

Global real interest rates are very low after a long period with a falling trend. It appears that lower and lower interest rates are required to attain a balance in the economies of most developed countries. One explanation could be that the global neutral interest rate has fallen. A lower neutral interest rate means that the policy rate must be even lower to attain monetary policy stimulus. Sweden is a small open economy that is affected by the global interest rate trends. If the downturn in the global neutral interest rate is expected to last for a long time, we can therefore expect a longer period of low interest rates in Sweden, too. Our analysis indicates that it is likely that the Swedish neutral interest rate will be lower than normal over a long period of time.

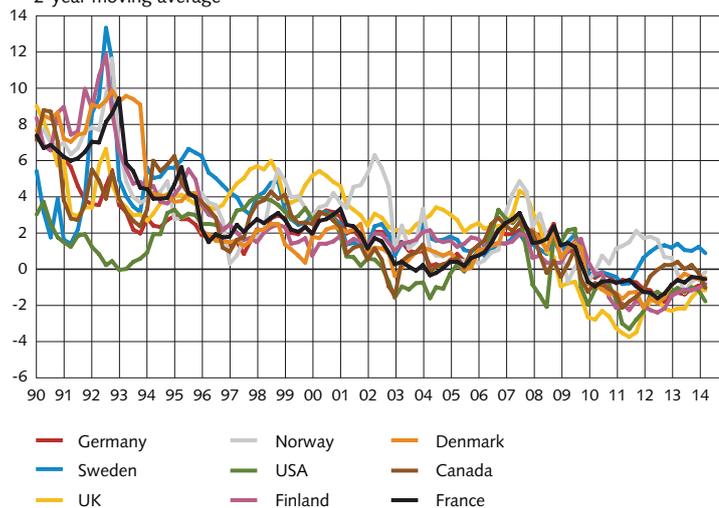
Lower neutral interest rate in Sweden?

Hanna Armelius, Paolo Bonomolo, Magnus Lindskog, Julia Rådahl, Ingvar Strid and Karl Walentin¹

The authors work in the Monetary Policy Department.

The Swedish economy is very dependent on the surrounding world and it is natural that an analysis of Swedish interest rates should take a global approach. The IMF has shown using principal component analysis² that common global factors are playing an increasingly important role for interest rates as international financial integration increases.³ Low Swedish interest rates should therefore be viewed in the light of global interest rates being very low and having fallen over the past 20 years. This is illustrated in Chart 1, which shows the development of short real government rates in Sweden since the end of the 1980s, together with interest rates in 5 other large economies.

Chart 1. International short-term real interest rates
2-year moving average



Note. Shows the 3-month government securities rate minus actual annual inflation.
Source: The OECD

There is currently an international discussion on to what extent the current low interest rates reflect the fact that the average (or what is usually called normal or neutral) long-term interest rates have fallen or whether it is rather due to temporary effects linked to the weak economic activity.

There are slightly different definitions of the neutral interest rate. This Economic Commentary uses the term "neutral interest rate" to describe the interest rate that has neither an expansionary nor a contractionary effect on the economy.⁴ If the neutral interest rate falls (rises), this means that the actual interest rate in the economy may be lower (higher) without this having an expansionary (contractionary) effect. A lower (higher) neutral interest rate would therefore mean that a lower (higher) interest rate than before was required to stimulate (slow down) the economy.

1. The authors would like to thank Mikael Apel, Göran Robertsson and Ulf Söderström for their valuable comments.

2. Principal component analysis is a technique for finding patterns in large data sets.

3. See the IMF WEO April 2014.

4. The idea of a neutral or "natural" interest rate was introduced by Knut Wicksell around 1900. For a more detailed discussion, see Westermark, A. and Lundvall, H., "What is the natural interest rate?". *Sveriges Riksbank Economic Review*, Sveriges Riksbank, 2011.

One can also distinguish between real and nominal interest rates, where the real interest rate is the same as the nominal interest rate excluding inflation. So the following applies for the repo rate:

$$\text{the repo rate} = (\text{real neutral interest rate}) + (\text{monetary policy stance}) + \text{inflation}$$

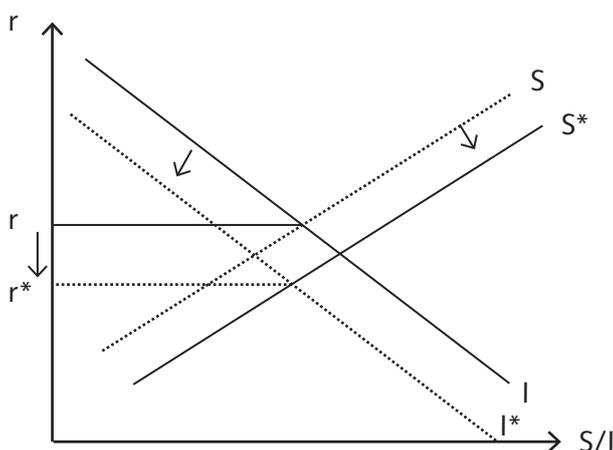
On the basis of the above equation, one can see that it may be important for a central bank to try to gain an idea of the neutral interest rate in principle, as it is deviations from this that determine whether a particular repo rate has a stimulating or a tightening effect on the economy. In practice, however, there is considerable uncertainty over the level of the neutral interest rate.

What determines the neutral interest rate?

The way the neutral interest rate is determined can be viewed from different theoretical perspectives. One common theory is based on the neutral interest rate depending on households' propensity to save and on technological advances. A high technological advancement gives higher productivity growth, which in turn leads to household income growing at a faster pace. As households want to even out their consumption over time, expectations of higher incomes mean they want to consume more now. Because the interest rate is the compensation the household receives for postponing consumption, a higher interest rate is needed to attain the same savings. Households' propensity to save and technological advances are sluggish factors that change very slowly over time. This means that the neutral interest rate according to this framework is also stable over time.

Economic research literature also uses the concept of the medium-term neutral interest rate, which in addition to households' propensity to save and technological advances is also affected by macroeconomic shocks that affect the economy. The medium-term neutral interest rate thus varies more. Shocks can entail, for instance, temporary changes in productivity, imbalances in private or public sector saving, changes in financial markets or economic policy that in different ways affect saving and/or investment decisions. The figure below illustrates how the interest rate is determined in a savings and investment framework.

Figure 1. Savings, investment and the real interest rate



We can assume that the economy is in a situation where the supply of saving is represented by the curve S and the demand for investment by the curve I in the figure. The interest rate is determined by the point in the figure where the curves intersect, r . If willingness to save increases, the S curve will shift outwards to S^* and the interest rate will be lower. If willingness to invest declines at the same time, so that the I curve shifts to I^* , the new interest rate will be even lower (r^*). Both willingness to save and willingness to invest are affected by short-term cyclical factors as well as more long-term structural factors. The former can be expected to entail a temporary adjustment in the interest rate, while the latter entails a more permanent adjustment of the neutral interest rate.

It is difficult to estimate the neutral interest rate

Regardless of the approach taken, the neutral interest rate is a theoretical concept that cannot be measured directly. But on the basis of the theoretical reasoning above that the long-term neutral interest rate is determined by technological advances and willingness to save, one can produce a rule of thumb where the long-term neutral real interest rate corresponds to long-term productivity growth.⁵ Productivity growth in Sweden has been 2 per cent on average since 1980. If one assumes that this corresponds to long-term technological advances, the rule of thumb means that the Swedish long-term neutral repo rate is around 2 per cent plus expected future inflation. With an inflation rate of 2 per cent, this means that the nominal long-term neutral repo rate is 4 per cent. But, as mentioned above, this is a very rough measure of the neutral interest rate in the longer term. When the economy is subjected to large shocks, it may take a long time before all variables return to their long-run equilibrium values and this also applies to the neutral interest rate.

There are different methods for estimating the medium-term neutral interest rate. All of the methods are uncertain and the results are often very dependent on different assumptions. Somewhat roughly, the methods can be divided up as follows:

By studying market rates: This can include observing actual interest rates, market expectations or implied interest rates via market pricing. Observed actual or implied interest rate will give us information about how the market views, for instance, the neutral interest rate, the monetary policy stance (or expectations of future monetary policy) and risk and term premiums.⁶ As economic activity is on average in balance in the longer run, an average interest rate over longer time periods can give a rough interval for the medium-term neutral interest rate. Another alternative is to study long-term averages for productivity growth.

By estimations using DSGE models: According to New Keynesian theory, the neutral interest rate is the interest rate that would apply if there were no price and wage rigidities in the economy. Large forecasting models that have a relatively rich modelling of the economy, so called DSGE models, can produce a measure of the interest rate that would prevail without rigidities. However, the results can vary substantially, depending on the specific assumptions in the model.

By analysing the correlation between actual interest rates and economic activity: There are various statistical methods that utilise the correlation between the growth potential of the economy and the neutral interest rate. These methods are very uncertain, as the results depend on different assumptions, such as the long-run sustainable growth rate.

Possible explanations of the negative trend in global interest rates

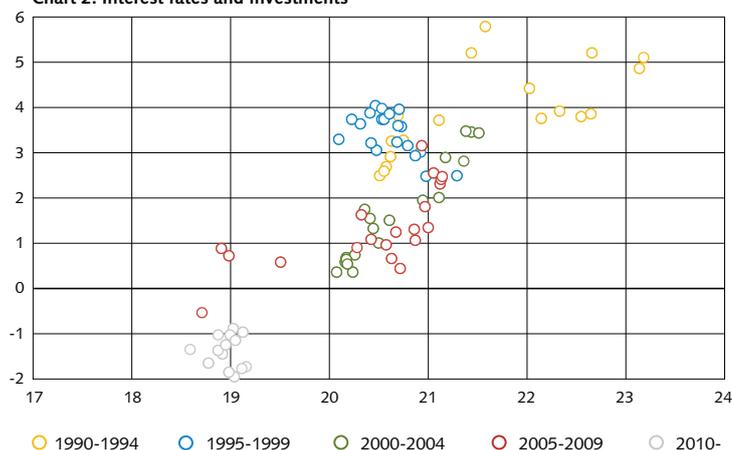
A number of different causes have been highlighted as possible explanations why interest rates have shifted downwards in recent decades, which in turn are based on the saving/investment framework in Figure 1.⁷ However, an obvious problem is that it is not possible to observe actual saving propensity or demand for investment. We can only observe actual saving and actual investment at times with different interest rates. But as the world as a whole is a closed economy, the global supply of saving must in principle coincide with the global demand for savings, that is, global investment. We can thus form an idea of what global interest rate is compatible with equilibrium in global saving and global investment at a particular point in time. In terms of Figure 1, this means that we can identify interest rates for the points where the curves for the supply of saving (S) and the demand for investment (I) intersect. This is illustrated in Chart 2, which shows short-term real interest rates against investment as a percentage of GDP for a cross-section of OECD countries.

5. This applies to utility functions with a constant relative risk aversion equal to one and no discounting, and is an assumption that is made, for instance, in the Riksbank's DSGE model, Ramses.

6. Actual interest rates also contain risk and term premiums that vary over time and can be difficult to measure.

7. See Blanchard, O., Furceri, D. and Pescatori, A. "A prolonged period of low real interest rates?", Essay in "Secular stagnation: facts, causes and cures". VoXEU e-book, 2014, for a more detailed discussion of the low global interest rates.

Chart 2. Interest rates and investments



Note. The marks in the chart show an unweighted average of Germany, the UK, the USA, France and Italy, where each mark comprises a quarter.

We can view the coloured marks in Chart 2 as different equilibrium points for the interest rate in Figure 1. The global trend of falling interest rates is reflected in the fact that the marks representing the respective decade have shifted downwards. The shift from the 1990s to the 2000s appears to contain a shift in both saving and investment, as interest rates shifted down more than investment. In Figure 1, this would correspond to the curves for both demand for investment (I) and the supply of saving (S) shifting inwards. However, since the financial crisis it appears as though weak demand for investment has dominated developments, as the downturn in interest rates coincides with a decline in investment as a percentage of GDP. In Figure 1, this would correspond to the curve representing demand for investment (I) shifting inwards along a given curve for the supply of saving (S).

The explanation for the shift in interest rates thus depends on the time perspective used. Some explanations are linked to the financial crisis; others to more structural changes. These explanations can be linked to changes in saving and investment:

High global saving:

- Precautionary saving has increased since the financial crisis.
- Public sector saving increased following the Asian crisis, when many central banks built up their foreign currency reserves.⁸
- Demographics may have affected the interest rate situation. Saving is increasing in that many countries have an ageing population close to retirement age.
- Income inequality is growing and an increasing percentage of assets are owned by a small group of rich individuals. This may have contributed to pushing down interest rates as people with high incomes tend to save proportionally more than people with lower incomes.

Relatively higher demand for safe assets than for risky:

- Following the dot-com crisis in the 2000s, the demand for safe assets increased, and this may have pushed down risk-free yields.
- The financial crisis created an uncertainty that increased the demand for safe assets, but the supply did not increase at the same pace. The situation was made worse by some assets that had been considered safe prior to the crisis proving not to be safe.

8. Saving as a proportion of GDP increased by over 10 percentage points in emerging economies after the Asian crisis. In a speech, Bernanke called this the "global saving glut". See Bernanke, B. "The Global Saving Glut and the U.S. Current Account Deficit". Speech, 10 March 2005.

Lower demand for capital investment:

- The demand for investment has declined following the financial crisis, probably because growth prospects deteriorated.
- Some people point out that today's large corporations, such as IT companies, do not need to borrow to invest in the same way as traditional industrial companies.⁹ Modern companies often invest in research and development rather than in plant and machinery. This could have led to a decline in the demand for investment.¹⁰

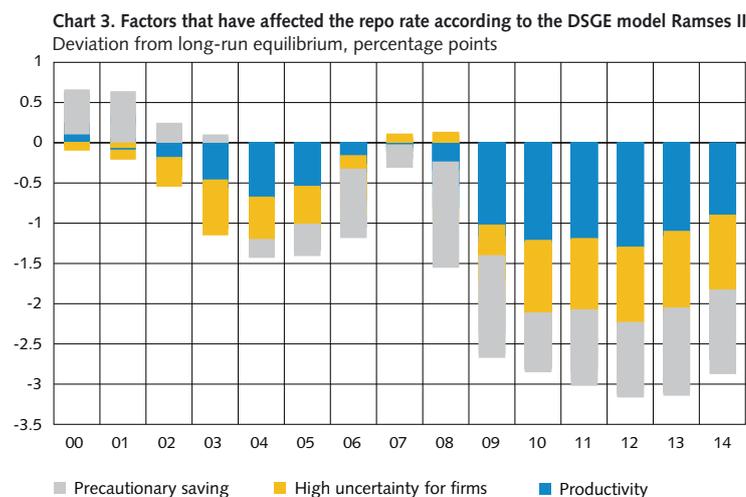
Lower productivity growth:

- Productivity growth has been weak since the financial crisis. There is an international discussion under way on whether this is due to repercussions of the crisis or to something of a more long-term nature.¹¹

It is difficult to know which of these explanations has played the largest role and to what extent their effects are lasting or transitory.

The downturn in global interest rates implies lower rates in Sweden in the medium-term

Since the inflation target was introduced, the repo rate has only on a very few occasions exceeded its previously assumed long term equilibrium level of just over 4 per cent, despite growth generally being in line with its historical average. To gain an idea of the factors contributing to the relatively low repo rate, one can use the Riksbank's large forecasting model Ramses II.¹² Chart 3 shows the model's interpretation of how the most important shocks have contributed to the repo rate's deviation from its long-run equilibrium.



We see that a high level of uncertainty in the corporate sector, which leads to low investment, a high level of precautionary saving among households and low productivity are the factors that have contributed the most to holding the repo rate down, by around one percentage point each since the financial crisis. The Ramses model thus explains the low repo rate as a combination of low investment, a high level of saving and low productivity growth. All of these factors originate from the financial

9. See, for example, Summers, L. H., "US economic prospects: secular stagnation, hysteresis, and the zero lower bound". *Business Economics*. Vol. 49. 2014.

10. Blanchard et al. 2014 (see footnote 6) reaches the conclusion, however, that this is less important to the downturn in interest rates.

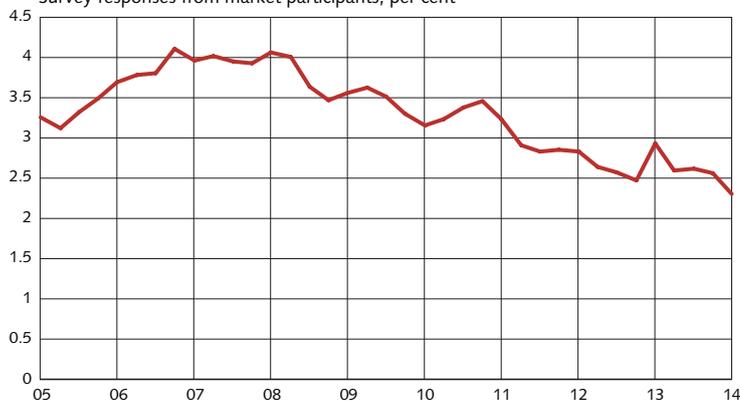
11. See, for example, Summers, L. H., "US economic prospects: secular stagnation, hysteresis, and the zero lower bound". *Business Economics*. Vol. 49. 2014, Gordon, R. J. "The demise of US economic growth: restatement, rebuttal, and reflections". NBER WP No. 19895. 2014. A summary of the discussion on secular stagnation can be found in Teulings, C. and Baldwin, R., "Secular stagnation: facts, causes and cures". VoXEU e-book, 2014.

12. See Adolfson, M., Laséen, S. Christiano, L. Trabandt, M. and Walentin, K., "Ramses II – Model Description". Occasional paper series No 12. Sveriges Riksbank, 2013.

crisis. They can also to a great extent be said to come from abroad, as Sweden has not had any domestically-generated crisis. Their influence can thus also be expected to wane as the repercussions of the crises fade from the global economy.

Another means of studying what has kept interest rates down in Sweden is to use information from the financial markets. Forward-looking information shows that the market is expecting a long period with low interest rates in Sweden. Chart 4 shows the results of Prospera's questionnaire responses from a sample of market participants regarding the question of what the repo rate might be in five years' time. As shown in the chart, expectations of the future nominal repo rate have fallen from around 4 per cent in 2007 to around 2.5 per cent in recent years. This need not of course solely reflect the market's assessment of the neutral interest rate as expectations are also affected by, for instance, assessments of economic activity and inflation. But under normal circumstances five years can be said to be sufficiently long time for the economy to return to its long-run equilibrium. By studying market participants' responses to the question on expected inflation and GDP growth together with the response to the question on the expected nominal repo rate, we can also note that the market's expected real interest rate in five years is around 0.5 per cent, at the same time as economic activity is expected to be in balance.

Chart 4. Market agents' expectations of the level of the nominal repo rate in 5 years, average
Survey responses from market participants, per cent



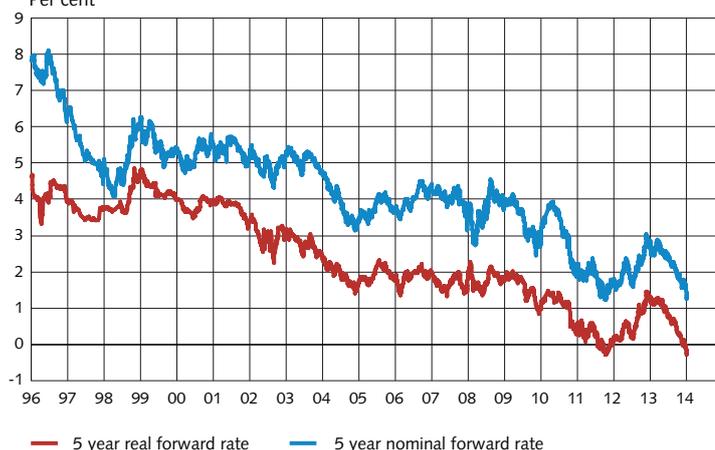
Sources: TNS SIFO Prospera and the Riksbank

A complement to the survey responses in Chart 4 is to study market pricing of future interest rates. Chart 5 shows nominal and real forward rates five years ahead. Forward rates consist of two components: an expectation of future short-term interest rates¹³ and a term premium.¹⁴ One needs to make assumptions regarding term premiums to be able to draw conclusions regarding the neutral short-term interest rate. As these usually are positive, one tends to assume that forward rates in the long term state an upper limit as to what the market expects the short-term interest to be in the future. If one also assumes that the market assesses that the economic situation will be normal in five years' time (see above), Chart 5 thus shows an upper limit for the market's expectations of the neutral level for short-term interest rates. However, it is difficult to exclude the term premium and thus create a picture that purely reflects market expectations of future short-term interest rates. There are also many indications that the term premium varies over time. In recent years, the term premium could have been pushed down, for instance, by the fact that many central banks are conducting unconventional monetary policy. This makes the global forward rates fall, and thereby also the Swedish ones, without being any sign that the neutral interest rate has become lower. It may even be the case that the forward premium is negative and that market pricing thereby can no longer be interpreted as an upper limit for market expectations of the neutral interest rate. Having said this, forward rates together with Prospera's survey responses indicate that the nominal neutral interest rate according to the market has fallen from around 4 per cent between 2005 and 2009 to around 2.5 per cent at present.

13. For nominal forward rates, short-term interest rates can be divided up into expected real interest rate and expected inflation.

14. This premium is a compensation for holding an investment during a particular prolonged period of time.

Chart 5. Nominal and real forward rates, 5 years
Per cent



Source: The Riksbank

Should increased spreads affect the long-run repo rate?

As mentioned earlier, there is a difference between the policy rate set by the central bank and the final interest rates charged to households and companies, as the latter contain a mark-up, known as a “spread”, that varies over time. As it is households and companies that make the economic decisions in the economy, it is conceivable that the central bank would want to take into account changes in spreads when setting the policy rate. Since the financial crisis, the spreads have increased both in Sweden and abroad. In Sweden, the spreads for mortgages are currently around 0.4 percentage points higher than their historical average. It is likely that they will not return to the low levels that prevailed prior to the financial crisis, as the market has probably adapted its view of risk. One question that arises then, is whether the long-run repo rate should be adjusted, so that the final interest rates remain the same as prior to the crisis.

In the short term, changes in spreads have relatively large effects on the economy, which would normally also lead to effects for monetary policy.¹⁵ However, economic research cannot give any clear answer as to whether increased spreads should lead to compensation in the form of a lower policy rate in the long run. In models where households save mainly for other reasons than to postpone consumptions, the effect of changed spreads on the long-run policy rate may be substantial.¹⁶ However, in most models, increased spreads have very little or no effect on the long-run policy rate.¹⁷ Unless the spreads increase more in the long run, we therefore draw the conclusion that the effect of increased spreads on the long-run repo rate is of less significance for the Swedish long-run neutral interest rate.

15. According to Walentin (2014), an increase in the spread of 100 basis points leads to a corresponding cut in the repo rate of 50 basis points, see Walentin, K. “Business Cycle Implications of Mortgage Spreads”, *Journal of Monetary Economics*, 2014, Vol. 67.

16. See, for instance, Goodfriend, M. and McCallum, B. T. “Banking and interest rates in monetary policy analysis: A quantitative exploration” *Journal of Monetary Economics* 2007, Vol 54.

17. This is the way it works in Ramses II, for instance, and if one adds a spread in models with loan-limited households, such as Iacovelli, M. and Neri, S. “Housing Market Spillovers: Evidence from an Estimated DSGE Model”, *American Economic Journal*, 2010.



Conclusions

Global real interest rates are very low after falling over a long period of time. Our model estimates indicate that interest rates in Sweden are very dependent on international developments. The analysis also shows that the current very low interest rates are largely due to factors that originate from the financial crisis and can therefore be expected to decline in importance over time.

In the long run, the interest rate is determined by the long-run conditions in the economy, such as the rate of innovation and household preferences. To the extent that these are not affected by the crisis, it appears reasonable to assume that the neutral interest rate has not been affected by the crisis in the long run.¹⁸ On the other hand, if, for instance, the decline in productivity growth were to prove to be long-lasting, then the long-run repo rate may also become lower. It is still too early to determine how long the effects of the crisis will last. But many of the factors that have pushed down global interest rates, and thereby also interest rates in Sweden, can be expected to prevail in the medium term. Our assessment is therefore that it will take a long time before the neutral interest rate returns to more normal levels in Sweden.

18. Barro (2006) has demonstrated how extreme events can have long-term effects on real interest rates, for example (see Barro, R. J. "Rare Disasters and Asset Markets in the Twentieth Century" *The Quarterly Journal of Economics*, 2006).