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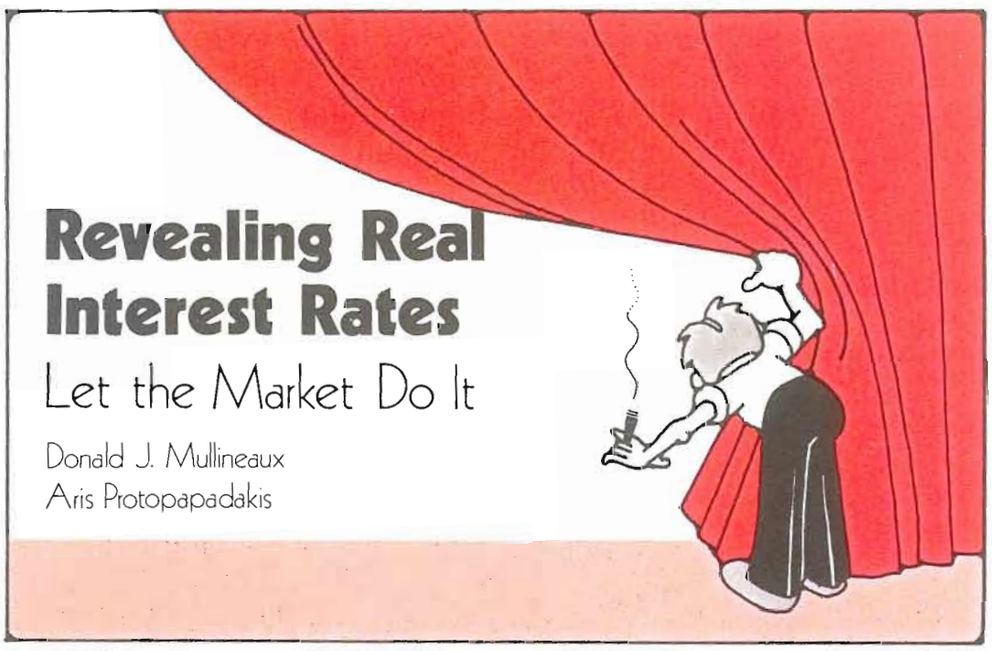

Revealing Real Interest Rates

Let the Market Do It

Donald J. Mullineaux
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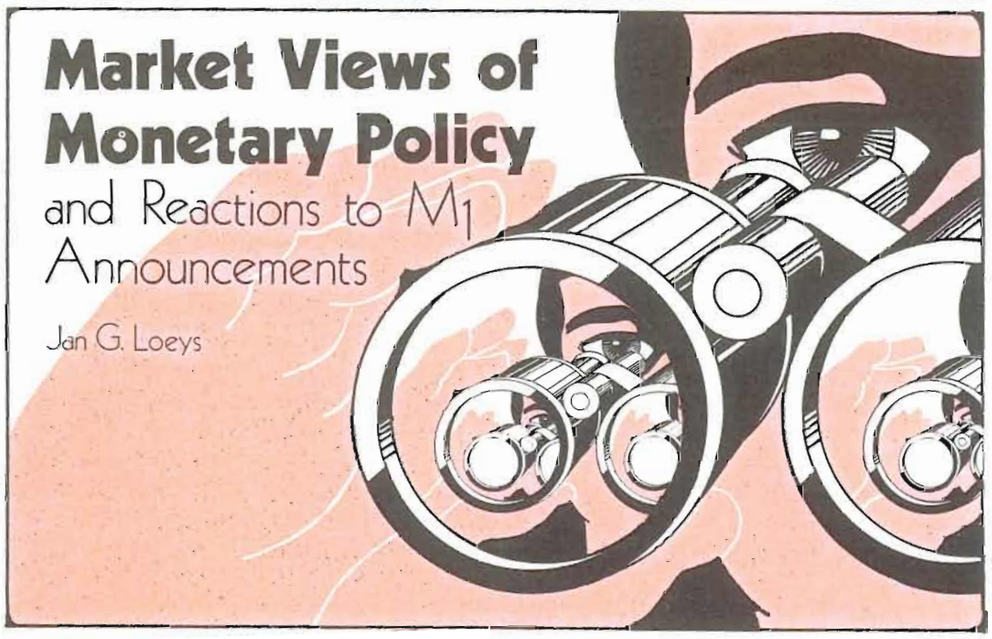

Market Views of Monetary Policy

and Reactions to M_1 Announcements

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Revealing Real Interest Rates:
Let the Market Do It

*Donald J. Mullineaux and Aris Protopapadakis**

"When money and goods change with reference to each other—in other words, when the money standard appreciates or depreciates in value in terms of goods—the numbers expressing the two rates of interest, one reckoned in terms of money and the other reckoned in terms of goods, will be quite different. Moreover, the money rate, the *only rate quoted in the market*, will be influenced by the appreciation or depreciation."

—Irving Fisher, *The Theory of Interest* (1930)

Most Americans today would view as commonplace the notion that inflation (what Professor Fisher calls a "depreciation of the monetary standard") affects interest rates. Living through the great inflation of the late 1960s and 1970s made the link between accelerating inflation and rising interest rates painfully obvious. Many would also recognize that inflation can drive a substantial wedge between the money interest rate and the so-called real rate of interest (what Fisher labels the rate "reckoned in terms of goods"). But few, if any, people could give a precise answer to the following seemingly simple question: "What is the real rate of interest on Treasury bills this week?

Fisher hints at one reason why. Only money rates are "quoted" by brokers and dealers and published in the financial press. No one can look in the *Wall Street Journal* or call his bank to find out the real rate. People instead are forced to make an estimate—an educated guess—about the level of real interest rates. And policymakers, who presumably care about interest rates at least as much as the rest of us, must do the same. That we are left with an error-prone estimation procedure to gauge real rates seems anomalous, since economists claim that real rates are more important than money rates for explaining many kinds of behavior.

It is possible to structure a means for markets to

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"reveal" real rates of interest, however. If some substantial borrower—the federal government, for example—issued bonds with interest and principal tied to some index of the general price level, then brokers who traded such bonds would be quoting a real rate of interest rather than a money rate. The yield on indexed Treasury securities, for example, would represent a real rate of interest based on a particular index.[1] Movements in the "quoted" real rates on indexed Treasury bonds could prove valuable to households, businesses, and policymakers.

WHY REAL INTEREST RATES MATTER....

To say that interest rates are important is like saying that kids like ice cream—few people will disagree with either suggestion. Crucial decisions—whether to consume or save, for example, whether to buy a car, whether to build a new plant, whether to pump oil from the ground or leave it there—all depend on the level of interest rates. Indeed, any decision that involves looking into the future—and almost all do—involves taking account of interest rates.

....to Households.... Households, for instance, must decide whether to consume today or at some point in the future. A decision to postpone consumption is, by definition, a decision to save. The expected real interest rate is the reward for saving, or, to put it another way, it is the amount of extra future consumption households expect to get by refraining from consuming today. Therefore, the higher this rate, the stronger the incentive to save.

When people decide to save, however, they typically do not set aside goods, such as groceries or tennis shoes, nor do they receive interest payments in goods. Rather they set aside money (they lend the money) and they are paid back in money. The distinction between receiving interest in the form of goods or in money is not important in a world where there is no inflation. In such a case, one dollar can be exchanged for the same basket of goods whether it's today or tomorrow. The money rate of interest (sometimes called the "nominal rate") would therefore be the same as the rate of interest expressed in terms of goods (the "real rate of interest"). An interest rate of 5 percent, for example, means that lending $1,000 gets you back $1,050 a year hence. But, since prices are unchanged, it also means that you can buy 5 percent *more* goods next year than you can buy today. With no possibility of inflation the expected real interest rate and the nominal interest rate are one and the same.

If there is some inflation, however, then it takes more money "tomorrow" than today to buy the *same* basket of goods. Therefore, if people expect to get extra goods by postponing consumption, the nominal (money) interest rate must include not just the expected real rate, but also a component that reflects the amount of anticipated inflation between today and tomorrow. This component, which is intended to preserve the consumer's purchasing power, is referred to as an inflation premium. For example, if the inflation premium is 5 percent and the nominal rate is 10 percent, then lending $1,000 gets you back $1,100 one year hence, but it only buys $1,050 worth of goods in this year's prices. In other words, the reward for saving is identical to that when nominal rates are 5 percent and there is no expected inflation. So, there is no incentive to consume less today simply because nominal rates are high. It would take a rise in the real rate to induce postponing more consumption.

....to Business.... Similarly, it is the expected real rate which firms must consider in deciding whether to build a new plant or install some new equipment. New equipment will benefit the stockholders of a corporation if the amount of extra goods which can be produced with the new machine adds more to the company's revenues than the costs of owning and operating the new equipment. The interest rate is an important component of those costs, because a firm must borrow the capital necessary to finance such purchases.[2]

[1] The "real" rate quoted on an indexed bond is in reference to a particular price index. The same bond tied to a different index could carry a different real rate. The expectation is that real rates with respect to a variety of indices will move together, enabling policymakers, households, and businesses to use the quoted real rates as indicators of the real rates not quoted.

[2] Borrowing in this context should be broadly conceived. It includes borrowing from financial institutions, issuing com-

When the company borrows to buy equipment, it pays the nominal rate on those borrowings. However, it is the size of the real rate component of that nominal rate that influences the firm's decision. The real rate reflects the cost (in percentage form) of financing *in terms of the good produced.* A 5 percent annual real rate, for example, suggests that if a widget firm borrows an amount equivalent to 100 widgets for one year, it would expect to repay 105 widgets-worth at year's end. Thus, the expected real interest rate allows for an easy comparison with the number of extra widgets that investment in new equipment would yield. If the new machine yields 110 widgets, then it's a good deal. The lower the real cost of borrowing (the real interest rate) the stronger the incentive for a business to buy new equipment or to build a new plant.

If there is no significant inflation underway, then there is no reason to emphasize the distinction between real and nominal interest rates in making investment decisions. When inflation is high, however, nominal interest rates will also be high. But high nominal interest rates need not discourage investment if the real rate is low. The reason is simple: though higher inflation increases borrowing costs, it also raises revenue flows because a firm's product will sell at higher prices. A business will look through the impact of inflation on its profits to assess the "real" gains from investment, and the real interest rate serves as the standard against which those gains are compared.[3]

The expected real rate is a useful indicator of the amount of investment businesses are likely to undertake in any one year, because of its role in the way businesses make decisions. Increases in this rate tend to discourage investment, and conversely, declines in the expected real rate tend to encourage investment.

....and to Policymakers.... The importance of the real rate of interest has not been lost on monetary policymakers. Indeed, the short-run impact of changes in monetary policy is transmitted to the economy largely through changes in the real interest rate. If the Fed unexpectedly reduces the rate of money growth, for example, people try to make up for the "shortage" of money by selling various kinds of financial assets. This makes both nominal and real interest rates rise. Nominal rates rise because the sale of these assets depresses their prices. The real rate rises because the inflation premium adjusts slowly to changes in money growth.[4] Therefore, the expected real rate—namely, the difference between the nominal rate and the inflation premium—increases.

Consumers react to the rise in expected real rates by postponing purchases of new homes and automobiles, and firms react by cutting back on plans to build new plants and to buy equipment. Inventories are also likely to be trimmed since a higher real rate makes them more expensive to finance. These reactions to an increase in real rates reduce the overall demand for goods and services in the economy, and the growth rate of real GNP is likely to decline. Alternatively, if the Fed provides more money to the economy unexpectedly, then the real rate falls, at least temporarily, and economic growth accelerates for awhile.

The expected real rate of interest is one of the channels through which monetary policy influences the economy. In principle, therefore, the Fed can judge how its policy actions are influencing the economy by monitoring what is happening to the real rate of interest. A rising real rate would signal a more restrictive monetary policy, while a declining real rate would suggest some monetary ease, other things being equal. In practice, the Fed has a difficult time using the real rate as an indicator of the thrust of monetary policy, because it, like everyone else in the economy, lacks adequate knowledge of what the real rate is. There is no asset available in the financial markets which pays just a real rate. Instead, the real rate must be estimated in some fashion or other. Unfortunately, none of

mercial paper, selling long term bonds, using retained earnings, and floating new stock issues.

[3]We are not claiming here that inflation is "neutral" in the sense that it has no impact on real economic activity. Inflation can have an impact on relative prices of goods and on corporate profits. Rather, we claim that, since an individual corporation's investment decisions have no measurable impact on inflation, a corporation can calculate the real demand for its products as well as the costs of production in terms of its output, without reference to the trend growth in the prices of all the goods.

[4]Empirical evidence shows that inflation adjusts slowly to money growth; hence, expected inflation, that is, the inflation premium, also adjusts slowly.

the procedures used to gauge the expected real rate offers much promise of yielding good estimates.

THE REAL RATE MUST BE ESTIMATED

Analysts have a useful starting point for estimating the expected real rate, namely, today's nominal interest rate in the market. The expected real rate is embedded in the nominal rate, so one way to get at it is to separate the expected real rate from the other components that make up the nominal rate. One of these is the inflation premium; to identify that component in nominal rates, analysts must have some means of estimating the *anticipated* rate of inflation. Anticipated inflation is not the only "premium" which gets built into nominal interest rates. Lenders also will want some protection from the risk that their inflation forecast is likely to be wrong. If actual inflation exceeds what lenders and borrowers expected over the life of a loan contract, for instance, then lenders will unexpectedly lose purchasing power and borrowers will gain. Borrowers will repay lenders with "cheaper" dollars in terms of purchasing power. Should inflation fall short of expectations, lenders gain and borrowers lose. Inflation is indeed imperfectly predictable, so credit market participants find their future purchasing power at risk over the horizon of a loan. Since people typically are averse to risky situations, financial markets build a *risk premium* component into nominal interest rates to induce lenders to take on these risks. The more uncertain the outlook for inflation, the larger this risk premium is likely to be.

If good information is available on the size of the inflation premium and the risk premium, then these components can be "netted out" of the nominal interest rate.[5] What's left is the expected real rate, the compensation lenders require for postponing consumption when there is no inflation expected and no risk concerning the inflation outlook.[6] Calculating the expected real rate sounds like simple arithmetic: just subtract the inflation premium and the risk premium from the nominal rate.

THE REAL RATE ARITHMETIC HAS DIFFICULTIES...

Unfortunately, information about the expected inflation and risk premium components of interest rates is very hard to come by. How do we know, for example, what credit market participants expect inflation to be? One way is to ask them. But there are no comprehensive surveys of the inflation forecasts of borrowers and lenders, presumably because no one has strong incentives to collect such information. Furthermore, it is not obvious that borrowers and lenders have the incentives to be as careful in responding to surveys as they are in investing their money. There are surveys of professional economists' forecasts of inflation, (well-known examples are surveys by Joseph Livingston and Robert Eggert) but it is far from obvious that the average of such forecasts coincides with the average sentiment of credit market participants. Another shortcoming of such surveys is that they seldom contain inflation predictions for more than one year ahead. This makes it impossible to use the surveys to gauge long-term real rates of interest. Yet it is long-term real rates that probably matter most for certain key decisions, such as whether to build a new plant or to buy a house.

An alternative to extracting an average expected inflation from survey information is to forecast inflation using econometric models. But this method also has some difficulties. For one thing, the various forecasting models commercially available do not agree closely in their predictions of inflation, particularly over periods longer than a year. Furthermore, these longer-term forecasts have not been very accurate, which raises the question of whether inflation is inherently unpredictable or whether the models are not very good. In sum, while there are available measures of inflation expectations, they are of limited scope and doubtful quality.

While information on anticipated inflation is flawed, data on risk premia are virtually nonexis-

[5] For a more complete analysis of these concepts, see Simon Benninga and Aris Protopapadakis, "Real and Nominal Interest Rates Under Uncertainty: The Fisher Theorem and the Term Structure," *Journal of Political Economy* 91 (October, 1983).

[6] If there is some prospect of default on repayment of interest on principal, still another kind of premium gets built into a security's yield—a default risk premium. The securities we discuss in what follows— Treasury issues—are presumed to be free of default risk.

tent. There is no way to measure in any direct way the size of the risk premium. Nor has anyone developed a reliable technique for estimating the risk premium. Some analysts have tried to avoid this difficulty by assuming that the risk premium is zero (there is no risk premium), but there is no strong evidence to support that presumption. That neither the inflation premium nor the risk premium can be measured with much precision makes it very difficult to use the arithmetic procedure to determine the expected real rate of interest.

...AND SO DO ALTERNATIVE APPROACHES

The difficulties with the real rate arithmetic have prompted some economists to try an alternative method for estimating the expected real rate. They note that it is easy to calculate an "after-the-fact" or ex post real rate by simply subtracting the actual inflation rate over the horizon of a loan from the nominal rate on the loan.

If economists can uncover a set of factors—an econometric model—which explains the ex post real rate, then it should be possible to use that model to estimate the expected real rate. Factors that have been used to explain ex post real rates include the behavior of real GNP, investment, federal deficits, money growth, and inflation.

There are several difficulties with this approach to estimating expected real rates, however. First, the statistical methodology assumes that market expectations of inflation *were correct on average* over the horizon of the interest rate in question. While this may be a valid view over long periods of time and during periods of relatively stable policy, it probably doesn't hold over shorter periods or when the policy environment is changing. A second difficulty is that this approach fails to take account of the behavior of the risk premium. If the economy is characterized by changing risk premia, the ex post rate approach will mismeasure the expected real rate of interest. Thus, both the arithmetic and ex-post rate approaches to estimating expected real rates seem unsatisfactory.

CAN THE MARKET REVEAL REAL RATES OF INTEREST?

Markets frequently are touted as sources of cheap information. By relying on prices to convey information about relative demands and supplies, for example, both buyers and sellers can avoid collecting huge amounts of data to help them decide how to behave. Unfortunately, no market currently conveys direct information about the real rate of interest. But it may be possible to create such a market.

The prospect, which has been suggested on a number of occasions in recent years, is for the U.S. Treasury to offer bonds which are indexed to a measure of the price level. The amount of interest and principal paid on indexed bonds (the yield) is adjusted in line with movements in the designated price index.[7] If inflation increases during the second year of a two-year security, for instance, the yield to the bond holder automatically rises, while if inflation falls, the yield falls.[8] One of the advantages these bonds offer is that the interest rate quoted on them in the financial press would be the expected real rate of interest on these securities. In other words, now you can open the *Wall Street Journal* and answer the question we posed earlier: "What's the real rate of interest on Treasury bills this week?"

The market reveals a real rate because holders of index-linked securities will be compensated for whatever inflation occurs over the life of a loan contract, so they need not build any inflation forecast into the rate they require for lending. Morever, the yield on index-linked bonds need contain no "risk premium" against unexpected future inflation, since inflation will not erode

[7]There are two possible types of indexing. One is to add the amount of actual inflation to the agreed upon coupon payment. Thus if inflation turns out to be 6 percent and the agreed upon coupon rate is 2 percent, the total interest paid would be 8 percent. An alternative method is to pay the agreed upon coupon rate but to increase the face value of the nominal bond by the inflation rate. In the example above the coupon payment would be only 2 percent but the face value of the bond would increase by 6 percent. Since both methods of indexing insure the purchasing power of the owner of the bond against inflation, the agreed upon coupon rate is the real rate of interest.

[8]There are, of course, a number of details that would need to be specified in an indexed-bond contract, including the specific price index to be used, the frequency of adjustment, procedures for handling issues such as possible revisions in the index and the tax treatment of the index-related compensation. In a highly developed market for such securities, bonds indexed to different price-level indices might well be available, just as options on several different stock-market indices are now available.

future purchasing power. The quoted yield on an indexed security is the real rate, pure and simple.

Treasury issues of indexed securities would, of course, provide direct information only about real rates on government bonds. It would still be necessary for people and businesses to estimate real rates on other kinds of assets.[9] However, the changes in the yields on indexed securities would provide valuable information as indicators of probable changes in other real rates. These other rates would be expected to change when indexed-bond yields change because investors can choose to hold either kind of security in their portfolios. A rise in yields on indexed bonds would therefore require a rise in other real rates to make those other assets as attractive as indexed-linked securities.

From the viewpoint of monetary policymaking, indexed bonds would fill a crucial need. Fed decisionmakers would have a very important indicator of the economic impact of monetary policy, which could alert them that a particular policy course may have run "too far." From a monetary policy standpoint it would be most useful to have indexed Treasury bonds in a series of maturities. Information about changes in short-term real rates could then be distinguished from changes in long-term real rates. Such a distinction is important because the movement of real rates at different maturity classes yields information about different aspects of real economic activity. Short-term real rates generally affect working capital and inventory decisions, for example, while long rates affect the outcomes for housing and for investment in plant and equipment.

Indexed bonds are likely to answer certain needs for consumers and businesses even beyond providing valuable information. Investors cannot presently purchase insurance against unexpected inflation in the form of indexed securities; nor is it easy to think of a way for investors to combine purchases and sales of other assets that will guarantee preservation of purchasing power against inflation. Consequently, indexed bonds would have to make at least some investors better off.

The ramifications of having indexed bonds are, in fact, even broader. In a world without indexed bonds, the government can end up, in a sense, defaulting on some of its debt if inflation is in excess of what people expect. Suppose people purchasing Treasury securities anticipate 6 percent inflation, but government policies produce a 10 percent rise in the price level. Then each dollar of debt the government repays yields 4 percent less purchasing power than people expected when they bought the bonds. The government has repaid its nominal debt, but has "defaulted" in terms of purchasing power. Many economists believe that this possibility of defaulting weakens the government's incentives to prevent surprise inflations.[10] With indexed bonds, however, the government simply cannot "default" on its debt in purchasing power terms.

CONCLUSION

There is much to be said in favor of proposals for the U.S. Treasury to begin issuing index-linked securities. Policymakers would benefit from the availability of improved information, and if better information produced better policies, then everyone would be better off. In addition, investors are likely to gain from the existence of such bonds. Financial markets have fostered a large number of innovations in recent years which provide more information and allow investors to better manage risks, including a wide range of financial futures contracts, options, and even options on futures. The substantial growth in the volume of these new assets suggests there is a large demand for securities which allow investors to manage risks better and which reveal information. Indexed-linked securities would make a welcome addition to the menu of such assets.

[9]The private sector's failure to provide index-linked securities has been a puzzle to financial economists. Some have argued that risk considerations militate against the use of indexed-bonds by businesses. In particular, since actual inflation is unpredictable, corporations issuing indexed securities commit to an unknown stream of future interest payments. And there is no guarantee that the price of its own products will match up well with the rate of inflation. The real interest rate *in terms of its own products* is therefore uncertain if it issues indexed bonds.

[10]See T. Sargent and N. Wallace, "Some Unpleasant Monetarist Arithmetic," Federal Reserve Bank of Minneapolis *Quarterly Review* (Fall, 1981) pp. 1-18.