earning assets available to depository institutions was automatically matched by a change in the fed funds rate. This would reduce the volatility of the difference between the rates and the volatility of the resultant deposit changes. However, the effect of lagged reserves was to prevent the movements in the fed funds rate from matching the changes in the rate on assets available to depository institutions. The increased volatility in the fed funds rate with the adoption of the new operating procedure only served to increase the volatility of the difference between the fed funds rate and the rate on assets available to depository institutions. Since the system came to equilibrium by having depository institutions purchase or sell earning assets (and change deposits) until the rate on these assets moved into equilibrium with the fed funds rate (and expected future fed funds rates), increased volatility in the difference between these rates led to increased short-run deposit volatility.¹³

Finally, the interest rate view of money determination provides a somewhat different view of the possibilities for accurate monetary control. Typically, advocates of monetary targeting have conceded that accurate monetary control is not possible in the short-run, but that

sufficiently accurate longer-run control is possible by controlling the monetary base or some variant of reserves. Supporting evidence is usually provided in the form of extensive studies of the long-run stability of various reserve multipliers.¹⁴

It is very likely that the evidence from reserve multiplier stability is too optimistic with regard to the degree of monetary control possible under the present reserve accounting system with reserve targeting. The monetary authority has typically targeted the funds rate within a narrow range over the period when these reserve multipliers were calculated. The essence of a funds rate targeting procedure is moving reserves to match changes in the level of required reserves, so as to keep excess reserves (and the funds rate) stable. This policy makes the multiplier look more stable than would be the case if the monetary authority independently set a desired level of reserves and the level of required reserves were forced to adjust to the level of reserves.

On the other hand, the view that accurate monetary control is not possible in the short-run is far too pessimistic, and the typical evidence based on the short-term behavior of the multiplier is actually irrelevant. Accurate monetary control every settlement period is very possible and the evidence can be obtained from a relatively simple micro-analysis of the individual depository institution. This assertion may seem wildly optimistic in light of the prevailing opinion regarding the possibilities for accurate short-run monetary control. However once again, an historical episode and the evidence from reserve accounting provides valuable insight. In the wake of the Great Depression of the

1930's, a number of economists advocated one-hundred percent reserve requirements as a means of giving the monetary authority absolutely accurate control over money. Whatever the other draw-backs of one-hundred percent reserve requirements, no economist expressed doubt that such a system would provide accurate short-run monetary control. Yet no one conducted any studies of the likely reserve multipliers under such a system. The reason is that analysts could immediately see by considering the behavior of the individual institution that one-hundred percent reserve requirements was a system in which excess reserve holdings would be essentially zero, and accurate control over reserves would translate into accurate control over money.

One-hundred percent reserve requirements make it clear that reserve accounting, and its impact on individual bank behavior, is the key to accurate monetary control. Indeed, one-hundred percent reserve requirements make it clear that accurate monetary control is not really the fundamental problem. As noted, economists knew how to control the money supply accurately in the 1930's. A system of one-hundred percent reserve requirements would give accurate monetary control, but it would also stimulate the search for instruments that would give the services of demand deposits but be exempt from one-hundred percent reserve requirements. The real problem of monetary control is how to control money without putting such onerous taxes on the target aggregate as to destroy its integrity.¹⁵

In the 1970's two systems were proposed that represented great improvements in potential monetary control. Poole [21] proposed a system

of one-hundred percent marginal reserve requirements that would greatly improve monetary control, even with fractional reserve requirements. However, the monetary control accuracy of even the Poole proposal declined as reserve requirements were lowered to very low levels. Laurent [15] proposed a reserve accounting system that, reversing the lagged reserve system, would have depository institutions satisfy deposits in the current week with reserves held in some previous week. This reverse lag (or more appropriately named-lead reserves) system would allow very accurate monetary control every settlement period, no matter how low the level of reserve requirements. It should be noted that neither of these proposals involved any macro-analysis at all. The path to accurate monetary control is not through macro-analysis, but rather through a micro-bank analysis.¹⁶

IV

The previous sections of the paper have advanced the view that the money supply mechanism operates through the relationship between the fed funds rate set by the Fed and rates on earning assets available to depository institutions. While this view has not been prominently advanced in the economic debates of recent years, it should not be inferred that this is a new insight. Indeed, some of the most prominent economists in the history of economic thought, including most especially believers in a prominent role for money in economic theory, have clearly recognized the role of interest rates in the money supply mechanism.

Milton Friedman, as strong an advocate as any of interpreting monetary policy through money stock changes, stated in Congressional testimony [5]

"The present procedure is a carryover from the time before 1970 when the Fed had money market conditions as its objectives. The present procedure involves setting a money supply target, the 5 to 7 1/2 percent, for example, that Dr. Burns set the other day, and then asking the staff to calculate what federal funds rate would lead to that money supply target being achieved, and then asking the New York Federal Reserve Bank to peg the Federal funds rate at that level.

Now in principle that method could work. In principle there is a Federal funds rate that would induce the commercial banks, the member banks, to add to their reserves that amount which would be necessary to produce the desired growth target. In principle, therefore, it could work; but unfortunately there are two major slips between that principle and the practice.

The first slip is that the Fed cannot predict what the right Federal funds rate is. The Federal funds rate that is right depends on the rates at which commercial banks can lend as well as the cost of funds to them. The Federal funds rate is the cost of funds but it doesn't tell you anything about the rate at which they can lend.

In order to be able to predict what the right Federal funds rate is, you have to be able to predict the rates at which they can lend ..."

It could not be stated more clearly that the problem in the central bank trying to control money through setting an interest rate, is not that interest rates play no role in the money supply process, but rather the difficulty of knowing the correct rate. The Friedman quote also clearly states that the correct level for the federal funds rate depends on the rate at which depository institutions can lend.

The concept of monetary policy operating through the relationship between two interest rates is a idea popularized at least as long ago as the beginning of this century by Knut Wicksell, the prominent Swedish economist. Wicksell distinguished two rates - a market rate set by the central bank, and a natural rate determined by the marginal productivity of capital. A market rate set below the natural rate results in an

expansionary monetary policy, while conversely a market rate set above the natural rate produces a contractionary monetary policy. Wicksell himself viewed his work as directed at the problem of determining what level of bank notes would be issued by a banking system with a central bank and non-convertible bank notes. His analysis is relevant to any modern banking system with a central bank and fiat money. Wicksell's analysis not only established the determinants of fiat money in such a system, it also resolved a paradox that had often troubled economic observers. This paradox, labeled Gibson's paradox by economists, notes that theory clearly indicates that an expansionary policy is implemented by lowering interest rates, yet periods of heightened economic activity are characterized by high interest rates. Wicksell's interest rate mechanism explains the paradox - policy is eased by lowering the market rate relative to the natural rate, but as the economy strengthens the natural rate rises.

Wicksell's interest rate mechanism is clearly similar to the money supply mechanism advanced earlier in this paper. Wicksell viewed the fundamental problem of monetary policy to be establishing the determinants of prices. Even a cursory reading of Wicksell makes it clear that he did not view his interest rate mechanism as being in any way in conflict with a prominent role for money. Indeed, as Wicksell described it in the preface to his book Interest and Prices [28]:

"If the monetary institutions offer their money or their credit on abnormally favourable terms, this must logically lead to an intensified use of money or credit on the part of the public. A rise in prices is the result, and we have seen that prices will continue rising so long as credit remains easy. A tightening of credit has, of course, the opposite effect.

A very important qualification is, however necessary. Though it is called for by the very nature of these phenomena, it is frequently overlooked, and hasty conclusions, which the facts fail to support, are the result. The rate of interest charged for loans can clearly never be

either high or low in itself, but only in relation to the return which can, or is expected to, be obtained by the man who has possession of money. It is not a high or low rate of interest in the absolute sense which must be regarded as influencing the demand for raw materials, labour, and land or other productive resources, and so indirectly as determining the movement of prices. The causative factor is the current rate of interest on loans as compared with what I shall be calling the natural rate of interest on capital. This natural rate is roughly the same thing as the real interest of actual business. A more accurate, though rather abstract, criterion is obtained by thinking of it as the rate which would be determined by supply and demand if real capital were lent in kind without the intervention of money.

It is remarkable that this proposition - fundamentally very simple, indeed almost self-evident - though occasionally alluded to by economists, has never, to my knowledge, been used as the foundation for a complete theory of money and prices."

Essentially, Wicksell viewed his interest rate relationship as being the monetary policy mechanism determining money and, through money, prices. He saw no conflict between an interest rate mechanism and a prominent role for money.

While the attractions of Wicksell's approach have long been appreciated, there is a problem in applying it to the conduct and interpretation of monetary policy. The problem is that the natural rate is unobservable. While the market rate can be easily observed, the setting of the market rate effectively hides the natural rate. The presentation earlier in this paper indicates that currently the rate most directly influenced by the Fed is the overnight fed funds rate. Again though, there is no way to observe the natural fed funds rate.

However, the position of the fed funds rate at the very shortest end of the yield curve does suggest another possibility. Is it possible that the relationship between the fed funds rate and the yield on longer term rates might give a clue as to whether the market fed funds rate was set

high or low? The level and slope of the yield curve in the vicinity of the fed funds rate is likely to be heavily influenced by the Fed's target fed funds rate and market expectations as to expected future Fed moves. However, as one moves further out on the yield curve the influence of Fed policy in determining rates should diminish. This suggests that a useful comparison might be between a long-term rate and the fed funds rate.

In the author's earlier study the difference between the 20-year constant maturity treasury rate and the fed funds rate (on a bond equivalent basis) was used as an indicator of monetary policy.¹⁷ The greater the algebraic difference the easier is monetary policy and the more likely that real economic activity will expand in the future. The smaller the algebraic difference, the tighter monetary policy and the slower will economic activity expand in the future. It might seem tempting to think of the long-term interest rate as the natural rate. This is neither necessary nor likely to be true. In terms of Wickseil's view of the world, all that is required is that the spread between the long rate and the fed funds rate be positively related to the difference between the natural fed funds rate and the market fed funds rate. In this view, the spread between the long-term rate and the fed funds rate provides an indicator of monetary policy by providing a trace of the spread between the natural fed funds rate and the market rate set by the Fed.

An alternative interpretation of an interest rate spread is provided by the recognition that the yield curve contains implicit forecasts of future interest rates. A downward sloping yield curve can be interpreted

as consistent with expectations of declining interest rates while an upward sloping yield curve can be interpreted as consistent with expectations of rising interest rates. Since interest rates tend to be positively associated with economic activity, the yield curve can be viewed as containing market forecasts about future economic activity. To the extent that one is inclined to this interpretation of the yield curve, one would be likely to use government securities for both the short and long-term yields, so as to avoid the problems of changing credit risks. The majority of spreads advanced have been differences in yields between long-term governments and short-term governments, and so have lent themselves to the interpretation that they are extracting a market forecast about future economic activity.¹⁸

Though the two interpretations of the yield curve are not completely incompatible, there is a very real difference in the two views. The interest rate spread between a long-term rate and the fed funds rate is designed to gauge whether the fed funds rate is set high or low. This approach is more amenable to an interpretation as a gauge of policy since it contains the fed funds rate through which monetary policy is currently implemented. The interest rate spread between a long-term and short-term government security yield is more amenable to an interpretation of capturing market expectations of future interest rate movements. This latter approach is more sensitive to the subtleties of how expectations are formed.

Conclusion

The conduct and interpretation of monetary policy have become more difficult in the 1980's as the relationship between fluctuations in real money growth and real economic activity that were formerly relied upon appear to have deteriorated. Recently, a number of studies have suggested various forms of the spread between a long-term interest rate and a short-term interest rate as an alternative indicator of the thrust of monetary policy. These suggestions have been based almost exclusively on empirical tests of the forecasting abilities of the spreads and have appeared to involve an entirely distinct approach from the previous money based indicators. This paper argues that the interest rate spread approach is entirely consistent with the theory that underlie the use of money as an indicator of monetary policy. It argues that the problems with money as an indicator of monetary policy stem from recent disturbances to the demand for money. The paper argues that in such a situation, it would seem reasonable to look at the money supply process for an alternative indicator of monetary policy.

The paper argues that the usual emphasis on reserves as the key element in the money supply process is misplaced. Instead, an interest rate spread between the rate on earning assets available to depository institutions and the fed funds rate is the key mechanism in the money supply process. This view gives a different interpretation of a number of recent issues in monetary policy including: the mechanism underlying a reserve targeting procedure, the importance of reserve accounting in the money supply mechanism, the true nature of the operating procedure adopted

in October 1979, the role of reserve requirements in monetary control, the appropriate analytical framework for analyzing the short-run controllability of the money stock, and the feasibility of accurate short-term monetary control.

The paper then argues that the role of an interest rate spread in the money supply mechanism, while not recently prominent in monetary policy debates, has a long pedigree going back at least to the time of Knut Wicksell. Finally, the paper argues that the particular form of the interest rate spread advanced as a forecaster of future real growth is critically dependent on the implicit view the researcher has of the information contained in the term structure of interest rates.

FOOTNOTES

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1. See [18].

2. See [1],[2],[9],[22], and [26]. There has also been increased attention paid to interest rate differences between commercial paper and Treasury bills as indicators of future income growth. see [3] and [26].

3. For a view that argues for auction market prices as indicators of monetary policy, including, but not limited to, interest rate spreads, see [13] and [14].

4. See [10].

5. This argument is more extensively developed in [16]. One can also consider the extreme case of the central bank just dropping currency on the sidewalk to demonstrate the point. Does it require a fortuitous increase in the demand for money to produce an increase in the money stock? Hardly. By offering money in exchange for the mere physical effort of bending over and picking it up, one can be absolutely certain that the money stock will increase by the full amount dropped on the sidewalk.

6. The classic reference in discussing the theory behind the role of the demand for money in a monetary policy implemented through money stock control is [4].

7. Even if implicit interest is paid on deposits for which explicit interest is forbidden, one would still expect a reduction in demand for the deposits as interest rates rise. Paying implicitly in services is inherently inefficient relative to paying in money, and the cost of this inefficiency will rise the greater the amount paid implicitly.

8. See, for example, the Shadow Open Market Committee recommendation in [25].

9. See, for example [24].

10. The material in this section and the next section borrows heavily from parts of the author's earlier work [19].

11. A more detailed description of the operation of the discount window and its role in the new operating procedure is provided in [8],[12], and [19].

12. As noted above, even when described as reserve targeting (1979 - 1982) monetary policy was not implemented by targeting total reserves. In actual practice, the Fed has never operated by targeting total reserves and allowing the funds rate to be set by the difference between reserves and required reserves based on current deposits.

13. For another view of deposit volatility in this period, which though different, also emphasizes supply considerations, see [11].

14. Again, see [24].

15. An alternative approach is to adopt 100 percent reserve requirements but pay interest on required reserves to avoid the problem of destroying the integrity of deposits. For an approach along this line see [5]. While this approach seems perfectly justifiable theoretically, it is not trivial to determine the correct level of interest rates to pay on reserves. For a description of the problems see [21].

16. See [15], [20], and [27]. Of course, as noted earlier, the desirability of accurate monetary control depends upon a stable demand for the target monetary aggregate.

17. In an ideal environment one would probably prefer to use the rate of return on long-term private issue debt of a constant quality. This would avoid problems of the idiosyncrasies of government debt issue under a non-profit maximizing system (e.g. the congressional ceilings on the quantity of long-term debt issued). However, recent years have witnessed a great increase in event risk in the private debt markets and resultant turmoil in the credit ratings on private debt.

18. See [2],[22], and especially [9] as examples of interpreting the spread as an extraction of market interest rate expectations. An interesting variant of this approach is [7] which adjusts interest rate expectations for expected changes in inflation.

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