

# NORGES BANK PAPERS

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for 2017

NO. 3 | 2018



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EVALUATION OF NORGES  
BANK'S PROJECTIONS FOR  
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ISSN 1894-0293 (online)

ISBN 978-82-8379-070-2 (online)

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*Norges Bank's projections for economic developments, both in Norway and among Norway's main trading partners are an important basis for the formulation of monetary policy. Evaluations and analyses of forecast errors can enhance Norges Bank's understanding of the functioning of the economy and improve the Bank's forecasts. Norges Bank's projections for economic developments are therefore evaluated annually.*

*This article starts with a brief overview of economic developments in 2017. This is followed by a comparison of Norges Bank's projections for 2017 with actual developments, and deviations are assessed in the light of historical forecast errors. Furthermore, the Bank's projections are compared with the projections of other forecasters in Norway.*

*Projections for the global economy will be evaluated in a separate Norges Bank Paper.*

*The annual projection for mainland GDP in 2017 from Monetary Policy Report 4/16 proved to be a fairly accurate forecast of actual developments. The projection for employment growth proved to be somewhat low, while registered unemployment fell more than expected. Also consumer price inflation as measured by the CPI-ATE and annual wage growth were lower than expected.*

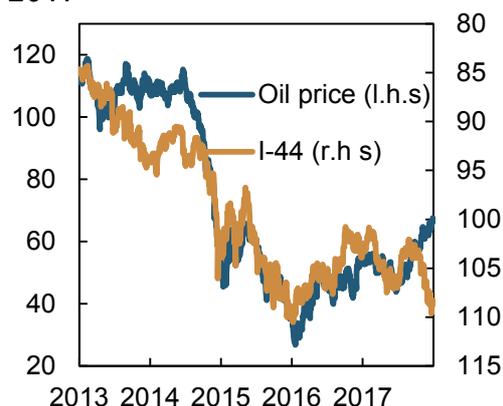
## 1. Economic developments in 2017

The upturn abroad gained a broader footing through 2017, and economic growth among trading partners proved to be higher than expected. Labour markets improved through the year, and investment growth picked up. At the same time, turbulence surrounding political process, such as the UK withdrawal from the EU and a possible escalation in the use of trade barriers contributed to uncertainty regarding global economic developments further out.

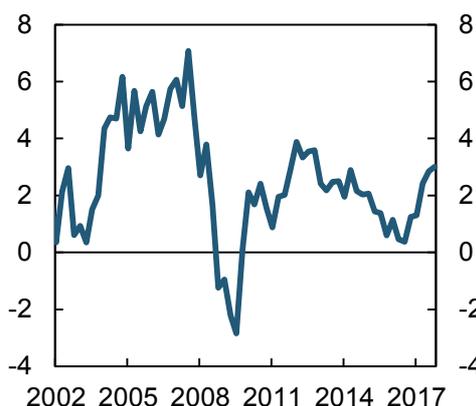
Despite higher growth and lower unemployment, price and wage inflation remained moderate. The rise in prices excluding energy and food products changed little between 2016 and 2017. Oil prices fell from around USD 55 per barrel at the beginning of 2017 to around USD 45 per barrel in June 2017. Through autumn, both spot and futures prices rebounded. At year-end, oil prices were at around USD 60 per barrel (Chart 1). The rise in oil prices contributed to some pick-up in overall consumer price inflation among trading partners between 2016 and 2017.

With a stronger growth picture and prospects for higher price and wage inflation, monetary policy normalisation began among some trading partners in 2017. In the euro area and in Sweden, policy rates were kept unchanged. At year-end, forward rates continued to indicate a very gradual rate rise for trading partners as a whole.

**Chart 1** Oil price<sup>1)</sup> and import-weighted exchange rate<sup>2)</sup>. 1 January 2013 – 31 December 2017

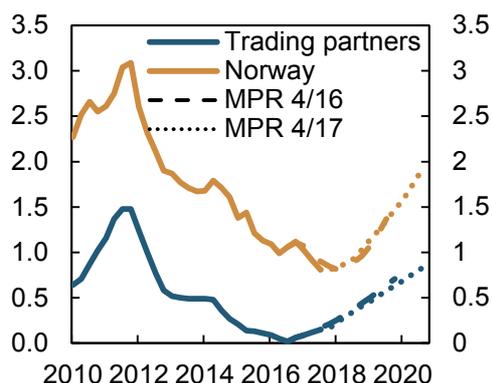


**Chart 2** Mainland GDP. Four-quarter change. Percent. 2002 Q1 – 2017 Q4

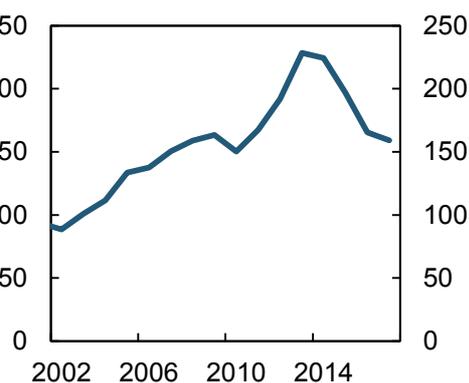


1) USD per barrel.  
 2) A rising slope indicates a stronger exchange rate.  
 Sources: Statistics Norway and Thomson Reuters

**Chart 3** Three-month money market rates. Percent. 2010 Q1 – 2019 Q4<sup>1)</sup>



**Chart 4** Petroleum investment. In billions of NOK. Constant 2016 prices. 2002 - 2017



1) Forward rates from *Monetary Policy Report* 4/16 (broken line) and *Monetary Policy Report* 4/17 (dotted line). For Norway, the forward rate is given as the policy rate plus the Norwegian money market premium. The estimates are based on the policy rate being priced in in the money market.  
 Sources: Statistics Norway and Thomson Reuters

In Norway, economic activity picked up, after some years of weakness (Chart 2). Higher demand from trading partners, low interest rates and better cost-competitiveness contributed to the upswing.

Norges Bank kept the policy rate unchanged through the year. Measured by the import-weighted krone exchange rate index I-44, the krone depreciated through autumn and was around 5 percent weaker than one year earlier. The depreciation was more pronounced than developments in the interest rate differential against other countries and oil prices in isolation would suggest (Charts 1 and 3).

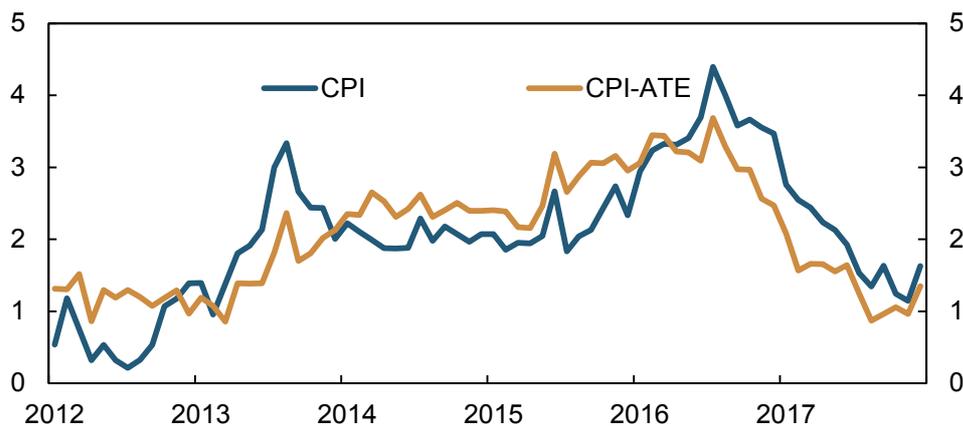
The upswing in the Norwegian economy resulted in an improved labour market. Employment rose sharply, and unemployment fell. The fall in unemployment was most pronounced in regions dominated by the oil sector. Capacity utilisation rose through 2017, but continued to be assessed as at lower than a normal level at year-end.

After two years of low growth in household income, real income rose appreciably between 2016 and 2017. With the improved labour market, wage growth rose somewhat, at the same as oil sector downsizing did not have as strong a dampening effect on overall wage growth as in 2016. At the same time, consumer price inflation was low. Household expectations regarding economic developments improved, and confidence indicators rose to fairly high levels. Growth in household consumption picked up, and was in line with income growth.

Higher economic activity in Norway and abroad and continued low interest rates gave a further boost to business investment in 2017. However, mainland exports fell through 2017, but the decline was clearly less than in the previous year. Investment on the Norwegian shelf also fell somewhat through 2017, but considerably less than in the preceding years (Chart 4).

Despite the upswing in the Norwegian economy, house prices fell through 2017. The price decline must be viewed in the context of the sharp rise in prices in the preceding years and an increase in the housing supply. The tightening of the requirements for new mortgages, introduced at the beginning of the year, probably also contributed to the housing market correction. New home sales were moderate over spring, and towards year-end, housing investment fell.

**Chart 5** Consumer prices. CPI and CPI-ATE<sup>1)</sup>. Twelve-month change. Percent. January 2012 – December 2017



1) Consumer prices adjusted for tax changes and excluding energy products.  
Source: Statistics Norway

Consumer price inflation continued to decline (Chart 5), since the effect of the krone depreciation following the fall in oil prices in 2014 had dissipated, while cost growth remained low.

## 2. Evaluation of the projections for 2017

In what follows, the projections for 2017 in the last *Monetary Policy Report* of 2016 are compared with actual developments. Projections for some key variables are presented in Table 1; other projections are found in Appendix Table 1. For key variables, forecast errors are evaluated against historical forecast errors.

**Table 1** Projections for key macroeconomic variables for 2017. Percentage change from 2016 unless otherwise stated.

	MPR 4/16	MPR 1/17	MPR 2/17	MPR 3/17	MPR 4/17	Actual
<b>Mainland GDP<sup>1)</sup></b>	1.5	1.6	2.0	2.0	1.9	2.0
<b>Employment<sup>1)</sup></b>	0.4	0.6	0.8	0.9	1.0	1.1
<b>Registered unemployment<sup>2)</sup></b>	3.1	2.9	2.8	2.7	2.7	2.7
<b>Annual wages</b>	2.8	2.5	2.4	2.4	2.4	2.3
<b>CPI-ATE</b>	2.4	1.7	1.4	1.4	1.4	1.4

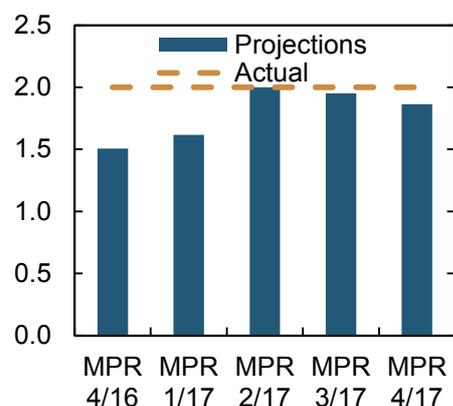
1) Actual data for 2017 are from the fourth publication of the quarterly national accounts and are subject to revision.

2) Rate, level.

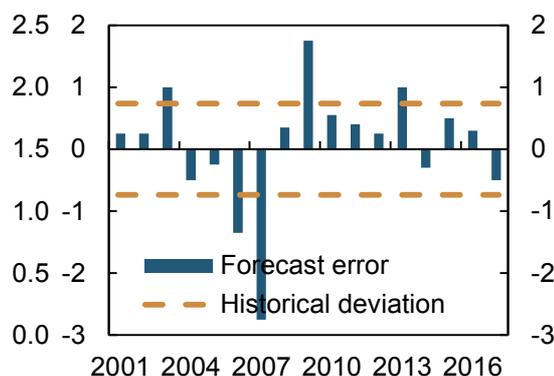
## 2.1. Output and demand

In *Monetary Policy Report 4/16*, growth in mainland GDP was projected to pick up from 0.7 percent in 2016 to 1.5 percent in 2017 (Chart 6). According to the preliminary national accounts data, GDP growth in 2017 was 0.5 percentage point higher than projected in December 2016 (Chart 7). The projection was revised up through the first half of 2017, as the upturn abroad proved to be somewhat stronger than expected, new information suggested that petroleum investment could be less than assumed and the enterprises in Norges Bank's Regional Network reported prospects of accelerating growth in the mainland economy.

**Chart 6 Mainland GDP. Annual growth in 2017. Percent. Projections through the year**



**Chart 7 Mainland GDP. Forecast errors<sup>1)</sup>. Percentage points. Per year and historical average<sup>2)</sup>**



1) Percentage point deviation between the projection in the last *Monetary Policy Report* the previous year and the first publication of the quarterly national accounts (QNA). For 2017, the fourth publication of QNA is used.

2) Simple average of absolute forecast errors in the period 2001 – 2016.

Sources: Statistics Norway and Norges Bank

Accelerating consumption growth was expected to contribute to the rise in GDP growth between 2016 and 2017. In December 2016, household consumption was projected to increase by 2.0 percent in 2017. Higher wage growth, rising house prices and continued low interest rates were expected to support household demand. The projection was accurate, but developments in the forces driving household consumption were somewhat different than had been envisaged. On the one hand, stronger employment growth and lower inflation than expected may have contributed to lifting growth in household demand. On the other hand, the house price correction in 2017 may have had a dampening effect. Consumer confidence remained at fairly high levels through the entire year.

In the light of the high house price inflation in the years 2014–2016, in *Monetary Policy Report 4/16*, the marked increase in housing investment was projected to continue through 2017. At the beginning of the year, housing starts were stronger than expected, and the housing investment projection was revised up. In the assessments through 2017, it was assumed that it would take some time for the decline in house prices to affect housing investment to a substantial degree. Home builders had considerable order backlogs and a large number of housing projects had commenced. Even though annual growth in housing investment proved to be a little higher than projected in December 2016, the correction in housing investment towards the end of 2017 was stronger than expected, and housing investment fell by 4.5 percent between Q3 and Q4.

In *Monetary Policy Report 4/16*, it was assumed that increased activity in the Norwegian economy and higher oil prices would contribute to lifting business investment. Annual growth in 2017 was expected to be a good 5 percent. In retrospect, growth proved to be clearly higher than expected, somewhat above 9 percent. In addition, investment growth for both 2015 and 2016 was revised up, so that the level of business investment in 2017 now appears to have been 17 percent higher than projected in *Monetary Policy Report 4/16*. The upward revision reflects among other things the inclusion by Statistics Norway of new information about investment in research and development and intangible fixed assets.<sup>1</sup> Even though business investment growth had been clearly higher than expected, there are no grounds for changing the Bank's perception of the long-run relationship between business investment and economic developments overall. However, the increase in business investment appears to have appeared earlier in this cyclical upturn than what has normally been the case. This may reflect pent-up investment demand after some years of relatively weak business investment growth.

In December 2016, petroleum investment was projected to fall by 11 percent in 2017, after a somewhat more pronounced decline the previous year. Through 2017, the investment intentions survey and the national accounts both showed that the decline would be less than expected, and the projection was revised up sharply. The primary reason for the less-than-expected fall in petroleum investment was the historically substantial decline in investment prices, which was probably related to considerable cost-cutting.

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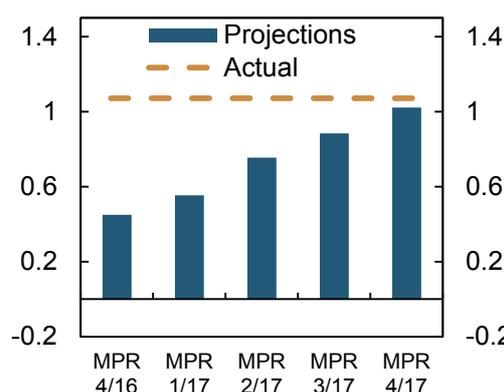
<sup>1</sup> See <https://www.ssb.no/nasjonalregnskap-og-konjunkturer/artikler-og-publikasjoner/reviderte-nasjonalregnskapstall-for-2016-og-2017> for a further review (in Norwegian only).

Overall mainland exports were projected to pick up markedly between 2016 and 2017. The continued downturn in the global petroleum industry was expected to curb oil service exports, while a weak krone and higher demand among trading partners were expected to pull up other mainland exports. Despite growth among trading partners that proved stronger than projected and a krone exchange rate that remained somewhat weaker than assumed, mainland exports fell between 2016 and 2017. The forecast error primarily reflects lower-than-expected services exports, while exports of traditional goods were broadly as projected. Even though services exports in 2017 proved to be lower than projected, the Bank's perception of how Norwegian exports are affected by demand from trading partners or the krone exchange rate has not been changed.<sup>2</sup>

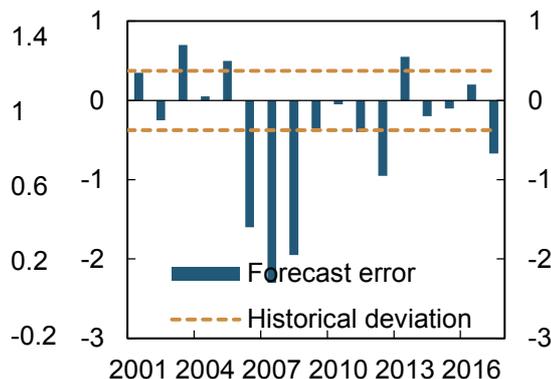
## 2.2. Labour market, productivity and capacity utilisation

The labour market improved more quickly than assumed in *Monetary Policy Report 4/16*. This partly reflects output growth that proved slightly higher than expected, at the same time as a slower-than-expected pick-up in productivity growth. Employment growth was surprisingly strong, and the projections were revised up through spring (Chart 8).

**Chart 8 Employment.**  
 Annual growth in 2017. Percent.  
 Projections through the year



**Chart 9 Employment. Fore-  
 cast error<sup>1)</sup>. Percentage  
 points. Per year and historical<sup>2)</sup>**



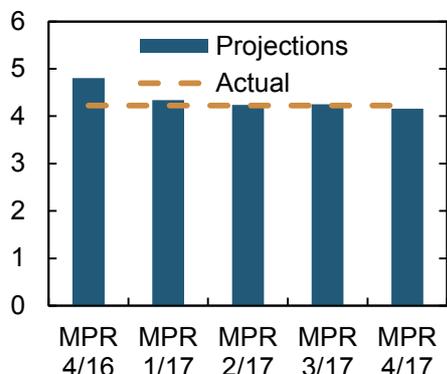
1) Percentage point deviation between projections in the last *Monetary Policy Report* in the previous year and the first publication of the quarterly national accounts (QNA). For 2017, the third publication of the QNA is used.

2) Simple average of absolute forecast error in the period 2001–2016

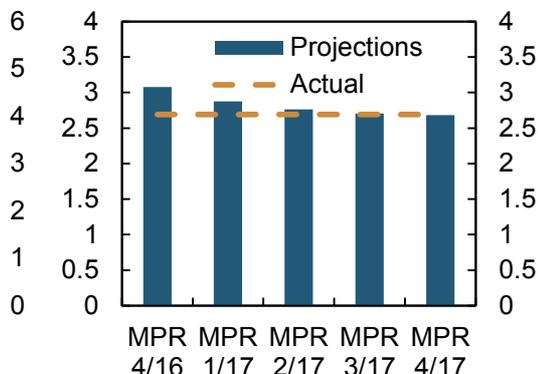
Sources: Statistics Norway and Norges Bank

<sup>2</sup> See post on the Bankplassen blog, Naug, B. and E. Nordbø "Hvor mye drahjelp har vi fått av kronesvekkelsen? Del 1 og Del 2" [How much impetus has the krone depreciation provided? Part 1 and Part 2] for a more detailed review (in Norwegian only).

**Chart 10** LFS unemployment in 2017. Projections through the year. Share of labour force. Percent



**Chart 11** Registered unemployment in 2017. Projections through the year. Share of labour force. Percent

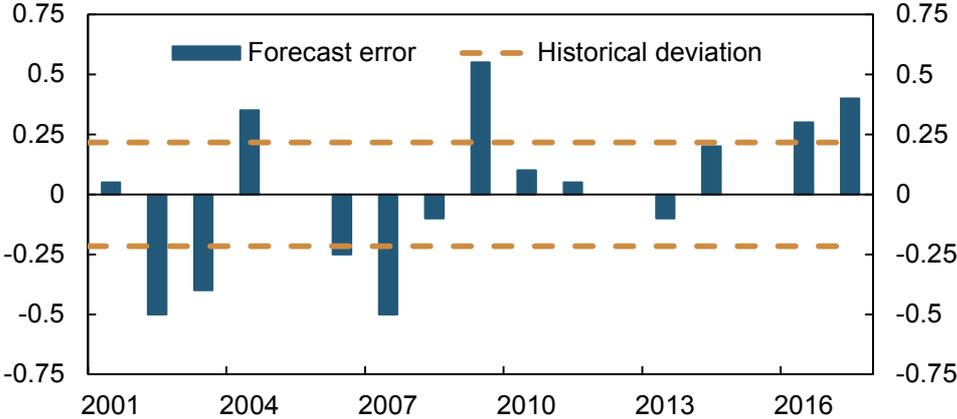


Sources: Statistics Norway, Norwegian Labour and Welfare Administration (NAV) and Norges Bank

The Bank's employment projection from December 2016 was well in line with reports from both the Regional Network and Norges Bank's expectations survey. Both surveys then indicated that employment growth would be moderate in the coming period. Respondents' near-term employment expectations improved between 2016 Q4 and 2017 Q1, remaining relatively stable thereafter. In retrospect, employment growth projections would have been somewhat more accurate if more weight had been given to the feedback from the Regional Network in Q1.

Unemployment fell more than expected through winter and spring 2017 (Charts 10 and 11). Compared with previous years, the forecast error for both employment growth and registered unemployment was somewhat greater than normal (Charts 9 and 12).

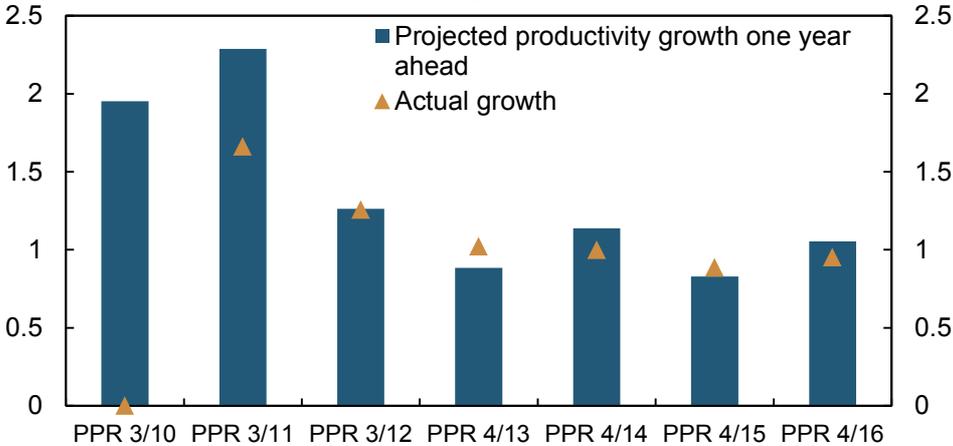
**Chart 12** Unemployment<sup>1)</sup>. Forecast error<sup>2)</sup>. Percentage points. Per year and historical<sup>3)</sup>



1) LFS unemployment for the years 2007–2009, registered unemployment otherwise.  
 2) Percentage point deviation between projections in the last *Monetary Policy Report* in the previous year and the first publication of the quarterly national accounts.  
 3) Simple average of absolute forecast error in the period 2001–2016  
 Sources: Norges Bank and Statistics Norway

Output growth and the strong growth in employment implied that productivity growth remained low through 2017, and rose a little less than assumed (Chart 13). Following the financial crisis, productivity growth has been lower than in the previous decade. For recent years, this probably reflects the downturn, since businesses normally take time to adjust their workforces to changes in output and demand conditions in the economy. But also the projections for trend productivity growth has been revised down over time.

**Chart 13** Productivity growth one year ahead. Norges Bank projections and actual developments. Percentage annual growth. 2010 - 2017



Sources: Statistics Norway and Norges Bank

In *Monetary Policy Report 4/16*, near-term productivity growth was projected to remain close to the average over the past 10 years, but pick up somewhat as the upswing in the Norwegian economy gained a firmer foothold, as observed earlier (Chart 14).

In the light of continued low productivity growth, the projection for growth in trend productivity in the years 2016 and 2017 were revised down further through 2017. The long period of low productivity growth suggests that structural conditions are the reason. The fact that many of Norway's trading partners had also been in a period of persistent low productivity growth pointed to common global explanations. Among possible explanations that have been put forward is the slower pace of innovation and diffusion of new technologies than previously.<sup>3</sup>

The output gap projection was revised up through 2017. The higher-than-expected rise in output at the same time as the downward revision in trend productivity indicated that capacity utilisation in 2016 and 2017 was a little higher than assumed. The real time projection of the output gap was revised up in each of the first three monetary policy reports of 2017. In the December 2017 *Report*, the projection for the output gap in 2016 was also revised up. The assessments and upward revisions were in line with developments through 2017 in other measures of capacity utilisation, such as the Regional Network and unemployment.

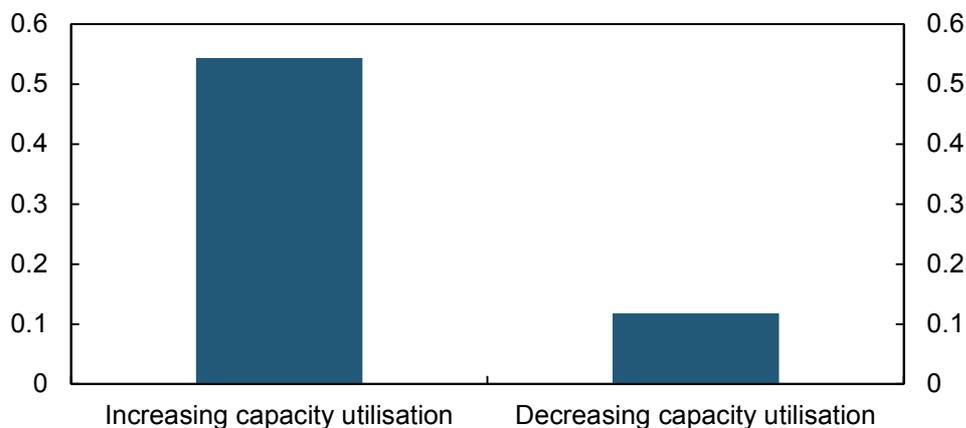
Estimates of capacity utilisation take account of developments in a number of indicators. The moderate wage growth and labour market developments measured by the LFS suggested that capacity utilisation remained below a normal level through 2017. On the other hand, registered unemployment approached a level that indicates full capacity utilisation in the economy. An explanation for the conflicting signals may be that the equilibrium level for registered unemployment is lower than previously assumed. A Special Feature in *Monetary Policy Report 2/17* took a closer look at the relationship between registered unemployment and capacity utilisation.

In late autumn 2017, the Bank began to use a broader set of models that summarise a large amount of information in order to estimate capacity utilisation (see *Monetary Policy Report 4/17*). The model estimates showed developments in the output gap that were well in line with previous projections, but at the same time underpinned the view that capacity utilisation in 2016 and 2017 had been higher than assumed earlier.

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<sup>3</sup> See eg OECD (2018), *OECD Compendium of Productivity Indicators 2018*, OECD Publishing, Paris.

**Chart 14** Productivity growth in cyclical upturns and downturns. Average productivity growth in quarters with a rising and falling output gap, respectively). 1979 Q1 – 2017 Q4



1) For 1979 Q1 – 1994 Q4, the output gap is given by the deviation between actual mainland GDP and a trend estimated using an HP filter with  $\lambda = 40000$ . Deviation from trend is smoothed three quarters. For 1994 Q1 – 2017 Q4, Norges Bank's official output gap projections are used.

Sources: Statistics Norway and Norges Bank

## 2.3. Wages

In December 2016, it was assumed that a tighter labour market and higher economic growth would contribute to a gradual rise in wage growth. Annual wage growth was expected to move up from 2.3 percent in 2016 to 2.8 percent in 2017. This would imply a 0.5 percent increase in real wages, after a fall of 1.3 percent in 2016. The projection lay between the expectations in the Regional Network and the projections from an estimated wage equation, and was well in line with social partners' expectations (Table 2).

Over winter 2017, wage growth in 2016 proved to have been considerably lower than assumed. That wage growth in 2016 proved to be so moderate reflects in part the stronger effect of structural adjustments in oil-related industries, with downsizing in high-wage sectors, on overall wage growth than the assumptions on which the Bank's projections are based. At the same time, inflation in 2017 appeared to be lower than assumed earlier.

Along with moderate wage growth abroad and low domestic inflation, the moderate wage growth in 2016 contributed to expectations of a moderate wage settlement also in 2017. The wage projection was therefore revised down to 2.5 percent in March (Chart 15). The projection was in line with the expectations of the social partners and Regional Network contacts. Developments in the wage norm and

current wage statistics were broadly as expected through the remainder of 2017, and the projection was little changed.

According to an estimated wage equation, the historically low wage growth in Norway in recent years may be largely explained by weak productivity growth and a deterioration of Norway's terms of trade. Low profitability among businesses and a rise in unemployment have pushed in the same direction.<sup>4</sup> Even though these factors have been taken into account in the Bank's forecasts, wage growth in recent years has been somewhat lower than projected. This probably reflects a slower-than-expected pick-up in productivity and an unexpectedly strong impact on wages following the oil price fall in 2014. Profitability in segments of oil services has fallen, probably owing to the considerable cost-cutting by oil companies. Also among many trading partners, wage growth has remained relatively low. Cyclical conditions and low productivity growth may have contributed to low wage growth abroad.

In retrospect, overall wage growth in Norway in recent years appears to have been reasonably well in line with historical relationships. A wage equation estimated on data available in December 2016, with a projection conditioned on the forecasts in *Monetary Policy Report 4/16*, would have indicated wage growth of 3 percent in 2017 (Table 2). Now the same model, with estimation and forecasts based on actual developments in the explanatory variables, would project wage growth in 2017 at 2.5 percent. The change in the model estimate primarily reflects clearly weaker terms of trade developments than assumed in *Monetary Policy Report 4/16*. A faster-than-projected improvement in the labour market in isolation pulls in the opposite direction, but in the model it takes some time for this effect to pass through to wage growth.

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<sup>4</sup> See Brubakk, L., K. Hagelund and E. Husabø (2018) "The Phillips curve and beyond – Why has wage growth been so low?" *Staff Memo* 10/2018. Norges Bank.

**Table 2 Projections for annual wage growth in 2017 for MPR 4/16. Percent**

<i>Monetary Policy Report 4/16</i>	2.8
- Expectations survey 2016 Q4	2.7
- Regional Network, November 2016	2.5
- Real-time model estimate <sup>1)2)</sup>	3.0
<b>Actual annual wage growth</b>	<b>2.3</b>
Model estimate on actual data <sup>2)3)</sup>	2.5

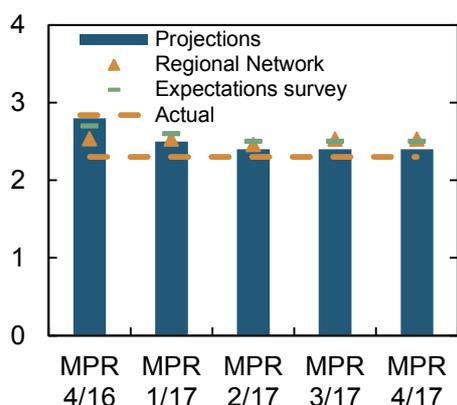
1) Model in Table 5 in Brubakk et al (2018) "The Phillips curve and beyond – Why has wage growth been so low?" *Staff Memo* 10/2018. Norges Bank. Model estimated on real-time data to 2015. Projection for annual wage growth in 2017 conditioned on projections for explanatory variables from MPR 4/16 for 2016 and 2017.

2) The model provides estimates of annual wage per normal full-time equivalent. Actual wage growth in 2017 was 2.5 percent.

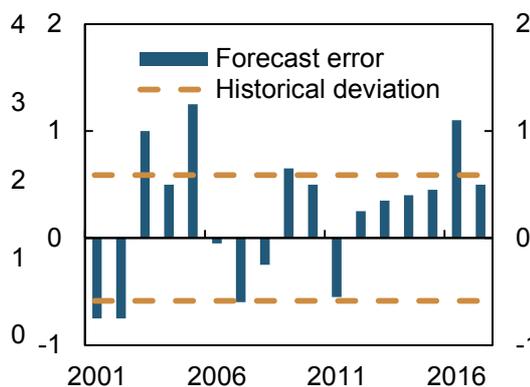
3) Model as in (1), estimated on actual data to 2015 and conditioned on actual developments in explanatory variables.

Sources: Epinion, Statistics Norway and Norges Bank

**Chart 15 Annual wages. Percentage growth. Projections through the year and expectations**



**Chart 16 Annual wage growth. Forecast error<sup>1)</sup>. Per year and and historical<sup>2)</sup>**



1) Percentage point deviation between the last Monetary Policy Report in the previous year and the first revision of the quarterly national accounts.

2) Simple average of absolute forecast error in the period 2001–2016.

Sources: Epinion, Norwegian Technical Calculation Committee for Wage Settlements (TBU), Regional Network, Statistics Norway and Norges Bank

## 2.4. Consumer prices

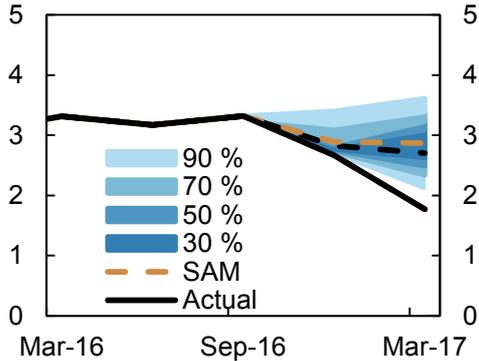
Inflation in 2017 was also lower than expected. In 2016, consumer prices had risen markedly owing to the krone depreciation in the wake of the oil price fall. In the period to *Monetary Policy Report 4/16*, inflation had been somewhat lower than expected. In the Bank's analyses it was assumed that this might indicate a somewhat faster

unwinding of the effects of the krone depreciation on consumer price inflation than in previous reports. On the other hand, the relatively high inflation in 2016 would contribute positively to inflation also in 2017, including though index adjustments of home rental leases.

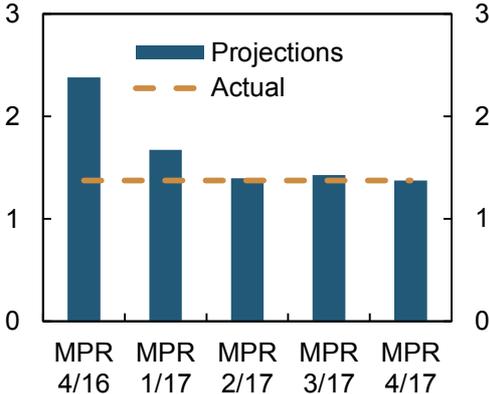
Overall it was assumed that the annual rise in the CPI and CPI-ATE would slow appreciably from 2016 and be at 2.3 and 2.4 percent, respectively in 2017 as a whole. The projection was close to the forecasts from the Bank's model apparatus (Chart 17).

In the period to *Monetary Policy Report 1/17*, inflation was lower than assumed in December. The dip in inflation in winter 2017 was unusually pronounced and clearly greater than had been indicated by the Bank's model apparatus. Along with the downward revision of the annual wage growth projections, this suggested a considerable reduction in the CPI-ATE projections (Chart 18). The actual annual rise in the CPI-ATE in 2017 was 1.4 percent, and thereby markedly lower than the projection in *Monetary Policy Report 4/16*. The actual annual rise in the CPI was 1.8 percent. Both the annual rise in the CPI and annual wage growth in 2015 were thus 0.5 percentage point lower than assumed in *Monetary Policy Report 4/16*.

**Chart 17** CPI-ATE. <sup>1)</sup> Four quarter change. Percent. 2016 Q1 – 2017 Q1



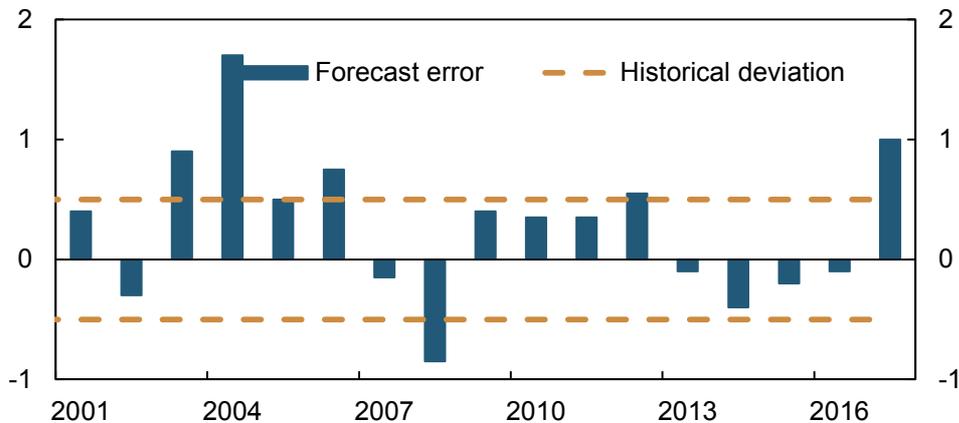
**Chart 18** CPI-ATE. Percentage change. Projections and actual developments. 2016 – 2017



1) Actual developments, projections in the baseline policy rate from MPR 4/16 and projections from SAM (System for Averaging short-term Models) from MPR 4/16 with fan chart.

Sources: Statistics Norway and Norges Bank

**Chart 19 CPI-ATE. Forecast error<sup>1)</sup>. Percentage points. Per year and historical average<sup>2)</sup>**



1) Percentage point deviation between the projections for the annual change in the last Monetary Policy Report in the previous year and the actual annual change.

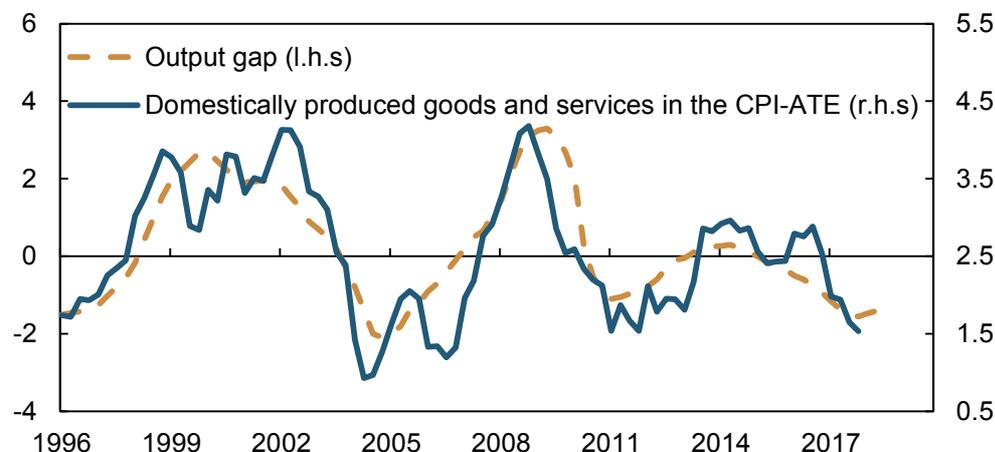
2) Median value of the absolute forecast error in the period 2001 - 2016

Sources: Statistics Norway and Norges Bank

Compared with previous years, the forecast error for the CPI-ATE in 2017 was greater than normal (Chart 19). A lack of historical parallels to the oil price fall in 2014 and the subsequent krone depreciation made projecting price developments a challenge. In real time it was difficult to ascertain when the turning point in inflation would come and how pronounced it would be. In particular, the Bank appears to have overestimated how long the exchange rate would contribute to holding up the rise in the prices for domestically produced goods and services.

In retrospect, the magnitude of the exchange rate pass-through nevertheless appears to have been in line with historical experience, but the rise in prices and the subsequent levelling-off may appear to have come faster than normally. Developments in domestic inflation appears overall to have been fairly well in line with developments in capacity utilisation (Chart 20).

**Chart 20** Domestically produced goods and services in the CPI-ATE. Four-quarter change. Percent. Lagged output gap.<sup>1)</sup> Percent. 1996 Q1 – 2017 Q4



1) The output gap is measured by the percentage difference between mainland GDP and estimated potential mainland GDP. The gap is lagged by six quarters and shows data for 1994 Q1 – 2018 Q3.

Sources: Statistics Norway and Norges Bank

## 2.5. Comparison with historical forecast errors and projections from other forecasters

Projections and forecast errors can be assessed in many ways and along different dimensions. In this section, the forecast errors for 2017 are assessed against Norges Bank's historical forecast errors. Then the Bank's projections are compared with projections from other forecasters through 2017.

### Comparison with historical forecast errors

Normalised deviations can be used to compare forecast errors across key macroeconomic variables. A normalised deviation shows the magnitude of the deviation relative to the normal variability in the particular series. Highly variable series will be expected to show greater forecast errors than less volatile series.

Table 3 shows relatively pronounced deviations for the CPI-ATE and registered unemployment, measured both as normalised deviations and compared with average absolute deviations in the period 2001–2017. For mainland GDP, the deviation was relatively small compared with the historical volatility in the series; the same applies to annual wage growth and in part to employment growth. The projection for mainland

GDP was also clearly less than the average historical deviation, while the forecast errors for annual wage growth and employment growth were close to the average forecast error.

Table 3 further shows that Norges Bank's mainland GDP and registered unemployment projections have, on average, been on the mark in forecasting actual developments over the past 16 years. On the other hand, the annual wage growth and CPI-ATE inflation projections have, on average, been somewhat high. However, the employment growth projections have, on average, been somewhat low in the period.

**Table 3** Forecast errors<sup>1)</sup> in 2017. Normalised deviation<sup>2)</sup>, actual deviation<sup>3)</sup> and absolute deviation<sup>4)</sup>. Average<sup>5)</sup> actual and absolute deviation in the period 2001 – 2017

	Normalised deviation	Deviation	Historical deviation	Historical absolute deviation
<b>Mainland GDP</b>	0.26	-0.50	0.05	0.71
<b>Annual wage growth</b>	0.42	0.50	0.18	0.63
<b>CPI-ATE</b>	1.22	1.00	0.21	0.50
<b>Employment</b>	-0.47	-0.67	-0.43	0.66
<b>Registered unemployment</b>	0.69	0.40	0.01	0.25

1) Estimates are based on annual change (in percent), except for unemployment, where the annual rate (level) is used. For GDP and employment, the deviations are estimated by comparing the projections with the first national accounts data for the relevant year.

2) Actual deviation divided by the standard deviation for the series in the period 2001–2017.

3) Difference between projections from *Monetary Policy Report 4/16* and actual outcome/first publication of quarterly national accounts (QNA) for GDP and employment. For 2017, the third publication of QNA is used.

4) Absolute value of actual deviation.

5) Simple average in the period 2001–2016.

## Comparison with other institutions' forecast errors

In this section, Norges Bank's projections for 2017 are compared with projections from other institutions<sup>5</sup> that publish macroeconomic forecasts. The charts show developments in Norges Bank's projections from *Monetary Policy Report 4/16* to *Monetary Policy Report 4/17* together with projections from other forecasters in the same time period.<sup>6</sup>

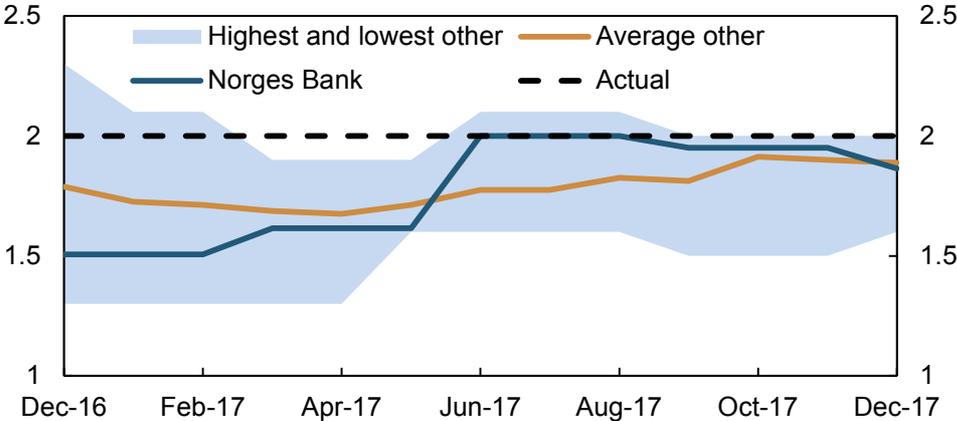
<sup>5</sup> DNB, Danske Bank, Handelsbanken, Ministry of Finance, Nordea, SEB and Statistics Norway.

<sup>6</sup> The various forecasters publish projections at different times. The projections are thus based on slightly different underlying information. In the charts, the forecasts are sorted by the month in which they are

The average of a sample of forecasters' projections for GDP growth in 2017 from the end of 2016 was well on the mark in forecasting the preliminary national accounts data. Norges Bank's projections at the same time were slightly lower, but were revised closer to the actual data through the year (Chart 21).

Like other forecasters, Norges Bank underestimated employment growth in 2017. Both the Bank and other institutions revised up the projections through the year, but not enough to accurately forecast actual developments (Chart 22).

**Chart 21 Mainland GDP. Projections from Norges Bank and other forecasters<sup>1)</sup>. Percentage growth between 2016 and 2017**



1) Confederation of Norwegian Enterprise (NHO), DNB, Danske Bank, Handelsbanken, Ministry of Finance, Nordea, SEB and Statistics Norway. Sources: Other forecasters and Norges Bank

Both Norges Bank and the other forecasters overestimated LFS unemployment for 2017 in late 2016 (Chart 22).<sup>7</sup> However, the projections were revised down to a fairly considerable extent in *Monetary Policy Report 1/17*. These projections ended overall as somewhat more accurate than those from other forecasters.

Through 2017, the Bank's projections for annual wage growth in 2017 were close to the average of the projections from other forecasters (Chart 24). Both the Banks' and other forecasters' projections were revised down during the first half of 2017, and were thereafter little changed during the remainder of the year. Actual wage growth in 2017

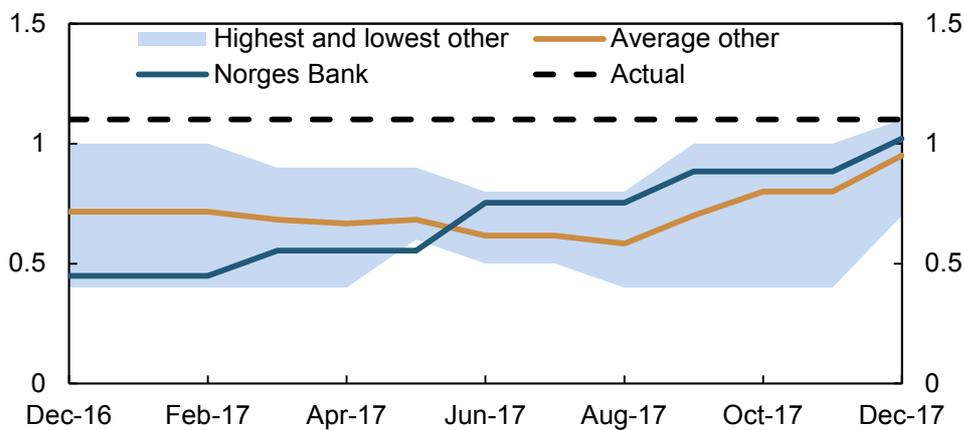
published. Thus, all projections published by the relevant forecasters in the period December 2016 to December 2017 are included.

<sup>7</sup> The basis for this comparison is LFS unemployment, since most of the other forecasters make projections for this unemployment measure.

proved to be lower than the Bank and other forecasters expected at the end of 2016.

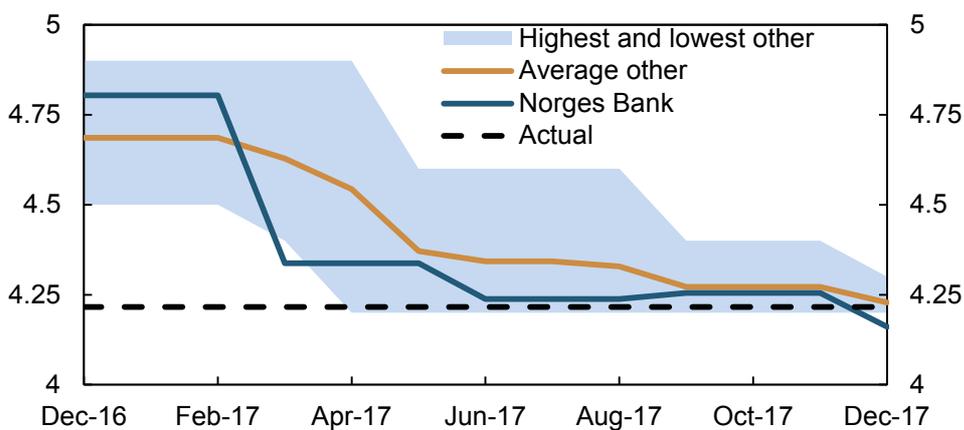
Both Norges Bank and other forecasters overestimated CPI-ATE inflation for 2017 at the end of 2016 (Chart 25). All forecasters revised down their forecasts through spring and summer, when inflation proved to be markedly lower than expected. From summer, Norges Bank's inflation projections were accurate.

**Chart 22** Employment. Projections from Norges Bank and other forecasters <sup>1)</sup>. Percentage growth between 2016 and 2017



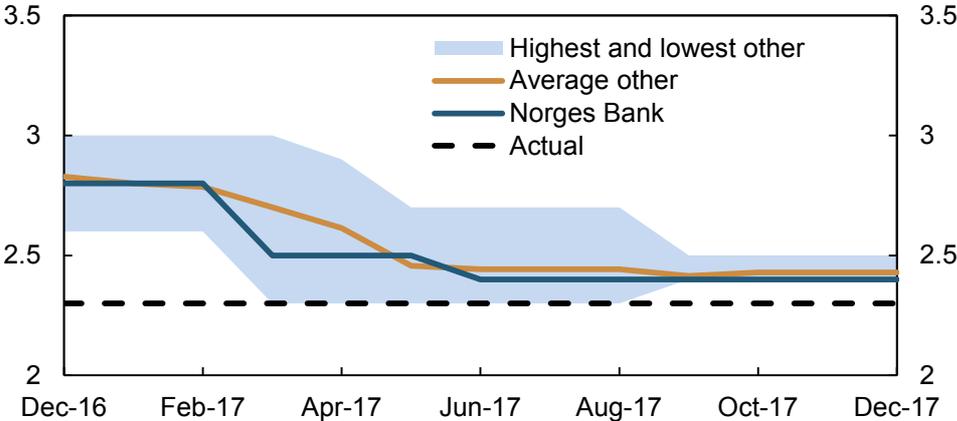
1) Confederation of Norwegian Enterprise (NHO), DNB, Danske Bank, Handelsbanken, Ministry of Finance and Statistics Norway. Sources: Other forecasters and Norges Bank

**Chart 23** Unemployment (LFS). Projections from Norges Bank and other forecasters <sup>1)</sup>. Percentage growth between 2016 and 2017



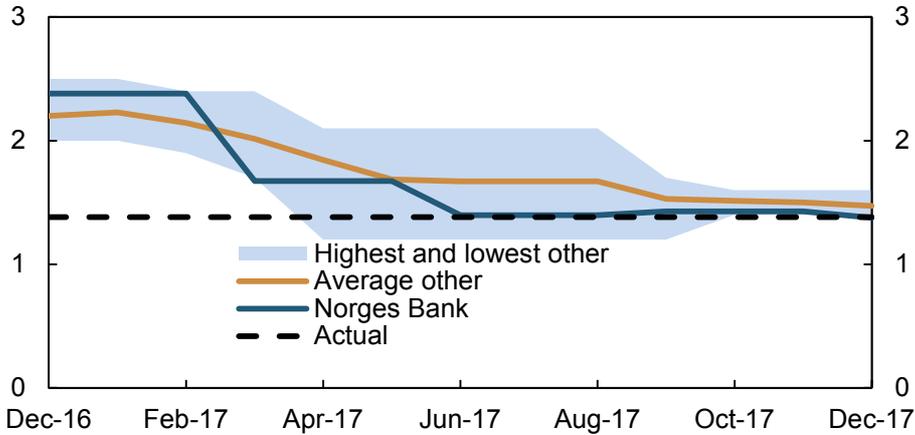
1) Confederation of Norwegian Enterprise (NHO), DNB, Handelsbanken, Ministry of Finance, Nordea, SEB and Statistics Norway. Sources: Other forecasters and Norges Bank

**Chart 24 Annual wages. Projections from Norges Bank and other forecasters <sup>1)</sup>. Percentage growth between 2016 and 2017.**



1) DNB, Danske Bank, Handelsbanken, Ministry of Finance, Nordea, SEB and Statistics Norway.  
 Sources: Other forecasters and Norges Bank

**Chart 25 Consumer prices (CPI-ATE). Projections from Norges Bank and other forecasters <sup>1)</sup>. Percentage change between 2016 and 2017**



1) DNB, Danske Bank, Handelsbanken, Ministry of Finance, Nordea, SEB and Statistics Norway.  
 Sources: Other forecasters and Norges Bank

### 3. Conclusion

Developments in the real economy in 2017 were reasonably well in line with the projections from the end of 2016, but overall, the upswing in the Norwegian economy was a little stronger than envisaged. Viewed in a historical perspective, the Bank's GDP growth projection for 2017 was relatively accurate, while the forecast errors for employment, registered unemployment and the CPI-ATE were greater than in previous years.

Slightly higher-than-expected GDP growth and a faster-than-assumed decline in unemployment contributed to an upward revision in the projection for capacity utilisation through 2017, but activity was still assessed as being below a normal level. The Bank's projections were based on the assumption that weak productivity would also continue through 2017. Productivity growth rose a little between 2016 and 2017, but the rise was somewhat less than expected. Employment rose more than projected.

Despite higher-than-expected capacity utilisation in 2017, both wage and price inflation were lower than assumed. Both in Norway and among many main trading partners, wage growth in recent years has been lower than developments in capacity utilisation in isolation would suggest. This also reflects the relatively low productivity growth in period. For Norway, the fall in oil prices has, in addition, probably also helped to pull down wage growth. Developments in Norway's terms of trade were weaker than assumed in December 2016, providing less room for wage growth. In addition, lower activity in the oil industry contributed to a shift in employment towards lower-wage sectors.

Unexpectedly low inflation in 2017 may in part reflect wage growth in 2016 and 2017 that proved lower than expected. The Bank also appears to have overestimated how low the exchange rate depreciation would contribute to sustaining inflation.

### Appendix

**Appendix Table 1. Projections for key macroeconomic variables for 2017. Percentage change from 2016 unless otherwise stated**

	MPR 4/16	MPR 1/17	MPR 2/17	MPR 3/17	MPR 4/17	Actual 2017
<b>Prices and wages</b>						
CPI	2.3	2.2	1.8	1.9	1.9	1.8
CPI-ATE <sup>1)</sup>	2.4	1.7	1.4	1.4	1.4	1.4
Annual wages <sup>2)</sup>	2.8	2.5	2.4	2.4	2.4	2.3
House prices	8.6	8.8	6.9	5.8	5.7	5.9
<b>Real economy</b>						
GDP	0.5	1.0	1.2	1.5	1.9	2.0
Mainland GDP	1.5	1.6	2.0	2.0	1.9	2.0
Output gap for Mainland Norge (level) <sup>3)</sup>	-1.6	-1.5	-1.2	-1.1	-0.9	-0.9
Employment, persons, QNA	0.4	0.6	0.8	0.9	1.0	1.1
Labour force, LFS	0.5	-0.3	-0.3	-0.3	-0.5	-0.2
LFS unemployment (rate, level)	4.8	4.3	4.2	4.3	4.2	4.2
Registered unemployment (rate, level)	3.1	2.9	2.8	2.7	2.7	2.7
<b>Demand</b>						
Mainland demand <sup>4)</sup>	2.7	2.9	2.9	3.0	3.0	3.3
- Household consumption <sup>5)</sup>	2.0	1.9	2.1	2.7	2.4	2.2
- Business investment	5.1	4.7	3.8	3.9	6.0	9.3
- Housing investment	6.4	11.3	9.8	9.8	9.7	7.0
- Public demand <sup>6)</sup>	2.5	2.4	2.4	2.0	1.9	2.7
Petroleum investment <sup>7)</sup>	-11.4	-9.8	-5.2	-1.0	-2.0	-3.8
Mainland exports <sup>8)</sup>	2.9	1.3	1.1	0.2	0.8	-1.4
Imports	3.0	0.3	2.2	4.3	1.7	1.6
<b>Interest and exchange rates</b>						
Policy rate (level) <sup>9)</sup>	0.4	0.4	0.5	0.5	0.5	0.5
Import-weighted exchange rate (I-44, level) <sup>10)</sup>	102.0	102.9	104.7	103.8	104.6	104.5
<b>Global economy and oil prices</b>						
GDP for trading partners <sup>11)</sup>	2.1	2.3	2.4	2.7	2.8	2.9
External price impulses, IPK <sup>12)</sup>	0.4	0.7	0.4	0.8	0.8	0.9
Oil price (Brent Blend), USD per barrel (level) <sup>13)</sup>	56	54	50	52	54	54

1) CPI adjusted for tax changes and excluding energy products.

2) Annual wage growth is based on the Norwegian Technical Calculation Committee for Wage Settlements' (TBU) definitions and calculations. Actual figures for 2017 are from the fourth publication of the quarterly national accounts for 2017.

3) The output gap is a measure of the percentage deviation between mainland GDP and projected potential mainland GDP.

- 4) Household consumption and private mainland gross fixed investment and public demand.
- 5) Includes consumption for non-profit organisations.
- 6) General government gross fixed investment and consumption.
- 7) Production and pipeline transport.
- 8) Traditional goods, travel, petroleum services and exports of other services from mainland Norway.
- 9) The policy rate is the interest rate on banks' deposits in Norges Bank.
- 10) The weights are estimated on the basis of imports from 44 countries, which comprise 97 percent of total imports.
- 11) Export weights, 25 main trading partners.
- 12) Indicator of external price impulses to imported consumer goods.
- 13) Average futures prices for last five trading days of 2017.

Sources: Eiendomsverdi, Finn.no, Norwegian Labour and Welfare Administration (NAV), Norwegian Technical Calculation Committee for Wage Settlements (TBU), Real Estate Norway, Statistics Norway, Thomson Reuters and Norges Bank.

## Data

In the description of actual developments in national accounts variables through the year (in Section 2), reference is made to real-time data, ie the first publication of quarterly national accounts figures at the time in question. In the rest of the discussion and analysis of developments for 2017 as a whole, both in Sections 1 and 2, the fourth publication of annual national accounts figures are used, as published on 13 November 2018. This also applies to figures for 2017 in charts and tables.