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Economic Commentaries

What is the normal interest rate level?

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* *The views expressed in this commentary are those of the authors and not necessarily of Norges Bank.*

What is the normal interest rate level?

The normal real interest rate level in Norway is estimated to be in the interval of 2-3 per cent. With an inflation target of 2.5 per cent, the interval for the normal nominal interest rate is 4½-5½ per cent (three-month money market rate). This is a downward revision of half a percentage point from the previously estimated interval. The downward revision is in line with the market's interest rate expectations and estimates of potential growth.

Norges Bank's Monetary Policy Report 1/2010 *assumes a normal real interest rate of 2½ per cent and hence a normal nominal interest rate of 5 per cent. This is the same estimate used in the Bank's analyses in recent years, but the estimate is now the midpoint of the interval. In both Norway and other countries, it appears that market participants expect roughly the same long-term level of nominal interest rates that prevailed prior to the financial crisis, as measured by implied forward rates.*

The normal interest rate can be viewed as the interest rate level that is consistent in the long term with inflation at target and the real economy in equilibrium (defined as output equal to potential output). Monetary policy is then neither expansionary nor contractionary. The estimate of the normal interest rate is significant for Norges Bank's forecasts. The normal nominal interest rate is determined by the estimate of the normal real interest rate plus the inflation target.[1]

The normal rate is not directly observable in the market, and calculations are uncertain. Blinder (1998) says that it is *"difficult to estimate and impossible to know with precision. It is therefore most usefully thought of as a concept rather than as a number, as a way of thinking about monetary policy rather than as the basis for a mechanical rule..."* Central banks must nevertheless have a perception of it in their rate-setting. Norges Bank has previously estimated that the normal real three-month money market rate has been in the interval of 2½-3½ per cent. With an inflation target of 2½ per cent, the normal nominal interest rate has then been in the interval of 5-6 per cent.[2] In recent years, a normal real interest rate of 2½ per cent has been assumed.

In *Monetary Policy Report* 1/2010, the normal real interest rate is still assumed to be around 2.5 per cent, implying a normal nominal rate of around 5 per cent. The interval for the normal real interest rate, however, has been revised down to 2-3 per cent. The interval for the normal nominal interest rate has been revised down accordingly to 4½-5½ per cent, with the result that the point estimate is now the midpoint of the interval. There is considerable uncertainty about the normal interest rate level. We cannot rule out the possibility of new information emerging in the future which indicates that the Bank's forecasts should be based on a normal interest rate outside the interval currently assumed.

A key issue is whether the financial crisis of recent years has affected the normal interest rate level. Recent research on the effects of financial crises may suggest that they can affect the global economy's growth potential. In this case, the normal real interest rate may have fallen.[3] Methods for estimating the normal interest rate generally fall into two main categories: (i) market expectations of future interest rates and (ii) expectations of potential growth.

Market expectations of future interest rates

Long-term interest rates trended down over the past decade (see Chart 1 showing ten-year swap rates for selected countries). After climbing through to mid-2008, they fell markedly until early 2009. Long-term rates have risen again since, but remain low. Long-term interest rates are affected by short-term rates today and expected short-term rates in the future. Short-term rates today and in the immediate future are determined by the economic situation and the orientation of monetary policy, while expected short-term rates further ahead are more a reflection of expectations of potential growth and inflation. Long-term interest rates can also be affected by various premiums in the market. A central question is whether the low long-term interest rates observed today mean that the market has revised down its estimate of the normal interest rate (that is, the interest rate expected in the future when the economy is in balance).

1 The terms normal interest rate, natural interest rate, neutral interest rate and long-term equilibrium interest rate are used somewhat interchangeably in the literature. Two approaches are particularly prevalent. One associates all of these interest rate concepts with the level towards which interest rates will move over time in the absence of new shocks and when the economy is in balance. An estimate of this level will be of help when central banks calculate a path for future interest rates. In New Keynesian theory and general equilibrium models, however, there is a clear distinction between the neutral real interest rate and the long-term equilibrium real interest rate. In these models, wages and prices are sticky in the short term but flexible in the long term. If the assumption of sticky nominal wages and prices is relaxed, the flexible price solution of the model emerges – in other words, how economic variables would have developed had all prices been flexible. In these models, the neutral real interest rate is interpreted as the real rate in the flexible price solution. The estimate of the neutral real interest rate measured using this method is sensitive to the choice of model. The literature is extensive, but see, for example, Bjørnland et. al (2007) for details and references.

2 See box "Why are long-term interest rates so low?" in Inflation Report 1/2005 and Bernhardsen and Gerdrup (2006).

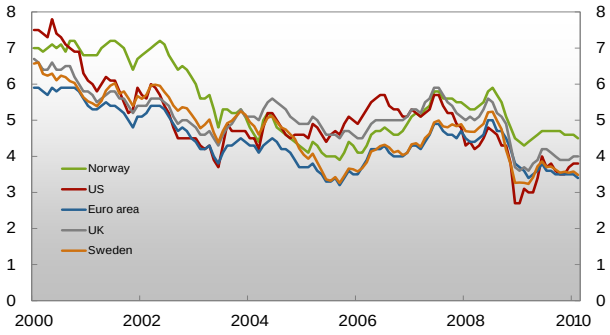
3 See Reinhart and Rogoff (2010).

Long-term interest rates as shown in Chart 1 are not suited to an assessment of the market's estimate of the normal interest rate. Market participants' estimation of future interest rate levels is better expressed by implied forward rates.[4] In the absence of term premiums and other risk premiums, implied forward rates can be interpreted as the market's future interest rate expectations.[5] Unlike spot rates, these rates will be largely unaffected by the current economic situation and more a reflection of future growth and inflation expectations. They will therefore be closer to the interest rate level expected when the economy is in balance, and they provide a better basis than spot rates for estimating the normal interest rate level.

We have calculated implied rates for Norway, Sweden, the US, the euro area, the UK, Canada, New Zealand and Australia. Charts 2-9 show implied five-year rates five years ahead based alternatively on government bond yields and swap rates, and implied one-year rates nine years ahead based on swap rates. Both government bond yields and swap rates can be affected by various premiums as well as expectations of the real interest rate and inflation. Central government debt in many countries soared during the financial crisis, which may have pushed up government bond yields. In this case, implied forward rates based on swap rates will probably provide a better picture of market expectations of future money market rates.

In Norway, implied forward rates fell through to the end of 2005. This was a period of low interest rates internationally.[6] Forward rates then climbed again, and forward rates based on swap rates ranged between 5 and just under 6 per cent in the period 2007-2010, whereas forward rates based on government bond yields have been slightly lower, at around 5 per cent over the past year.[7] The financial crisis does not appear to have caused market participants to revise down their long-term interest rate expectations. Developments in recent years lend support to the assumption that the market expects nominal interest rates in the area of 4½-5½ per cent in the long term, which is in line with our new interval for the normal interest rate. The midpoint of the interval is consistent with an inflation target of 2½ per cent and a real interest rate of 2½ per cent.[8]

Chart 1 10-year swap rates for selected countries.
January 2010 - February 2010



Source: Thomson Reuters

In other countries, developments in forward rates vary somewhat, but the general picture is that forward rates are at roughly the same level as before the financial crisis. Generally speaking, it does not appear that the market has revised down its future interest rate expectations or its view of the normal interest rate level in the future.

There can be risk premiums in long-term interest rates that complicate the interpretation of forward rates. On the one hand, term premiums may lead to higher long-term interest rates. Implied forward rates may then overestimate the market's expectations of short-term rates further ahead. Term premiums in swap rates may have been the reason why implied forward rates based on swap rates approached 6 per cent in 2007 (see Chart 2). On the other hand, term premiums can also be low or even negative. In *Inflation Report* 1/2005 and 2/2005, for example, it was assumed that forward rates underestimated actual interest rate expectations.[9] Term premiums vary over time, and it is difficult to separate them from interest rate and inflation expectations. Other types of premium can also complicate the interpretation of forward rates. Methods that adjust forward rates for various premiums will be uncertain and probably need to be modified over time. In the section below, we also show that reasonable assumptions of potential growth and inflation are in line with forward rates. We have therefore used forward rates when estimating the market's long-term interest rate expectations.

Historical developments in nominal money market rates and the real interest rate can also shed light on the normal interest rate level (see Charts 10 and 11). Table 1

4 Today's five-year and ten-year rates can be used to calculate the implied five-year rate five years ahead. This is the rate that gives a total return equal to the return on today's ten-year investment when the return on a five-year investment is reinvested in five years' time for another five years. Likewise, today's nine- and ten-year rates can be used to calculate the implied one-year rate nine years ahead.

5 This is what is known as the expectations hypothesis of the term structure of interest rates.

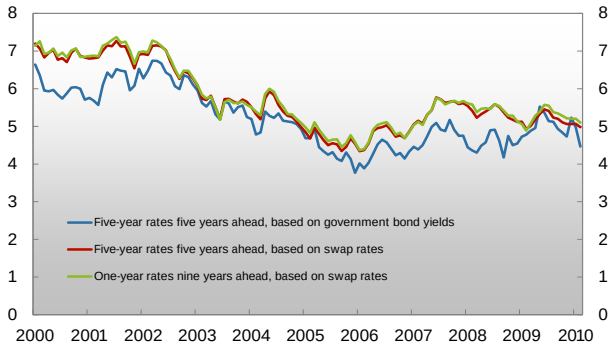
6 See box "Why are long-term interest rates so low?" in Inflation Report 1/2005 for an analysis of the low long-term interest rates during this period.

7 Very recently, forward rates in Norway based on government bond yields have fallen sharply. This is, however, due to special market conditions in the government bond market and cannot be interpreted as a decrease in the normal interest rate. This is supported by forward rates based on swap rates being unchanged.

8 Norges Bank calculates market interest rate expectations for Norway and other countries daily using the extended Nelson-Siegel method (see Kloster (2000) and Myklebust (2005) for details). This method is based on money market rates (up to one year) and swap rates (from one to ten years). As at the beginning of March 2010, the method results in an expected short-term money market rate of 4.9 per cent for Norway in 2017. This is in line with our estimate of the normal interest rate based on implied rates.

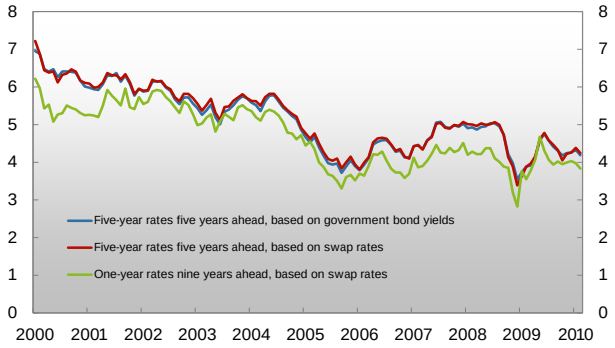
9 Up until Inflation Report 2/2005, the forecast for inflation was based on market interest rate expectations (since Inflation Report 3/2005 the Bank has calculated its own interest rate path). As forward rates were believed to underestimate future expectations of short-term interest rates, an interest rate path higher than forward rates was used in the analysis in Inflation Report 1/2005 and 2/2005.

Chart 2 Nominal forward interest rates for Norway.
January 2000 - February 2010



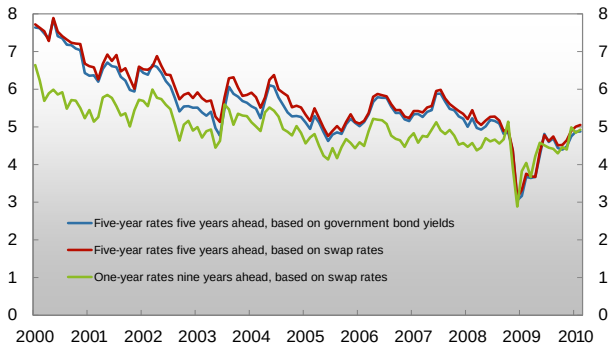
Source: Thomson Reuters

Chart 3 Nominal forward interest rates for Sweden.
January 2000 - February 2010



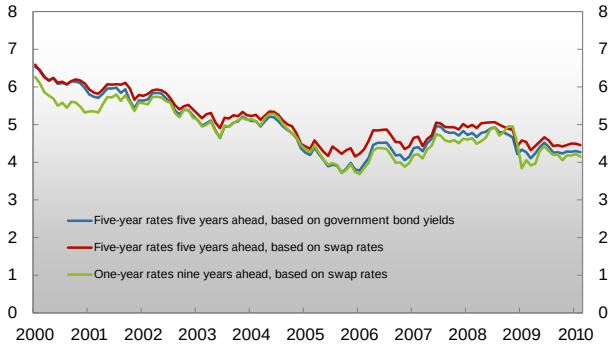
Source: Thomson Reuters

Chart 4 Nominal forward interest rates for US.
January 2000 - February 2010



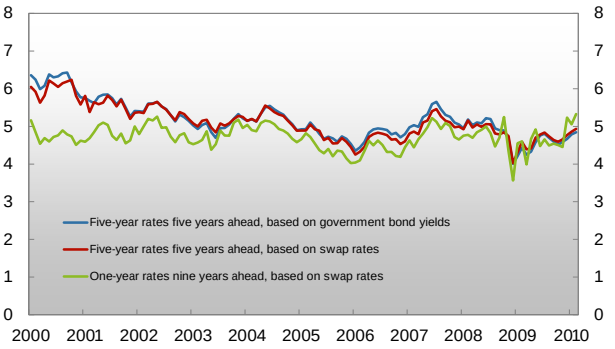
Source: Thomson Reuters

Chart 5 Nominal forward interest rates for the Euro area.
January 2000 - February 2010



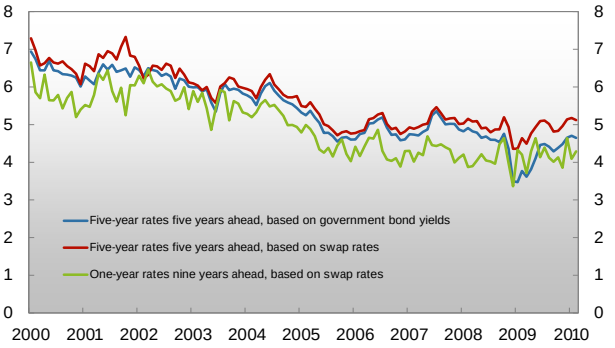
Source: Thomson Reuters

Chart 6 Nominal forward interest rates for the UK.
January 2000 - February 2010



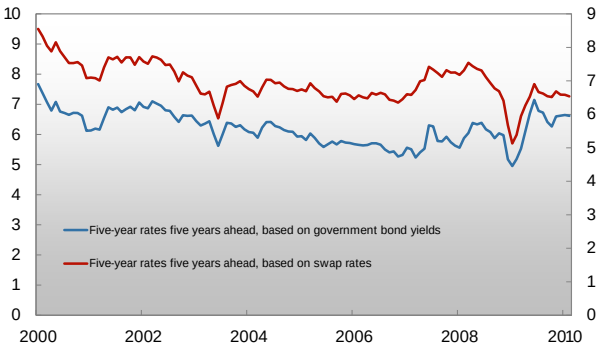
Source: Thomson Reuters

Chart 7 Nominal forward interest rates for Canada.
January 2000 - February 2010



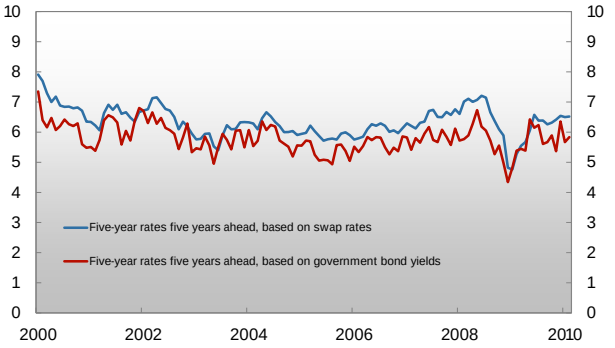
Source: Thomson Reuters

Chart 8 Nominal forward interest rates for New Zealand.
January 2000 - February 2010



Source: Thomson Reuters

Chart 9 Nominal forward interest rates for Australia.
January 2000 - February 2010



Source: Thomson Reuters

Table 1 Average interest rates in Norway. Nominal and real

	Nominal three month rate	Real three month rate (CPI)
Jan.1995-Feb. 2010	4.8	2.7
Aug.2000-Feb. 2010	4.5	2.4

Source: Ecowin and Statistics Norway

shows the average three-month real interest rate (based on CPI) and the average nominal three-month rate. The large swings through to the early 1990s were due to high and volatile inflation. The period since 1995, on the other hand, has featured low and stable inflation and provides a better basis for estimating the normal interest rate level under a low-inflation regime. Since the mid-1990s, the nominal interest rate has averaged just below 5 per cent, while the average real interest rate has been in the range of 2.4-2.7 per cent.[10] Although caution is required when using historical interest rates to draw conclusions about the normal interest rate level, these averages are in line with our estimates of the normal interest rate.

Potential growth and the normal interest rate level

The level of forward rates in the charts above varies somewhat across countries. This may be due to different expectations of future growth and different inflation targets. According to economic theory, the normal real interest rate is closely related to potential growth in the economy.[11] Table 2 presents forecasts of future growth in Norway and other countries from the publication *Consensus Forecasts*, which is issued monthly and presents long-term forecasts twice a year, in April and October.[12] For each country, the upper figures in the table are the forecasts from April 2009 and the lower figures are the forecasts from October 2009. The growth forecast for Norway in 2014-2019 is in the range of 2½-2¾ per cent, which is in line with historical growth since the early 1990s. Average growth in the mainland economy has been 2.8 per cent since 1993 and 2.6 per cent since 2000.[13] From 1993 to 2000,

10 During the first decade of the new millennium, the Norwegian economy was exposed to shocks that pull down inflation. These shocks made it necessary to set interest rates lower than otherwise in order to prevent inflation from falling too low. This can explain why the average nominal interest rate during this period was just below 5 per cent. These shocks can probably not be expected to continue to have an effect in the long term.

11 The precise relationship between the normal interest rate and potential growth depends on the economic model chosen. Common to these theories is that households expect higher future income when potential growth rises. Households are assumed to want to even out their consumption over time, which means that they will want to step up their consumption straight away. This reduces household saving and leads to higher interest rates. Another relationship comes from the investment side of the economy. If the real return on capital is higher than the real interest rate, it pays to borrow in the market and increase investment. This pushes up the real interest rate and pulls down the return on capital. Equilibrium arises when the real interest rate is equal to the return on capital, which, in turn, is equal to growth in the economy. These relationships are discussed in the theory of economic growth (see Bernhardsen and Gerdrup (2006) for details and references).

12 Consensus Forecasts presents an average of many different forecasters (see www.consensuseconomics.com).

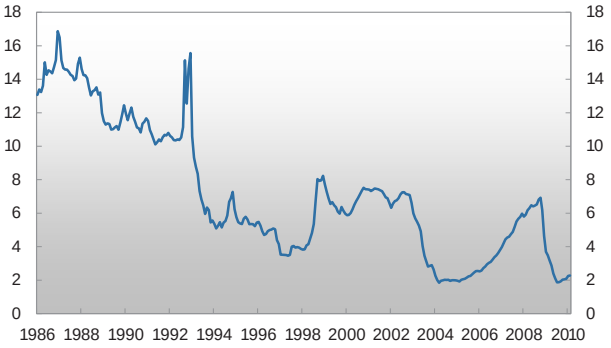
13 Based on data from EcoWin, series ew:nor01006.

Table 2 Growth forecasts from *Consensus Forecasts*. Per cent

		2014	2015-2019
Apr. 09	Norway	2.6	2.5
Oct. 09		3.0	2.7
Apr. 09	Sweden	2.7	2.6
Oct. 09		2.4	2.6
Apr. 09	USA	2.8	2.5
Oct. 09		3.0	2.6
Apr. 09	Euro Area	2.0	1.9
Oct. 09		1.9	1.8
Apr. 09	UK	2.3	2.3
Oct. 09		2.0	2.2
Apr. 09	Canada	2.8	2.4
Oct. 09		2.9	2.4

Source: Consensus Forecasts

Chart 10 Nominal 3-month money market interest rates for Norway. January 2000 - February 2010

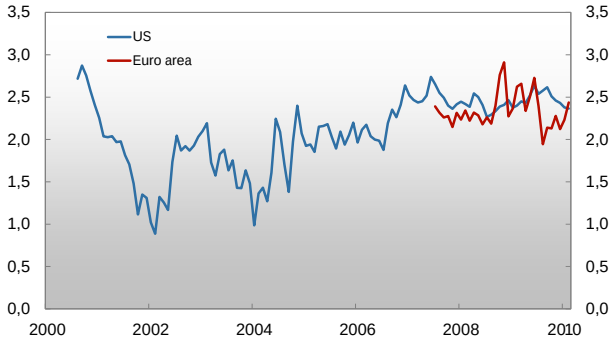


Source: Thomson Reuters

Chart 11 3-month real interest rates for Norway, deflated by CPI. January 2000 - February 2010

Source: Thomson Reuters

Chart 12 5-year real interest rates 5 years ahead for US and Euro area.
January 2000 - February 2010



Kilde: Thomson Reuters

growth was particularly strong at around 3 per cent, and it is possible that growth in the second half of the 1990s exaggerates the economy's future growth potential. This may indicate future potential growth of around 2.5 per cent. This may suggest that the normal real interest rate is also around 2.5 per cent, which is the midpoint of our estimate of the interval for the normal real rate.[14]

The growth forecasts from Consensus Forecasts vary somewhat across countries. Sweden is roughly in line with Norway. A somewhat lower inflation target (2 per cent) can explain why nominal implied forward rates based on swap rates are slightly lower for Sweden than for Norway (see Charts 2 and 3).[15] For the US, Consensus Forecasts indicates growth expectations of around 2½ per cent for the period 2015-2019, which is in line with the implied forward real rate for this period as priced in the market for inflation-linked bonds. Chart 12 shows that the implied five-year real interest rate five years ahead for the US has fluctuated around 2½ per cent in recent years. The expected real interest rate for the euro area appears to be somewhat lower than that for the US, probably due to lower growth expectations.

Based on Consensus Forecasts, it does not appear that potential growth is expected to be especially low in the period 2014-2019, either in Norway or elsewhere, with the possible exception of the euro area. Based on these forecasts, it does not appear that the normal real interest

14 First Securities also estimated the normal real interest rate in Norway at 2.5 per cent in its report of 15 January 2010.

15 In its February 2010 Monetary Policy Report, the Riksbank changed the interval for the normal repo rate (its key policy rate) from 3½-5 per cent to 3½-4½ per cent. In Norway, the normal three-month money market rate is estimated to be in the interval of 4½-5½ per cent, which puts the key policy rate in the range of 4¼-5¼ per cent (the normal spread between the three-month money market rate and the key policy rate is assumed to be in the region of 25 basis points). The normal key policy rate level in Norway is therefore around three-quarters of a percentage point higher than that in Sweden. This is in line with implied forward rates based on swap rates being around half to three-quarters of a percentage point higher in Norway than in Sweden, which corresponds, in turn, to the inflation target in Norway being half a percentage point higher than that in Sweden. The growth expectations from Consensus Forecasts are fairly similar for Norway and Sweden, and this may therefore suggest that different inflation targets can explain the somewhat different long-term interest rate expectations in Norway and Sweden.

Can the normal real interest rate vary from country to country?

We have argued above that the normal real interest rate is closely related to the economy's growth potential. In a theoretical model with free movement of capital and no transaction costs or uncertainty, capital will flow to where the marginal return on capital is highest. This means that differences in return between countries will be reduced. In equilibrium, all countries will have equal growth and an equal real interest rate. In practice, however, there are a number of factors which mean that capital will not necessarily flow to the highest marginal return, especially when there are only limited differences in the marginal return between countries. The prospect of achieving, for example, a 1 percentage point higher real return may be outweighed by various costs and risks. There may be considerable volatility in financial prices. There may be uncertainty about political and legal conditions. Many investors may be more familiar with economic conditions in their own country. Even if investors are expected to make a positive gain, this gain will not necessarily materialise *ex post*. We therefore see that even countries starting with roughly the same level of income have different rates of growth over time. Estimates of growth in different countries vary in the range of 2-3 per cent (see Table 2).

On the other hand, when there are large differences in economic growth and the return on capital between countries, there may be a greater tendency for capital to flow to the highest returns. This has been observed particularly when economic, legal and political conditions have been reformed. Examples include the countries of Southern and Eastern Europe following their accession to the European Union, and China's entry into world trade. Flows of capital to the likes of Eastern Europe and China will eventually reduce the return on capital in these regions, but this process may take a long time. Substantial differences in growth and capital returns between countries can therefore be observed over long periods.

rate has fallen.[16]

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Myklebust, G. (2005): "Documentation of the method used by Norges Bank for estimating implied forward rates", Staff Memo 2005/11, see http://www.norges-bank.no/templates/pagelisting____51416.aspx

16 The OECD (2009) has also published forecasts of potential growth, covering the period 2012-2017. For mainland Norway, its forecast is 3.4 per cent (3 per cent productivity and 0.4 per cent population growth), which is more than predicted by either Consensus Forecasts or Norges Bank. This forecast seems high and would entail a normal interest rate a full percentage point higher than our estimate. For the other countries in Table 2, the OECD's growth forecasts are 0.2-0.5 percentage point lower than the predictions from Consensus Forecasts. This may in itself pull the estimate of the normal interest rate down somewhat relative to the estimates based on Consensus Forecasts, but not far. The OECD calculates potential growth on the basis of a model described in more detail in Beffy et al. (2006). This model is based on a number of assumptions and is used for all countries, with country-specific adjustments. The OECD itself notes the uncertainty associated with these calculations. Unlike those from the OECD, the projections presented in Consensus Forecasts are an average of many different forecasters.