

## **Roger W Ferguson, Jr: Equilibrium real interest rate - theory and application**

Remarks by Mr Roger W Ferguson, Jr, Vice-Chairman of the Board of Governors of the US Federal Reserve System, to the University of Connecticut School of Business Graduate Learning Center and the SS&C Technologies Financial Accelerator, Hartford, 29 October 2004.

\* \* \*

I want to thank the University of Connecticut for providing me this opportunity to comment on the important and challenging concept of the equilibrium real interest rate and its relevance to monetary policy. I will use this occasion to discuss the role that estimates of the equilibrium real federal funds rate can play in thinking about the desired degree of policy accommodation. Those views, I should add, are my own and are not necessarily shared by anyone else in the Federal Reserve System. I hope that at the end of this talk you will conclude, as I do, that while the concept of the equilibrium real rate is a useful aid in thinking about setting monetary policy, it is not measured and observed with such precision as to provide a practical guide to the appropriate stance of policy.

### **Current situation**

As the most recent statement of the Federal Open Market Committee (FOMC) made clear, the U.S. economy appears to have moved out of the soft patch that characterized the second quarter. Supported by ongoing advances in productivity and the attendant increases in real incomes, household spending has picked up. Businesses, for their part, seem to have shaken off at least some of their hesitancy to spend, although the subdued pace of hiring may signal that they still retain a wary attitude toward making important commitments. But the strengthened balance sheets of the business sector, along with buoyant cash flow, should provide firms with the wherewithal to fund a healthy expansion of the capital stock in coming quarters. No doubt the recent run-up in energy prices poses some challenges, but the evidence indicates that, without some further material shock, aggregate demand is on a track consistent with sustained economic growth. That should gradually return the economy to full utilization of its resources, while inflation remains subdued.

The FOMC was confident enough about its assessment of the vigor of spending to indicate in its most recent statement that it continues to believe that policy accommodation can be removed at a pace that is likely to be measured. That begs the question, of course, of how the Committee can be sure that policy is currently accommodative.

I find it instructive to first consider how not to measure policy accommodation. In particular, the fact that the nominal federal funds rate remains quite low does not, by itself and without context, signal that policy is loose. After all, spending decisions should depend on real, not nominal, determinants, including the real federal funds rate, which is the nominal federal funds rate less prevailing inflation expectations. Although backward-looking measures of inflation - such as the four-quarter growth in core personal consumption expenditure (PCE) prices - imply that the FOMC's cumulative 75 basis points of tightening so far this year has moved the real federal funds rate into positive territory for the first time in almost three years, that observation is not sufficient to calibrate the stance of policy. For example, the U.S. economy expanded at about the same average pace from 1981 to 1990 and from 1991 to 2000. In the earlier period, however, the real short-term rate averaged 4-3/4 percent whereas in the more recent one the real rate was 2 percentage points lower. Clearly, prevailing conditions matter in determining the degree of policy accommodation. It is only against a backdrop of an economy that seems poised to maintain sustained and solid economic growth, even as the funds rate rises, that the FOMC can determine that current policy is accommodative.

### **The equilibrium rate in theory**

What is needed is a benchmark summarizing the economic circumstances - including, among other variables, the underlying strength of aggregate demand, the level of aggregate wealth, and economic developments in our trading partners - combining to shape the expansion of activity and the extent of pressures on inflation. One way of providing that benchmark is to consider what level of the real federal funds rate, if allowed to prevail for several years, would place economic activity at its potential and keep inflation low and stable. If the actual real rate is below that benchmark level, policy can be

viewed as accommodative, in that if that stance were maintained, ultimately pressures on resources would build. If the actual real rate is kept above that benchmark level, policy would seem to be contractionary. This definition makes clear that the most relevant aid in policymaking is an intermediate-run measure, in that there may be forces at work in the shorter run that push spending away from potential output even if the real rate were pegged at this benchmark rate. It also makes clear that the concept involves a good amount of judgment - indeed, the same judgment that goes into making any economic forecast - about the determinants of spending, the trend of productivity, and the forces affecting inflation in the intermediate term.

Economists famously cannot agree on much. In this case, we cannot even agree on the name of the benchmark concept that I have just described. The real interest rate consistent with the eventual full utilization of resources has been called the equilibrium real federal funds rate, the natural rate of interest, and the neutral real rate. I prefer the first name, the equilibrium real federal funds rate, because, by using the word "equilibrium," it reminds us that it is a concept related to the clearing of markets. Even if economists settled on a name, however, we are not likely to agree on a single model to describe a system as richly complicated as the U.S. economy. Thus, there are as many ways of estimating the equilibrium real federal funds rate as there are different economic models.

There is, however, one way of estimating the equilibrium real rate that I do not find especially convincing. Some economists derive point estimates of the equilibrium real rate by taking averages of the actual real rate over long periods of time. True, over a long-enough sample period, resource slack probably averages near zero, which suggests that the sample average of the real interest equals the equilibrium real rate. But decisions about the sample period - whether to include low-real-rate stretches, such as the 1950s, or high-rate periods, such as the early 1980s - have material bearing on the estimate. This indicates to me that there can be significant and persistent deviations in the equilibrium real rate from the observed long-run average measured over decades. The average interest rate that seems to have brought aggregate demand and aggregate supply into rough balance in the past may not be the same rate required in every conjunctural setting. Our inability to equate the long-run average interest rate to the equilibrium real interest rate that is relevant for setting policy is not surprising given the manner in which economic behavior, technology, and government policy can change over time. Put another way, an estimate derived from long-run observations may not be relevant for policy for two reasons. First, economic conditions during the policy-relevant period might differ from the average conditions during the observation period. Second, the economy changes in ways that tend to limit the relevance of historical observations for policymaking.

That said, policymakers do strive to understand what the equilibrium real interest rate will be over the long run, but that is a forward-looking notion that depends on our sense of how the forces of productivity and thrift will evolve over time as measured in decades. An understanding of a likely long-run level of the equilibrium real rate is useful, even though the level is not directly observable, because it provides a general sense of the level that would, over that longer period, allow aggregate supply and demand to move into balance, given the evaluation of secular forces such as productivity and population growth. Such an understanding of the longer-term prospects for the real interest rate aids in identifying variations in the concept over the intermediate run that is relevant for setting monetary policy - a period of several years, when cyclical forces dominate.

Critically, such deviations in the intermediate run can be especially important for policy choice. For example, an unusual hesitancy on the part of businesses to hire and spend emerged in 2001 after the collapse of equity prices and was subsequently reinforced by corporate-governance concerns; this hesitancy could be thought of as pulling the equilibrium real federal funds rate down temporarily below its longer-run value. In addition, other forces may also have weighed on growth, making it appropriate to move the real funds rate below the intermediate-run equilibrium for a time. From that perspective, the FOMC's reduction in the actual nominal federal funds rate over this period from the level of 6-1/2 percent that prevailed at the beginning of 2001 to the forty-five-year low of 1 percent by mid-2003 had three components: (1) A reduction to match the decline in inflation expectations so as to prevent the real funds rate from rising inappropriately, (2) an effort to chase a downwardly moving equilibrium real rate given the pressures on aggregate demand, and (3) an effort to bring the actual real rate below its apparently lowered equilibrium to provide sufficient stimulus to cope with transitory adverse factors and to speed the recovery in production and employment. So while the real federal funds rate ultimately was pushed below zero, the extent of policy accommodation was less exceptional, in that many estimates of the equilibrium real rate had also fallen significantly. This is a tangible recent example of the need both to judge how the equilibrium real interest rate that is relevant

for policy might have changed from a perceived long-run level and to set policy against the background of such an understanding.

Indeed, in my judgment, the lingering hesitancy of businesses to make commitments, the restraint imposed on domestic consumers from an increase in the cost of energy, and the drag on domestic production from the excess of imports over exports all represent forces pulling the equilibrium real federal funds rate below its perceived longer-term level. And, in the context of well-contained inflation, the evidence of remaining underused resources gives us a good reason to hold the real rate below even the intermediate-run notion of its equilibrium to allow the economy to be firmly set on a path that will shrink the pool of these underused resources over a reasonable period. But as the expansion regains its footing and resource slack is worked down, we should expect both that the equilibrium real rate will move toward its longer-run level and that policymakers will no longer find it appropriate to keep the actual rate below its equilibrium. That is, the FOMC will likely be removing its policy accommodation over time.

### **The pace of return to equilibrium**

I have thus far argued that the equilibrium rate that is relevant for actual policy determination can only be judged in the context of forces influencing economic developments.

Several aspects of the current outlook lead me to suspect that the return of the equilibrium real rate from its currently somewhat depressed level to its long-run value might plausibly be expected to be gradual and attenuated compared with historical experience. Let me highlight just three of these aspects. I have already mentioned the role of business hesitancy in determining the past trajectory of monetary policy. Clearly, if evidence of that hesitancy remains - for example, if the labor market were to remain sluggish - that might be one indication that the return of the equilibrium rate to its longer-run level is likely to be relatively gradual. Secondly, the household saving rate has fallen to less than 1 percent, quite low in its range of historical variation. If households, on net, take steps to return the saving rate closer to the middle of that range (which, I might add, would provide welcome support to capital accumulation), then a sustained period in which consumption grows more slowly than income would result. Third, given government budgetary trends, some fiscal restraint is in order, and one might expect that those responsible for fiscal policy will move that policy to a more-balanced position (another development I would welcome), thereby removing some fiscal impetus. I believe that the combined force of these three factors restraining aggregate demand, plus others that I have not mentioned, would require a lower real rate than otherwise to avoid economic slack.

Let me add, however, that there is a powerful force tending to make the equilibrium real rate higher than it would otherwise be. The rapid expansion of labor productivity has raised the growth of economic potential, increased permanent income and wealth, and created an important inducement to add to the capital stock. All else equal, a higher growth rate of productivity will be associated with a more elevated equilibrium real rate. As long as productivity grows steadily at its recent pace, however, there is no reason to suspect that it will produce a change in the equilibrium real rate. In addition, the factors that I mentioned above might not unfold as hypothesized. Business hesitancy might lift abruptly and would be evidenced by large increases in business demand for capital and labor resources; households might maintain a very low savings rate; and government policy might not return quickly to a more-balanced posture. Any of these factors might imply that the equilibrium rate relevant for policy returns more quickly to, or even moves above, its long-run level as fewer forces weigh on aggregate demand.

Recognizing the uncertainty regarding these various forces and the interplay among them, I believe it important that the FOMC calibrate the return of policy to the equilibrium real rate so that the process is neither hasty nor overly attenuated. Clearly, incoming data and the implications for the outlook should play a particularly important role in policy determination at this juncture. However, theory and practice both indicate that policy works with long and variable lags. Therefore, the actual stance of policy will have to approximate more closely the equilibrium real rate before the pool of underutilized resources is fully exhausted. Otherwise, we risk a buildup of inflationary pressures. Clearly the execution of policy will require careful evaluation as the FOMC attempts to judge both the equilibrium rate that is relevant and the pace of removal of accommodation that is appropriate.

## Estimating the equilibrium rate in practice

So much for the generality of theory. Economists have taken a variety of tacks to arrive at measures of the equilibrium real federal funds rate. I will touch on two techniques in particular. The first can be thought of as a mechanical attempt to implement my definition - the level of the real federal funds rate that, if allowed to prevail for a couple of years, would place economic activity at its potential - in models of the U.S. economy. For instance, we can use the many equations of a large-scale macroeconomic representation of the U.S. economy, such as the Federal Reserve Board's staff model, FRB/US, to calculate at any point in time the level of the real rate that would eliminate economic slack in a reasonable period of time. Or we can rely on a reduced-form description of the economy that measures the output gap in terms of the actual real short rate. The value of the real rate that will move that gap to zero can be thought of as the equilibrium real rate. Besides the assumptions undergirding the construction of either model, such a calculation will require judgment in determining what is a "reasonable" period of time and how to cope with the run of prediction errors that are inevitable when trying to explain economic data.

An attempt to employ a large model to calculate the equilibrium nominal federal funds rate can be found in an article by Antulio Bomfim.<sup>1</sup> Using the MPS model, the predecessor to the Board staff's current model, Bomfim found that the equilibrium nominal funds rate varied in a range from 2 percent to 14 percent over the period from 1965 to 1994, implying that his estimate of the equilibrium real rate turned negative at times. Laubach and Williams opted for the single-equation approach and estimated that the equilibrium real funds rate was around 3 percent in mid-2002 but that it varied from as low as 1 percent in the early 1990s to as high as 5 percent in the late 1960s.<sup>2</sup> In addition to exhibiting large swings, the Laubach-Williams point estimate of the equilibrium rate is a very uncertain statistic. The confidence interval around the estimate is such that there was a 70 percent probability that the actual value of the equilibrium real rate was between 0.5 percent and 5.5 percent. Clearly, this estimate is not measured sufficiently precisely to be a useful guide to policy.

An alternative approach turns to financial markets to infer the market's assessment of the longer-term prospects for real interest rates. Since 1997, the U.S. Treasury has been issuing price-index-linked securities providing an assured real return. With about \$250 billion of these inflation-protected securities now outstanding, we can get readings along the entire maturity structure of real interest rates. Currently, for instance, real short yields are close to zero, and longer-term rates are at about 1-5/8 percent. One could presume that the forward real rate of interest implied by yields on longer-term indexed debt - or the real return provided, say, over the period five to ten years from now - conveys a sense of market participants' view of the long-run equilibrium real interest rate.<sup>3</sup> Unfortunately for such an inference, however, longer-term yields embody expectations of future interest rates, a term premium, and potentially a premium for the relative illiquidity of these instruments, so this technique will provide an overestimate of the equilibrium real rate.

## Conclusion

This brief discussion highlights the uncertainties attending any attempt to measure the equilibrium real rate. I find these measures useful teaching tools to describe the complicated and iterative process of forecasting the path of the economy so as to arrive at the appropriate stance of policy. However, I believe it to be very important that the FOMC not go on a forced march to some point estimate of the equilibrium real federal funds rate. In my judgment, we should remove the current degree of accommodation at a pace that is importantly determined by incoming data and a changed outlook. Our knowledge of the workings of the economy is sufficiently imprecise that we could not attach much confidence to any single calculation that one might make of the equilibrium rate. Moreover, history provides a daunting record of challenges to economic forecasting associated with changes in

---

<sup>1</sup> Antulio Bomfim (1997), "The Equilibrium Fed Funds Rate and the Indicator Properties of Term-Structure Spreads," *Economic Inquiry*, 54(4), pp. 830-46.

<sup>2</sup> Thomas Laubach and John C. Williams (2003), "Measuring the Natural Rate of Interest," *Review of Economic Statistics*, 85(4), pp. 1063-70.

<sup>3</sup> See, for instance, Antulio Bomfim (2001), "Measuring Equilibrium Real Interest Rates: What Can We Learn from Yields on Indexed Bonds?" Finance and Economics Discussion Series 2001-53 (Washington: Board of Governors of the Federal Reserve System).

economic behavior, the evolution of technology, and swings in governmental policy that would suggest that the equilibrium can vary over time. In such circumstances, the performance of the economy will provide feedback to assess the level of the equilibrium real federal funds rate over time.