

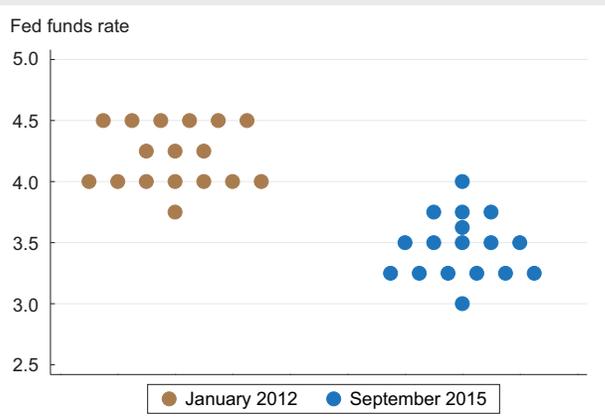
## The Long-Run Natural Rate of Interest

Charles T. Carlstrom and Timothy Stehulak

There has been a lot of speculation lately about whether the natural rate of interest has fallen, and if so, by how much. There are many related definitions of the natural rate, but we will define it as the real (inflation-adjusted) safe interest rate that the economy will converge to over time. This can be thought of as the neutral interest rate in the long term, that is, the real interest rate consistent with the central bank's inflation and employment mandates. It is important to remember that this interest rate is not a policy choice but instead is governed by factors such as world savings and interest rates, productivity growth, and demographics. We will look at estimates of long-term real interest rates and the preceding factors.

One way to estimate the natural rate is to take the long-range federal funds rate projection of Federal Open Market Committee members as a measure of the long-term nominal interest rate, and subtract the Committee's inflation objective, since it is anchoring longer-run inflation expectations. In January 2012, the median forecast of Committee members for the funds rate in the longer run was 4.25 percent. In September

Survey of Economic Projections: Long-Run Fed Funds Rate



Source: Board of Governors of the Federal Reserve System.

2015, it had fallen to 3.5 percent, a 75 basis point decline. Subtracting the Committee's inflation objective of 2 percent from each of these forecasts means the long-run real interest rate fell from 2.25 percent to 1.5 percent.

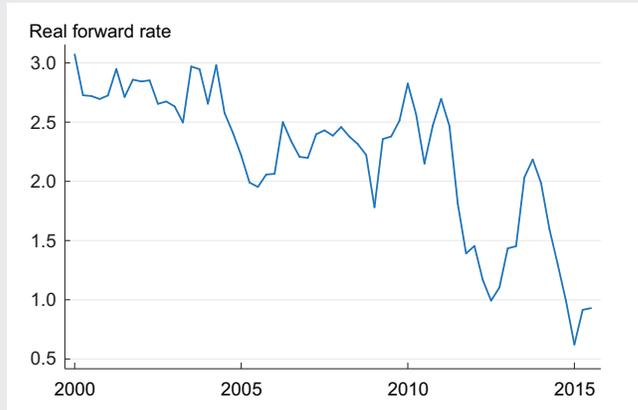
Another way of estimating what real interest rates are expected to be in the longer run is to calculate what markets expect them to be on average between five and ten years from now. We use five- and ten-year government bonds to estimate the longer-term nominal interest rate, which we then adjust for expected inflation using estimates from a model developed by the Federal Reserve Bank of Cleveland. This calculation also suggests a decline in the natural rate of interest. Prior to 2012 this measure of long-term real interest rates averaged more than 2 percent. Recently, however, it has averaged less than 1.5 percent. The decline is around 75 basis points.

One factor that may affect long-run real interest rates is long-run global interest rates. We see that the decline in interest rates has not been confined to the United States. There have been even more dramatic declines in Germany, France, and the United Kingdom. Before the recession, nominal interest rates in these countries were around 4 percent. These fell around 2 percentage points to 2 percent after the start of the recession, and currently they are even lower, around 1 percent. Though these figures are not adjusted for inflation expectations, they still suggest that the natural rate of interest may have fallen in these countries as well. Lower world-wide interest rates feed into lower domestic interest rates.

Another factor influencing the real natural rate of interest is productivity growth. Before the recession, it averaged 1.4 percent, but since the start of the recession, it has averaged only 0.4 percent—a full percentage point decline. Lower productivity growth depresses the real interest rate, all else equal.

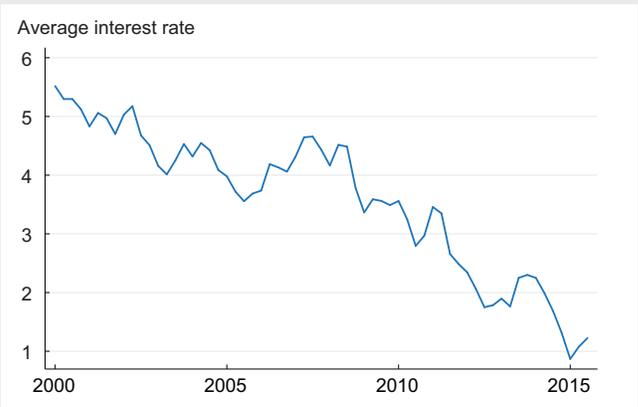
Yet another factor influencing real interest rates is population growth. Since 2000, population growth has declined approximately 0.4 percent from 1.1 percent to 0.7 percent. Lower population growth tends to lower the real interest rate.

### Real Five to Ten-Year Forward Rate for Government Bonds



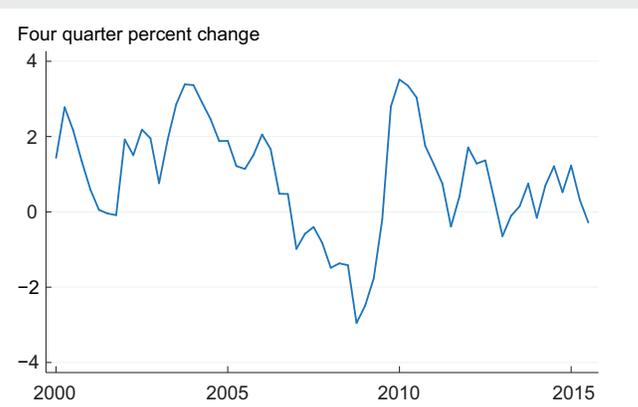
Sources: Board of Governors of the Federal Reserve System, Federal Reserve Bank of Cleveland.

### Ten-Year Interest Rate on European Government Bonds



Note: Simple average of 10-year bonds from UK, France, and Germany. Source: Bloomberg.

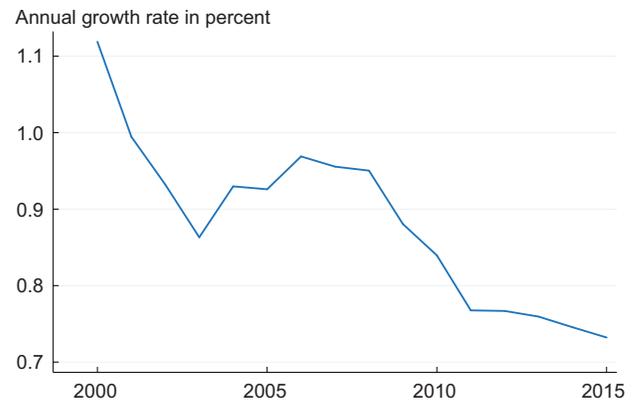
### Total Factor Productivity Growth



Note: Total factor productivity for business sector. Source: Federal Reserve Bank of San Francisco.

By every measure we have considered, it appears that long-term real interest rates have declined. On average since the recession, this decline is probably in the neighborhood of a full percentage point. In terms of monetary policy, this result does not bear so much on the argument about whether or not to increase interest rates shortly. But it does suggest that interest rates will increase more gradually than in past recoveries.

### United States Population Growth Rate



Source: US Census Bureau.



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