Analysis

The natural rate of interest – a useful but uncertain indicator for the economy

Monetary policy | 12 October 2016 | Lauri Vilmi

AUTHOR



Lauri Vilmi
Senior Adviser

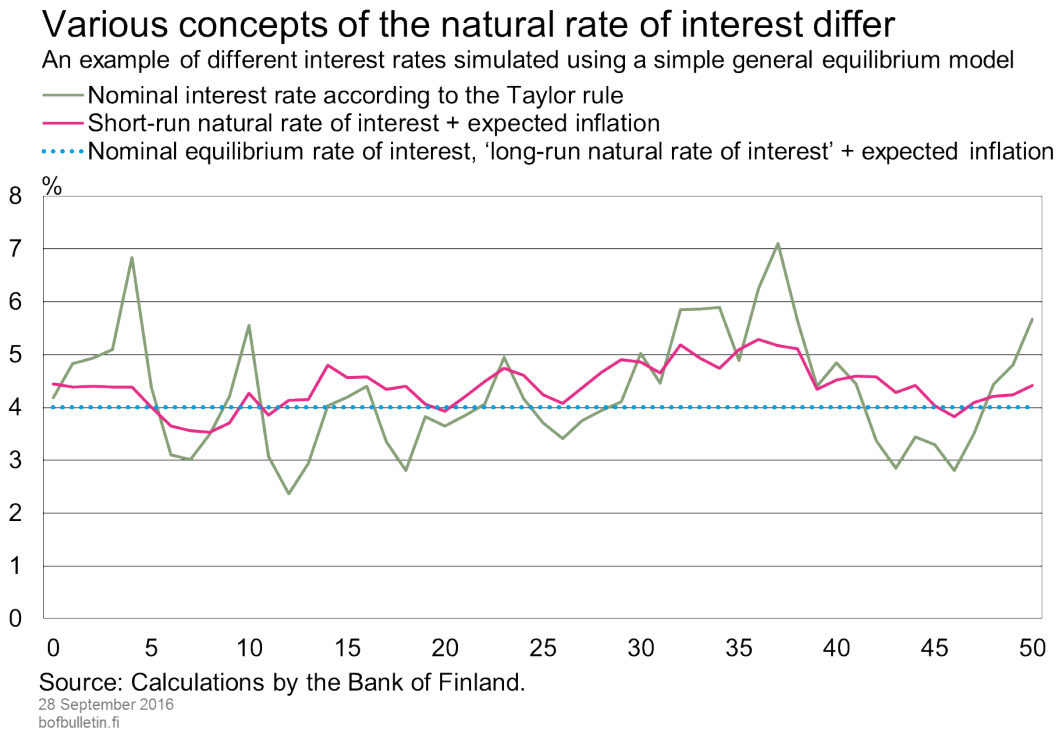
The natural rate of interest is the real interest rate that brings the economy into equilibrium and would prevail if the output of the economy were at its potential level, i.e. in a situation where the economy is neither in an upswing nor in a downswing. The equilibrium would lead to stable inflation over the long term. During the last 10 years, the natural rate of interest in the advanced economies is estimated to have declined substantially. This not only affects the assessment of current monetary policy but also the future challenges facing monetary policy. However, estimates of the level of the natural rate of interest are very uncertain, which hampers the use of this interest rate as a monetary policy guide.



What is meant by the natural rate of interest?

Interest rates have already fallen for several years in most advanced economies. This has also been the case in the euro area. A partial driving factor behind the interest rate decline has been the accommodative monetary policy, conducted as a response to weakening inflation and growth prospects (Chart 1). Despite the prolonged period of low interest rates, economic growth has remained sluggish, and the estimated closing of the negative output gap has been slow. Behind this may lie the decrease of the natural rate of interest, i.e. the equilibrium real interest rate, which has dampened the stimulating impact of low interest rates. The concept of the natural rate of interest originates from Wicksell (1898), who defined it in respect of prices as a neutral interest rate. There are many interest rates on the financial markets. Analyses of the natural rate of interest typically focus on the level of, and changes in, the risk-free short-term, e.g. 3-month, real interest rate.

Chart 1.

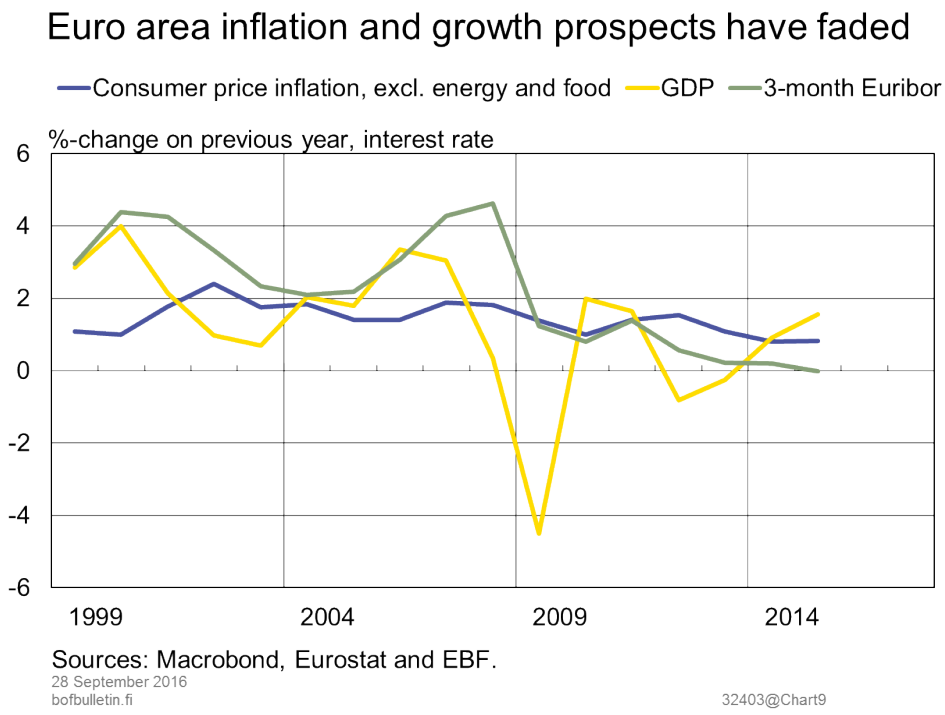


Although the natural rate of interest provides a useful benchmark for measuring the stance of monetary policy, its interpretation is complicated for a variety of reasons. The natural rate of interest is not observable, but it must be estimated on the basis of uncertain calculations using another unobservable factor, i.e. potential output. Therefore, the calculation of the natural rate of interest relies on the use of complex statistical methods, in which a number of assumptions need to made. The results obtained are sensitive to such assumptions.

Different interpretations have also been put forward regarding the concept of the natural rate of interest. Laubach and Williams define the natural rate of interest as an interest rate that would prevail in the economy in the absence of shocks.[1] According to this interpretation, the economy would ultimately stabilise at the level of the natural rate of interest. This may, however, take several years, even a decade. This definition of the natural rate of interest can, in fact, be regarded as a long-run approach. By contrast, in general equilibrium models, the natural rate of interest is understood to mean an interest rate that would close the output gap if there were no nominal rigidities present in the economy.[2] The natural rate of interest according to this short-run definition shows strong variation over time as a consequence of business cycles, for example. Even so, an interest rate level providing the optimal short-term path for economic growth and price stability could deviate from both of these natural rate of interest levels.

A notional example can be used to illustrate the concepts of different interest rates in a simple three-equation general equilibrium model, in which prices respond with a lag (price rigidities) to changes in demand and which is subject to shocks affecting both output and prices (Chart 2). One can see that the short-run natural rate of interest according to general equilibrium models varies strongly along with business cycles. However, the level of the natural rate of interest according to the short-run approach should fluctuate around the equilibrium interest rate over the longer term. In the absence of shocks, the economy would also conform to this interest rate level. The equilibrium interest rate is, by definition, close to the level of the long-run interest rate referred to by Laubach and Williams. Although this model example assumes a constant long-run equilibrium, the long-run natural rate of interest, in reality, also fluctuates over time, reflecting changes in the structures of the economy, such as volatility in the growth rate of potential output as well as changes in savings behaviour, such as the rate of time preference. Holston, Laubach and Williams, for example, have estimated changes in the level of the natural rate of interest at long horizons.[3]

Chart 2.



Even if the natural rate of interest leads – assuming a state of equilibrium – to the closing of the output gap and stable inflation over the long term, it is not, however, the interest rate level consistent with the objective of monetary policy over the short term. This is because the link between the output gap and inflation may change over time, for example as a result of cost shocks impacting price setting, prices responding slowly to changes or several different rigidities in the

real economy (such as those relating to the labour market or investments). The slow closing of the output gap would then be insufficient to restore desired rates of inflation, and the interest rate set for monetary policy purposes must be different from the natural rate of interest. With the actual real interest rate staying below the natural rate of interest, economic growth picks up, adding to price pressures and boosting inflation, which has been brought down, for example, by an external shock, and thereby helping to achieve inflation rates consistent with the central bank's target. Correspondingly, the opposite will be the case when the interest rate is above the natural rate of interest.

An interest rate according to the Taylor rule[4] is often seen as representing a guide for monetary policy, and it has also been a good indicator for central banks' behaviour in reality. In a simple model, policies based on the Taylor rule are also very close to optimal monetary policy.[5] Although the interest rate according to the Taylor rule differs from the natural rate of interest over the short term, these interest rates show co-movement over the longer term (see Chart 2).[6]

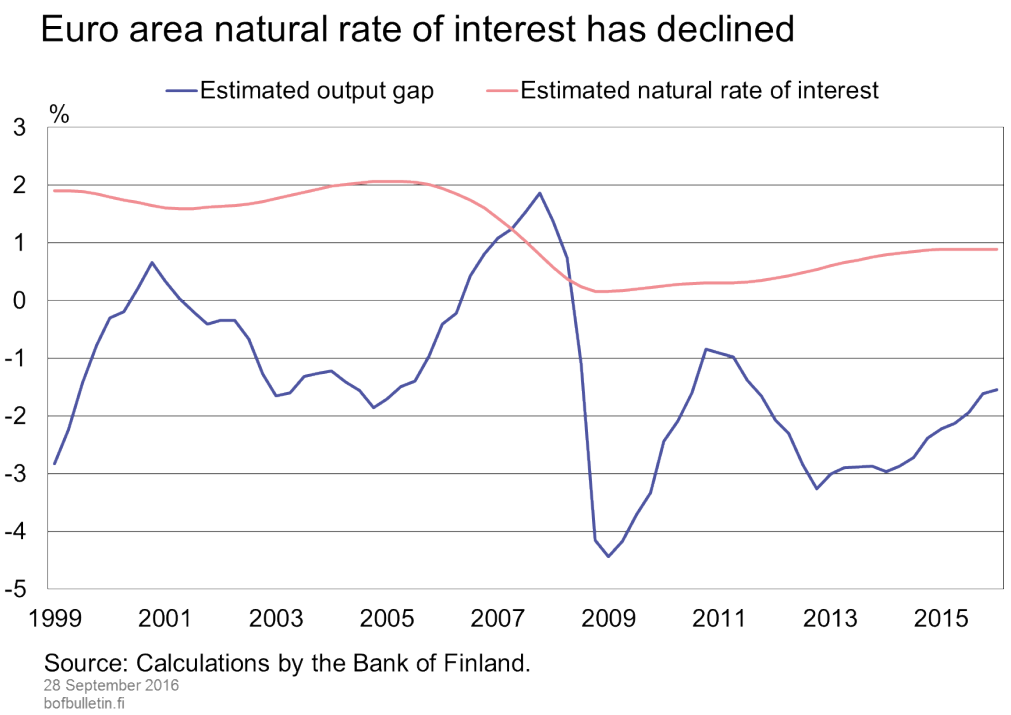
The level of the natural rate of interest has fallen in the euro area

Since there is no explicit standardised way of estimating the natural rate of interest, analysis of the natural rate of interest and its deployment as a measure of the state of monetary policy incorporate a considerable degree of uncertainty. With the interest rate prevailing at its natural level, however, the output gap should close over time. It is therefore possible to measure the level of the natural rate of interest if the output gap and the impact of an interest rate change thereon are known. There are significant challenges, on the other hand, associated with estimating the output gap.[7] Laubach and Williams sought to gauge the long-run natural rate of interest in 2003 by making use of the Kalman filter in the context of a simple macroeconomic model estimation. In their method of calculation, the level of the natural rate of interest is affected by the growth rate of the economy's potential output and by shocks to the willingness to save or invest.

The euro area long-run output gap and natural rate of interest can be examined on the basis of the definition and model by Laubach and Williams (Chart 3).[8], [9]

According to the estimates thus obtained, the slowdown of growth in potential output has in recent years caused the level of the natural rate of interest to fall from around 2% pre-crisis to less than 1%. These results are, in fact, accounted for almost entirely by deteriorating growth prospects. By contrast, in the results presented, other shocks affecting savings behaviour have had only a small impact on the natural rate of interest.

Chart 3.



The method applied in the calculations of the natural rate of interest incorporates, however, a considerable degree of uncertainty in respect of both the model employed and the statistical method. For example, according to the results recently presented by Holston, Laubach and Williams, the euro area natural rate of interest would have remained negative since 2011. The estimation by Holston, Laubach and Williams (2016)is based on an equivalent model but, compared with the above calculation presented here, they use data over longer periods and assume a bigger role for shocks affecting savings behaviour.

According to the results of both estimations, the slowdown of growth in potential output has been a significant factor weighing on the natural rate of interest. The European Commission's Spring 2016 Forecast suggests euro area potential growth has slowed to around 1% from the pre-crisis rate of around 2%. The subdued growth after the financial crisis reflects, in particular, the weak performance of total factor productivity.[10] Accordingly, the waning of the growth rate accounts for about 1 percentage point of the decline in the natural rate of interest during the period following the financial crisis. In the estimation of Holston, Laubach and Williams (2016), the slowdown of potential output also explains the bulk of the decline in the natural rate of interest in the United Kingdom, Canada and the United States.

The natural rate of interest entering negative territory in the euro area, as can be observed in the estimation of Holston, Laubach and Williams (2016), is accounted for by protracted and

considerable changes in the willingness to save. The driving factors behind such changes might include, for example, increased uncertainty, changing production structures or population ageing.[11], [12] By contrast, the short-run natural rate of interest according to the general equilibrium model could temporarily move into negative territory, driven by business cycles or other provisional shocks, for example.

Measured in terms of several different methods, the current level of the natural real rate of interest is exceptionally low, compared with pre-crisis interest rates of close to 2%. Different estimation methods for the natural rate of interest point to low and possibly even negative levels for the natural rate of interest. Constâncio goes through estimates of the natural rate of interest calculated using different methods, and these suggest that the interest rate would have declined in the euro area in recent years from the pre-crisis level of 1–2% to around -2–0%, depending on the method applied.[13]

Overall, the lower natural rate of interest is accounted for by the economy's uncertainty and weaker growth outlook. These may have added to the willingness to save and dampened the willingness to invest. In order for the economy to be balanced and for saving and investment to be equally high, the equilibrium interest rate must fall to a new level. However, different estimation results assign a role of different size to the interest rate decline and the factors contributing to it.

The level of the natural rate of interest appears to have declined not only in the euro area but also in other advanced economies. Holston, Laubach and Williams (2016) estimated that the interest rate has dropped after the financial crisis to 1.5% in the United Kingdom and Canada and to around 0.5% in the United States. They also find that natural rates of interest move globally to the same direction. This is, in part, explained by interdependencies between the economies, for example in respect of the financial markets and external trade, as well as by expectations of future global growth that have been downgraded, particularly after the financial crisis.

Where is the natural rate of interest heading?

The exceptionally low nominal interest rates prevailing during the current crisis have not so far led to strong economic growth or inflation. The output gap is thus estimated to have remained negative. Inflation has also remained below the monetary policy target for a long time. This can be accounted for by exceptionally permanent and possibly new negative shocks to the economy, but partly also by the lower level of the natural rate of interest.[14]

This lower natural rate of interest, in part, explains why stimulating the economy and achieving price stability have required stronger post-crisis monetary policy measures than in previous

decades. These measures have triggered considerable cuts in both short- and long-term interest rates.

Even so, estimates of the exact level of the natural rate of interest and the causes of its decline are highly uncertain.[15]

For this reason, it is also challenging to assess how the natural rate of interest will develop going forward. According to several estimates, the level of the natural rate of interest has been exceptionally low for eight years, i.e. for longer than observed at any time earlier. Doubts have, in fact, been voiced about the possibility of the current low natural rates of interest remaining in place for many years to come.[16]

In so far as the lower natural rate of interest is explained by the decelerating growth of potential output, it may well remain lower than in previous years over an extended period of time. On the other hand, as long as economic growth is expected to remain positive, constantly negative natural rates of interest would require considerable permanent changes in households' savings behaviour. For example, should uncertainty about future earnings prospects grow, households would increase savings. Likewise, a higher degree of uncertainty would reduce willingness to invest. Both of these factors would bring the natural rate of interest down. However, savings rates have not risen to exceptional levels in Europe since the eruption of the crisis. It is therefore possible that temporary phenomena, such as the still ongoing debt reduction, potential structural changes in the economies and the temporary uncertainty caused by the euro area crisis, have been instrumental in holding back crisis recovery, have reduced the willingness to invest and thus may have influenced some estimates of the natural rate of interest.

If the natural rate of interest is to remain at its current low level, achievement of price stability will also require lower interest rates in the future than seen in earlier decades. Non-standard monetary policy measures would then be used more frequently than before in an effort to achieve price stability. Accordingly, discussions at the 2016 Jackson Hole Symposium focused on the potential challenges posed by low interest rates for the conduct of future monetary policy.[17]

It is, however, possible for the natural rate of interest to return back to a higher level over time in the context of a rebound of global growth, the dissipation of uncertainty or higher productivity.

The natural rate of interest is a useful, albeit uncertain, benchmark for the purpose of assessing how expansionary the stance of interest rate policy is at a given time. It seeks to measure the longer-run equilibrium interest rate level in the absence of effects from short-term shocks. Owing to short-term shocks and rigidities in the economy, optimal monetary policy differs from the natural rate of interest over the short term. Monetary policy design should therefore be based on

the inflation outlook and estimates of the size of the output gap.

Sources

Anttila, J. (2016) Onko elpyminen myytti (‘Is recovery a myth?’) Bank of Finland Bulletin 4/2016.

Constãnsio, V. (2016) The challenge of low interest rates for monetary policy. Speech at the Macroeconomics Symposium. Utrecht School of Economics.

Curdia, V. (2015) Why So Slow? A gradual return for interest rates. FRBSF Economic Letter, 12 October 2015.

ECB (2005) The (un)reliability of output gap estimates in real time. Monthly Bulletin, February 2005, 43–45.

European Commission (2016) Spring 2016 Economic Forecast: Staying the course amid high risks, Institutional Papers 25. May 2016. Brussels.

Galí, J. (2008)Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework. Princeton University Press.

Hamilton, J. – Harris, E. – Hatzius, J – West, K. (2015) The equilibrium real funds rate: past, present and future. NBER Working Paper 21476.

Holston, K. – Laubach, T. – Williams, J. (2016) Measuring the Natural Rate of Interest: International Trends and Determinants. Federal Reserve Bank of San Francisco Working Paper 2016–11.

Justiniano, A. – Primiceri, G. (2010) Measuring the equilibrium real interest rate. Economic Perspectives 1Q/2010, Federal Reserve Bank of Chicago, 14–27.

Laubach, T. – Williams, J. (2003) Measuring the Natural Rate of Interest. The Review of Economics and Statistics, November 2003, 85 (4), 1063–1070.

Laubach, T. – Williams, J. (2015) Measuring the Natural Rate of Interest Redux. Federal Reserve Bank of San Francisco Working Paper 2015–16.

Summers, L. (2014) U.S. Economic Prospects: Secular Stagnation, Hysteresis, and the Zero Lower Bound. Business Economics 49 (2), 65–73.

Taylor, John B. (1993) Discretion versus Policy Rules in Practice (PDF). Carnegie-Rochester Conference Series on Public Policy. 39: 195–214.

Wicksell, K. (1898) Interest and Prices. R.F. Kahn's English translation. London. Macmillan, for Royal Economic Society in 1936.

Williams, J. (2016) Monetary Policy in a Low R-star World. Federal Reserve Bank of San Francisco Economic Letter, 15 August 2016.

Williams, John C. (2016) Whither Inflation Targeting. Speech. Hayek Group, Reno Nevada, 6 September 2016.

Woodford, M. (2003) Interest and Prices. Foundation of a Theory of Monetary Policy. Princeton, NJ. Princeton University Press.

Yellen, J. (2016). The Federal Reserve's Monetary Policy Toolkit: Past, Present, and Future. Speech at the Jackson Hole Symposium, 26 August 2016.

Notes

1. Laubach – Williams (2003). ↑
2. See e.g. Curdia (2015), Justiniano – Primiceri (2010) or Woodford (2003). ↑
3. Holston – Laubach – Williams (2016). ↑
4. See e.g. Taylor (1993). ↑
5. See e.g. Galí (2008). ↑
6. In the simple example in Chart 2, the differences between the Taylor rule interest rate and the natural rate of interest arise from cost shocks that influence pricing and cause inflation to change without affecting the output gap. The closing of the output gap would then be insufficient to restore price stability; the interest rate set for monetary policy purposes must be different from the natural rate of interest. ↑
7. See e.g. ECB (2005). ↑
8. The model according to Laubach and Williams(2003) is estimated for the euro area by Bayesian methods, using observations over the period 1999/Q1–2016/Q2. The data employed includes observations of the euro area real GDP, consumer price inflation (excl. energy and food), 3-month Euribor and one-year-ahead inflation expectations in the SPF survey. ↑
9. The estimated assessment of the natural rate of interest is conditional on the estimated assessment of the output gap. ↑
10. See also Anttila, J. (2016) Onko elpyminen myytti? ('Is recovery a myth?'). Bank of Finland Bulletin 4/2016. ↑
11. However, there is no exact information available on the factors affecting the decline of the euro area natural rate of interest. ↑
12. Summers (2014) reviews a number of potential factors weighing on the natural rate of interest in the United States. ↑

13. Constâncio (2016). ↑
14. Deleveraging and labour market normalisation, for example, take longer. In addition, the sliding oil price has reduced inflationary pressures. ↑
15. See e.g. Hamilton (2015) for the uncertainty related to the estimation of the level of the natural rate of interest. ↑
16. Laubach – Williams (2015). ↑
17. See e.g. Yellen (2016) and Williams (2016). ↑

Keywords

euro area, monetary policy, natural rate of interest