

# NORGES BANK PAPERS

Evaluation of Norges Bank's forecasts  
for 2018 and 2019

NO. 5 | 2020



NORGES BANK

**Norges Bank**

Adresse: Bankplassen 2

Post: Postboks 1179 Sentrum, 0107 Oslo

Telefon: 22316000

Telefaks: 22413105

E-post: [central.bank@norges-bank.no](mailto:central.bank@norges-bank.no)

Web: [www.norges-bank.no](http://www.norges-bank.no)

ISSN 1894-0293 (online)

ISBN 978-82-8379-188-4 (online)

EVALUATION OF NORGES  
BANK'S FORECASTS FOR  
2018 AND 2019

*Norges Bank's economic forecasts for the Norwegian economy for 2018 and 2019 were close to the mark and the forecast errors were mostly smaller than for the preceding 20 years. The evaluation for 2018 and 2019 indicates that the forecasting system captured the main features of economic developments. The forecast errors from simple models were also smaller than normal.*

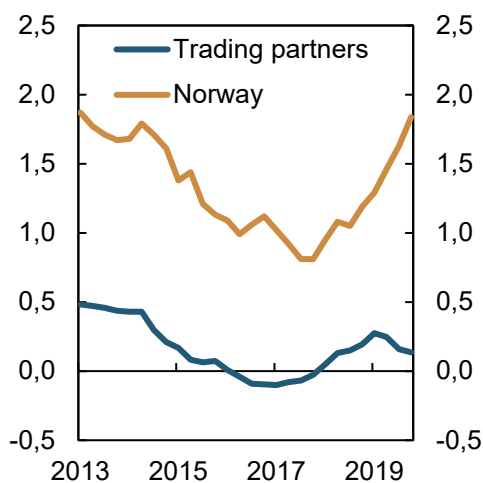
*For some of the variables, there has been a tendency of systematic forecast errors over time. If we look at the period after the oil price collapse in 2014, wage growth, productivity and the exchange rate have shown weaker-than-expected developments. Overall, it would appear that we underestimated the decline in the ability to pay wages in Norway.*

### 1. Economic developments in 2018 and 2019

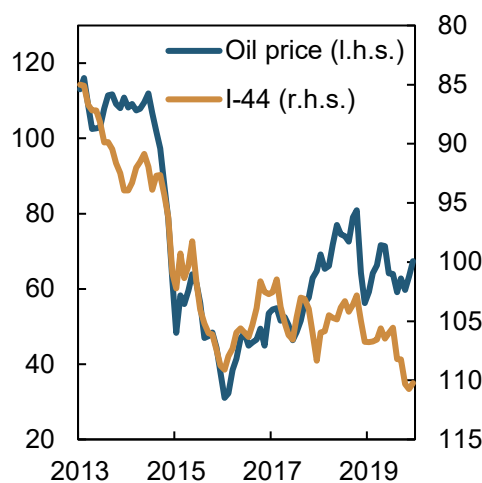
Growth among Norway's trading partners slowed towards the end of 2018 and into 2019 after several years of solid growth. The slowdown occurred against the background of trade conflicts and falling manufacturing production. Nonetheless, unemployment fell in many countries, while wage growth accelerated. Core inflation for most of Norway's trading partners still remained fairly stable at somewhat below inflation targets.

The global interest rate level was low. Policy rates in a range of countries were increased a little in 2017 and 2018, but some of the increase was reversed in 2019 (Chart 1).

*Chart 1 Three-month money market rates. Percent. 2013 Q1 – 2019 Q4<sup>1)</sup>*



*Chart 2 Oil price and import-weighted exchange rate. January 2012 – December 2019*



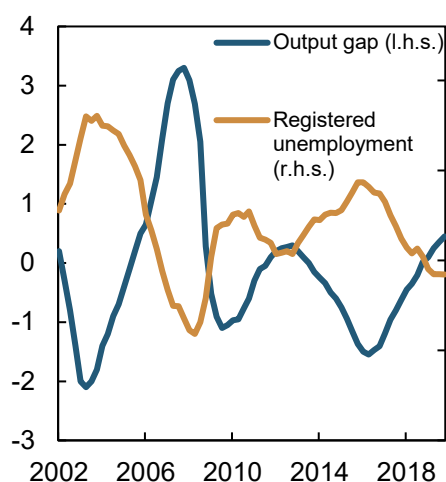
Sources: Refinitiv Datastream and Norges Bank

Oil prices fluctuated somewhat through 2018 and 2019 but remained higher than in the period 2015-2017 (Chart 2). The krone exchange rate depreciated between 2018 and 2019 and was weaker than implied by historical relationships against the oil price and the interest rate differential with other countries.

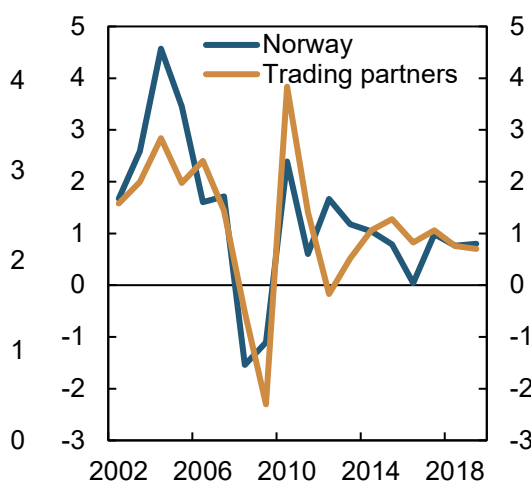
The Norwegian economy started to recover in 2016 and pursued its rebound in 2018 and 2019. Solid global growth, stronger cost competitiveness and low interest rates helped fuel the upturn. After falling over several years, both oil investment and mainland exports picked up, while growth in household consumption slowed a little. Housing investment fell through both 2018 and 2019, while growth in business investment abated gradually from a relatively high level.

Capacity utilisation in the Norwegian economy was estimated to be somewhat lower than a normal level at the beginning of 2018 (Chart 3). Spare capacity gradually diminished through 2018 and 2019, and capacity utilisation was estimated to be somewhat above a normal level at the end of 2019. Labour market conditions improved and employment rose. The share of enterprises in Norges Bank's Regional Network that reported increased capacity utilisation and labour shortages increased.

*Chart 3 Output gap and registered unemployment. Percent. 2002 Q1 – 2018 Q4*



*Chart 4 Productivity growth in Norway and among trading partners. Percent. 2002 - 2019*



Sources: NAV, Statistics Norway, Refinitiv Datastream and Norges Bank

By historical standards, productivity growth has been relatively low in recent years, averaging below 1 percent in the period 2016 – 2019 (Chart 4). Productivity growth was also low internationally.

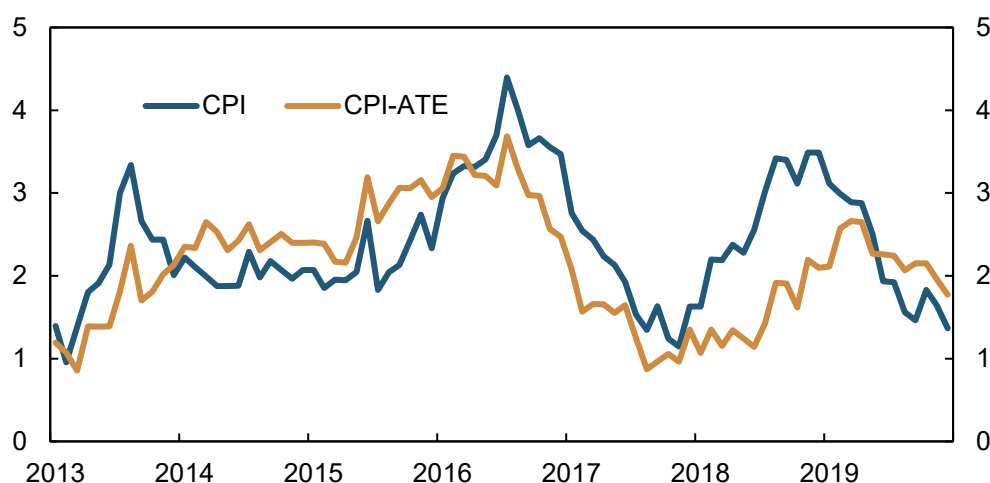
Low productivity growth implies in isolation low wage growth. Wage growth nonetheless continued to drift up in 2018 and 2019, partly reflecting a tighter labour market and improved terms of trade.

Due to the rise in price inflation however, real wages in 2018 were broadly unchanged on the previous year. In 2019, real wage growth climbed to 1.3 percent, the highest rate recorded since 2013.

Consumer price inflation rose markedly through 2018, but fell back in 2019 (Chart 5), reflecting developments in electricity prices. Underlying inflation accelerated through 2018 and 2019, partly driven by higher wage growth and increased imported inflation.

The policy rate was raised by a total of 1 percentage point through 2018 and 2019, and stood at 1.5 percent at the end of 2019.

Chart 5 CPI and CPI-ATE. Twelve-month growth. January 2013 – December 2019



Source: Statistics Norway

## 2. Evaluation of forecasts for 2018 and 2019

### 2.1 How accurate were the forecasts for 2018 and 2019?

In the following, we evaluate the forecasts for 2018 in the first *Monetary Policy Report* in 2018 (MPR 1/18) and the first *Monetary Policy Report* in 2019 (MPR 1/19). The first report of the year has been published at around the same point in time over the past 20 years. The main aggregates are presented in Table 1, while other forecasts can be found in Annex Table 1. For the main aggregates, the forecast errors are assessed against historical forecast errors and against forecasts by Statistics Norway published around the same time as the first *Monetary Policy Report* each year. The forecast errors are also compared with forecasts from simple models based on the same data available when the reports were published (see Box 1). These models and the historical forecast errors are further documented in a Staff Memo (to be published in the course of 2021).

The forecasts for mainland GDP, CPI-ATE, registered employment<sup>1</sup>, annual wage growth and employment for both 2018 and 2019 were fairly accurate, and the forecast errors were clearly smaller than in the period 1998 – 2017 (Table 1, Charts 6, 8, 9 and 13).

The forecast errors for the output gap and productivity for 2018 were also smaller than normal, while the forecasts for 2019 were about as accurate as usual (Charts 7 and 12). In 2019, the exchange rate was clearly weaker than projected (Chart 11).

Overall, there were no large differences between forecasts from Norges Bank, Statistics Norway and simple models.

*Table 1 Forecasts of main macroeconomic aggregates for 2018 and 2019 from MPR 1/18 and MPR 1/19*

	F'cast 2018	Actual 2018	F'cast 2019	Actual 2019	Differ- ence 2018 <sup>1</sup>	Differ- -ence 2019 <sup>1</sup>	Historical deviation <sup>2</sup>
<b>GDP, mainland Norway<sup>3)</sup></b>	2.6	2.5	2.7	2.4	0.0	-0.3	0.6
<b>Employment<sup>3)</sup></b>	1.3	1.6	1.4	1.7	0.3	0.3	0.5
<b>Productivity<sup>3)</sup></b>	1.3	0.9	1.3	0.7	-0.3	-0.6	0.5
<b>CPI-ATE<sup>3)</sup></b>	1.5	1.6	2.3	2.2	0.0	-0.1	0.2
<b>Annual wages<sup>3)</sup></b>	2.9	2.8	3.3	3.5	-0.1	0.1	0.4
<b>Registered unemployment<sup>4)</sup></b>	2.3	2.5 <sup>6)</sup>	2.3	2.3	0.2	0.0	0.1
<b>Output gap</b>	-0.2	-0.2	0.6	0.2	0.0	-0.4	0.4
<b>Exchange rate<sup>5)</sup></b>	103.7	104.6	104.4	107.6	0.8	3.2	2.4

1) Difference between actual and projected developments.

2) Average absolute value of deviations in the period 2002 – 2017.

3) Percentage growth.

4) As a percentage of the labour force and projected potential GDP, respectively.

5) Level.

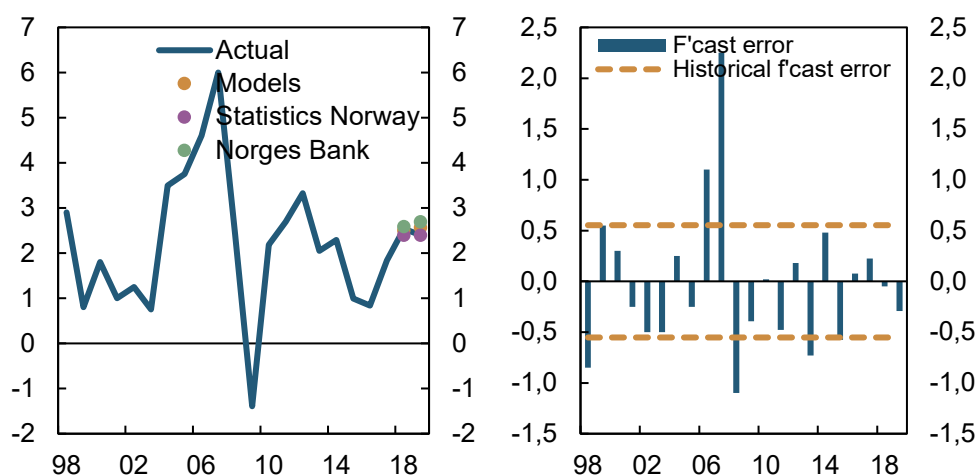
6) Registered unemployment was revised up during 2018 owing to methodological changes at NAV, which explains about half of the forecast errors in 2018.

<sup>1</sup> Registered unemployment was revised up in 2018 owing to methodological changes at NAV (Norwegian Labour and Welfare Administration). This accounts for about half of the forecast errors in 2018.

The unexpected krone depreciation through 2019 must be seen in connection with the persistent uncertainty about global developments. The international environment may have pushed up the risk premium for the Norwegian krone and other low-liquidity currencies. The krone depreciated markedly in the beginning of August when the trade conflict between China and the US intensified. Prospects for a decline in oil sector activity and uncertainty regarding the need for restructuring in the Norwegian economy may also have weighed on the krone.

The output gap was lower than estimated in 2019, primarily reflecting somewhat lower-than-expected output growth.<sup>2</sup> At the same time, our estimate of trend growth in the economy was revised up slightly through the year, partly because potential employment appeared to be higher than estimated at the beginning of 2019. Labour market entry was higher than we had assumed.

Charts 6a and b GDP mainland Norway.<sup>3</sup> Constant prices. Annual growth. Percent. 1998 - 2019



Sources: Statistics Norway and Norges Bank

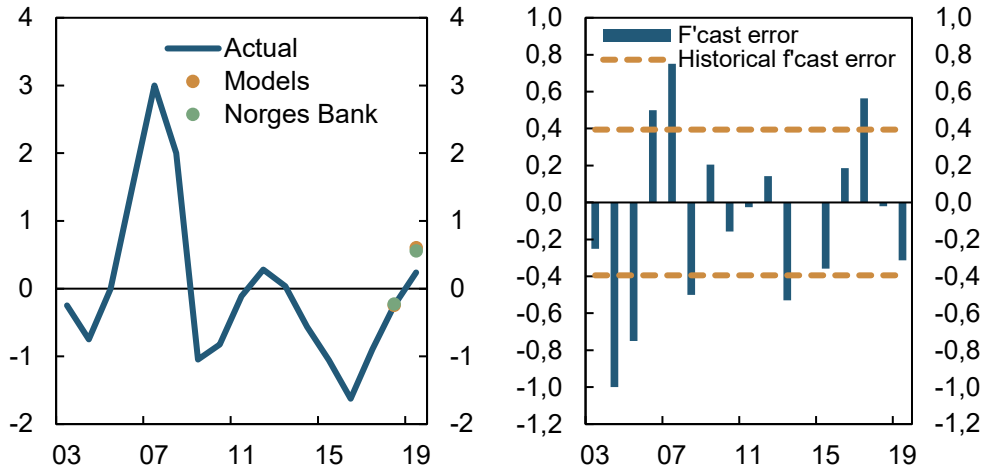
Lower-than-projected productivity growth must be seen both in the context of lower GDP growth and higher-than-expected employment growth. We had assumed that productivity growth would drift up in pace with the economic upturn. Normally, businesses use an economic upturn to use factors of production more efficiently. This probably occurred to a lesser degree than normally. At the same time, the economic upturn was somewhat weaker than we had projected. Productivity growth that proved

<sup>2</sup> The evaluation of the output gap differs from the evaluation of the other variables in two ways. First, the output gap is unobservable also in retrospect. Therefore, there is no absolute correct historical data. Second, the forecasts are evaluated against Norges Bank's retrospective evaluation. For the other variables, the historical series are produced by others than Norges Bank.

<sup>3</sup> The chart to the left shows real time figures (first publication), including forecasts for 2018 and 2019. The chart to the right shows Norges Bank's forecast errors per year against real time figures and average absolute forecast errors in the period up to and including 2017.

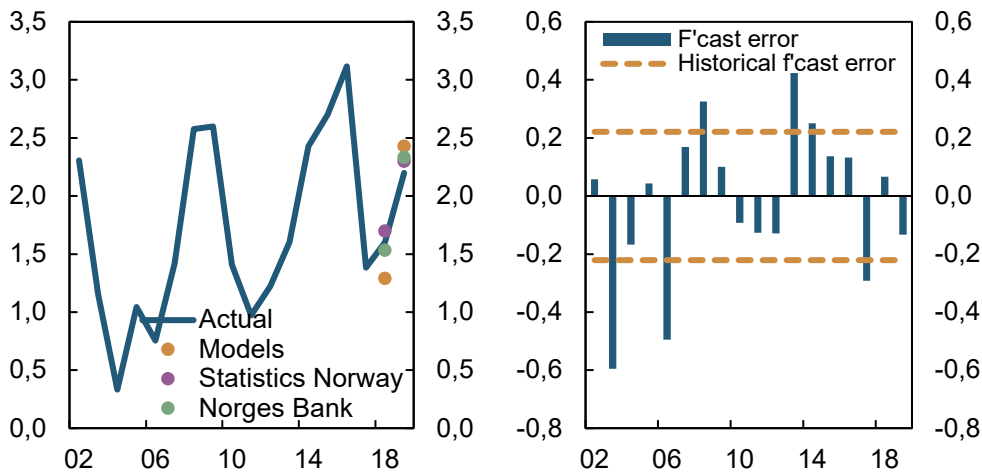
to be lower than expected may also reflect lower underlying potential productivity than we had assumed.

Charts 7a and b Output gap.<sup>3</sup> As a percentage of potential GDP. 2003 - 2019



Sources: Statistics Norway and Norges Bank

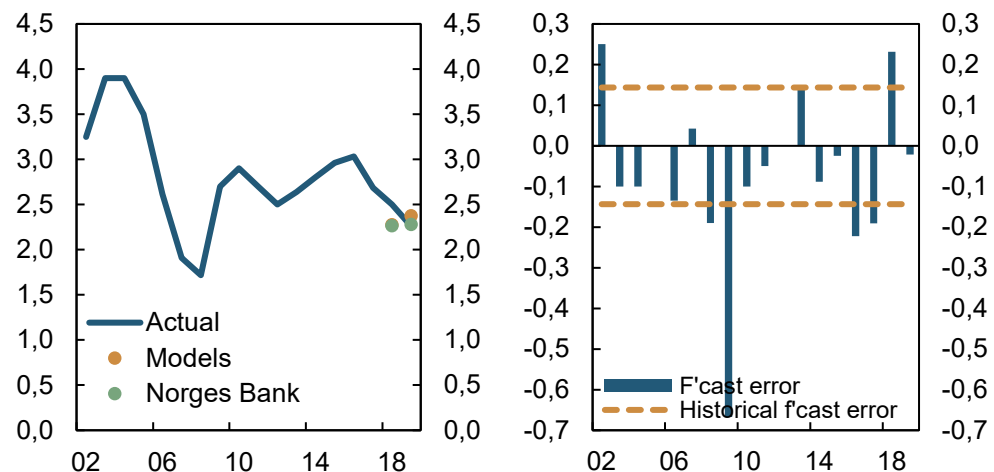
Charts 8a and b CPI-ATE.<sup>3</sup> Annual growth. Percent. 2002 - 2019



Sources: Statistics Norway and Norges Bank

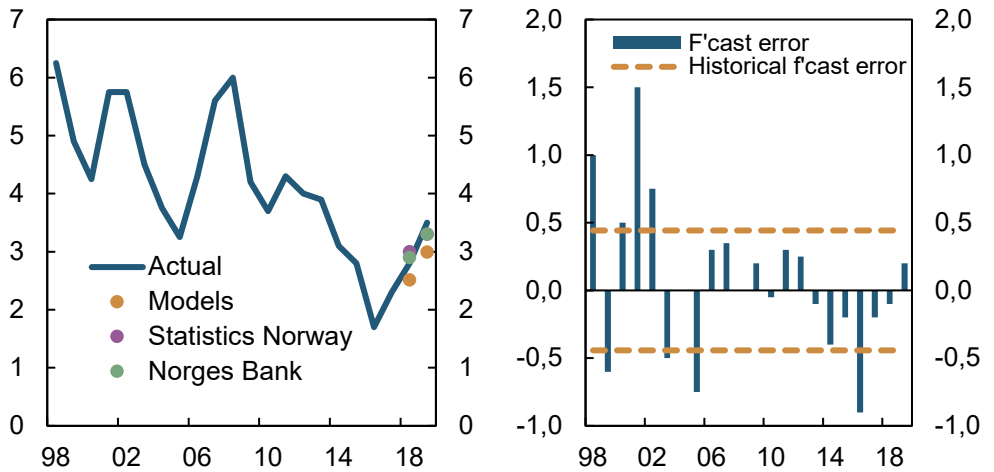


Chart 9a and b Registered unemployment. <sup>3</sup> Level. Percent. 2002 - 2019



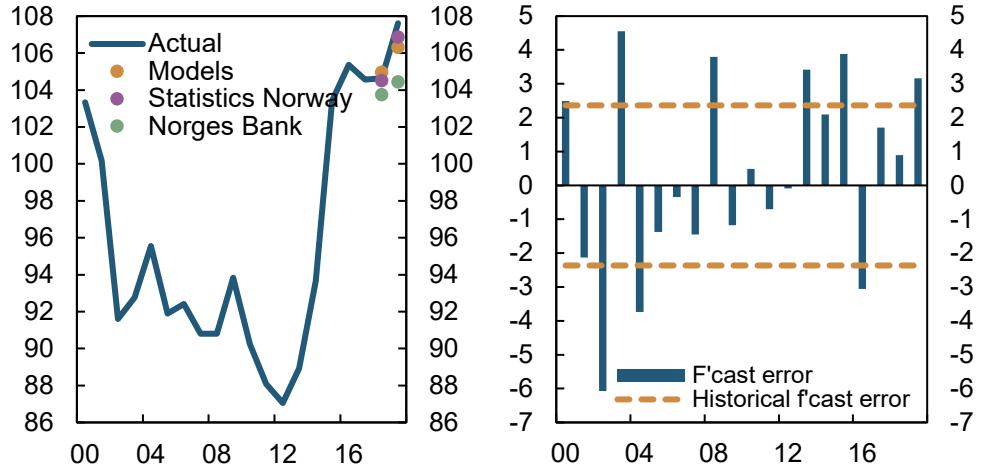
Sources: NAV and Norges Bank

Chart 10a and b Annual wages. <sup>3</sup> Annual growth. Percent. 1998 - 2019



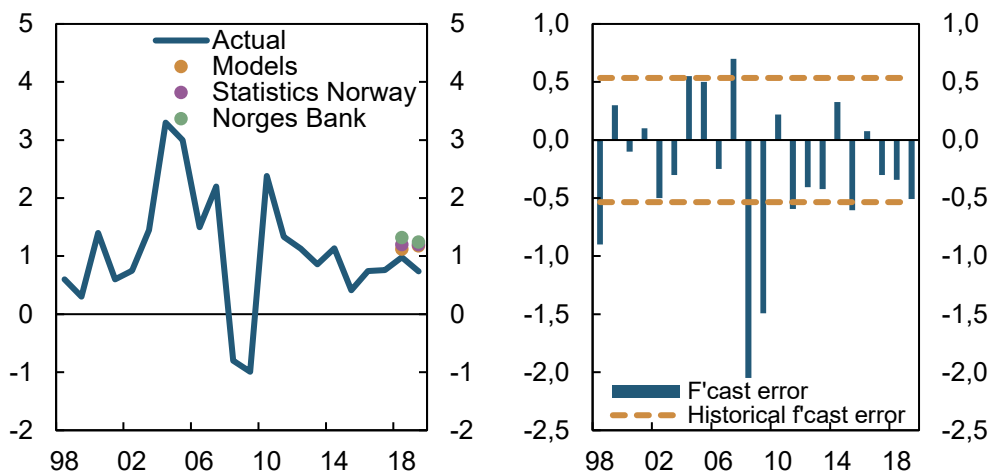
Sources: Statistics Norway and Norges Bank

Chart 11a and b I44. <sup>3</sup> Level. 2000 - 2019



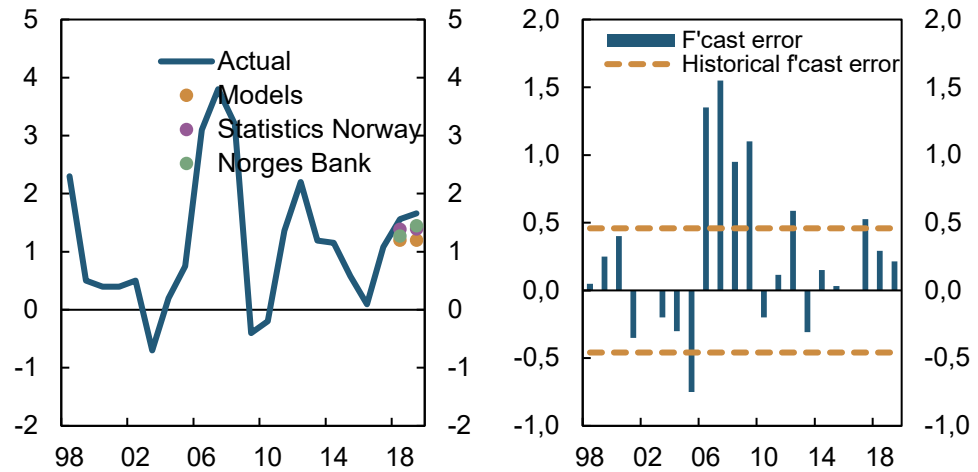
Sources: Statistics Norway and Norges Bank

Chart 12a and b Productivity.<sup>3</sup> Annual growth. Percent. 1998 – 2019



Sources: Statistics Norway and Norges Bank

Chart 13a and b Employment.<sup>3</sup> Annual growth. Percent. 1998 – 2019



Sources: Statistics Norway and Norges Bank

### **Box 1. More about historical forecast errors and models**

In this paper, the forecast errors for 2018 and 2019 are assessed against average forecast errors in the first *Monetary Policy Report* each year in the period 1998 – 2017.

For variables that are revised retrospectively, we have used the first publication as historical data. These real time variables are GDP for mainland Norway, employment, productivity, output gap, demand in mainland Norway, household consumption, investment, public demand, mainland exports and imports. CPI-ATE inflation, registered unemployment, wage growth and the krone exchange rate are not revised retrospectively.

Forecasts from the *Monetary Policy Report* are compared with a simple average of projections derived from simple rules and standard time series models. A simple rule may for example be to assume that growth in an aggregate will remain equal to the average growth in the past year. Standard time series models comprise linear and non-linear autoregressive models. The dataset for the models is the same as the one available when preparing the *Monetary Policy Report*. The forecasts are also compared with Statistics Norway's forecasts published around the same point in time as the first *Monetary Policy Report* every year.

A more detailed description of the historical forecast errors and models is presented in Staff Memo (to be published in the course of 2021).

Using normalised deviations is one method for comparing forecast errors across the main macroeconomic aggregates. Normalised deviation shows the magnitude of the forecast error relative to the normal variance in the series.<sup>4</sup> Series with high variance are expected to show greater forecast errors than less volatile series.

The sum of the absolute values of the normalised deviations is a simple way to measure the accuracy of the overall forecasts. Chart 14 shows average normalised deviations per year for forecasts from Norges Bank and simple models for the main macroeconomic aggregates presented in Table 1. A smaller average forecast error indicates that the overall forecasts were closer to the mark. Measured in this manner, the forecasts for 2018 and 2019 were among the most accurate during the period under review.

Forecast errors can reflect a variety of conditions. The economic relationships may differ from the assumptions underlying our modelling system. Conditions that are exogenous to the models may have been erroneously estimated. One way of evaluating forecast performance is to compare forecasts with previous forecasts, for example by calculating the

---

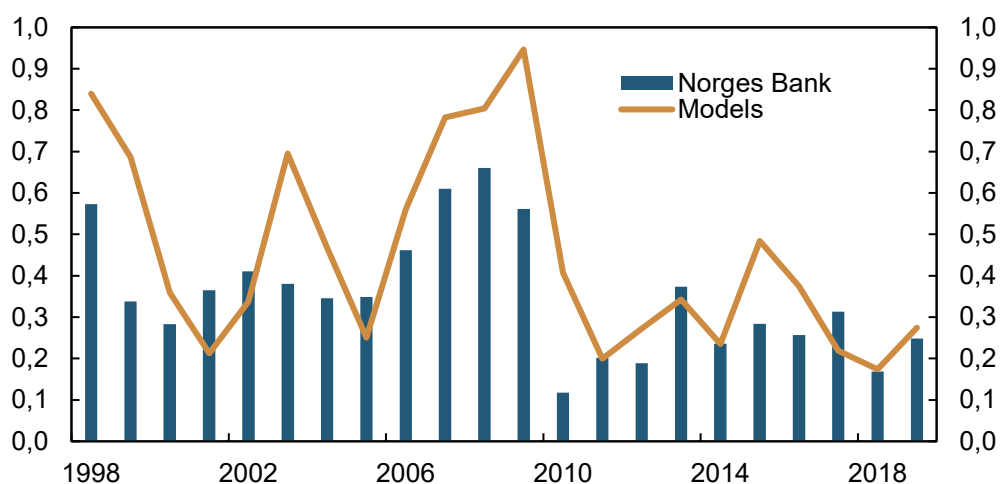
<sup>4</sup> Forecast errors are normalised by dividing by the standard deviation of the series. The standard deviation is calculated in the period Norges Bank has published forecasts for the variable.

difference between average forecast errors for simple models and for Norges Bank.

Chart 14 suggests that Norges Bank's forecasts are consistently better than forecasts from simple models since the difference for most of the years is positive. Compared with forecasts from simple models, Norges Bank builds its forecasts on a broader information basis and a richer modelling system. In addition, Norges Bank's forecasts are adjusted for judgement.

The simple models for 2018 and 2019 also had slightly higher average of forecast errors than Norges Bank's projections. The forecast errors for both Norges Bank and the simple models were relatively small and indicate that developments during these two years were relatively easy to project.

Chart 14 Average absolute value of normalised deviations<sup>1)</sup>. 1998 - 2019



1) The following variables are included (years in brackets denote the first year the variable is included in the average) GDP, mainland Norway (1998), annual wage growth (1998), employment growth (1998), productivity growth (1998), I-44 (2000), registered unemployment (2001), CPI-ATE (2002), output gap (2003). Sources: NAV, Statistics Norway and Norges Bank

## 2.2 More on demand growth

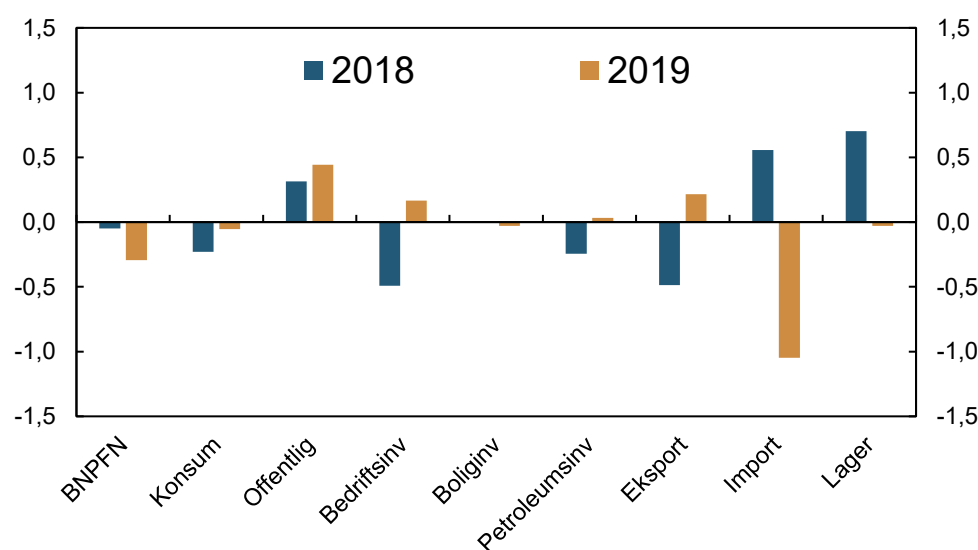
GDP growth projections for mainland Norway in 2018 and 2019 were fairly close to the mark. Overall demand was underestimated for 2018 and overestimated for 2019 (Annex Chart 1). This was counteracted by underestimation of imports and stockbuilding in 2018 and overestimation of imports in 2019 (Chart 15).

Overall, projections of demand components for 2018 and 2019 were about as accurate as the average since 2002 (Annex Charts 2-7).

There may be reason to note that public demand grew more than projected in both 2018 and 2019. We normally apply the projections in the budget documents. In 2019 public consumption in particular increased more than we had assumed (Annex Chart 3). The forecast error was greater than the historical forecast error. Statistics Norway's projections of public consumption in 2019 were somewhat more accurate than Norges Bank's projections.

Growth in household consumption was slightly lower than projected in 2018 and marginally lower in 2019, but the forecast errors were smaller than the historical deviations (Annex Chart 2). In 2018, growth in real income was moderately lower than projected despite higher employment growth. This reflected the fact that the rise in electricity prices was higher than projected. In 2019, consumption growth was partly dampened by the delay in delivery of electric cars from 2019 to 2020. Real wage growth in 2019 turned out to be higher than expected.

*Chart 15 Contribution to forecast errors for GDP, mainland Norway.  
Percentage points*



Sources: Statistics Norway and Norges Bank

### 2.3 A few lessons from the forecast errors in recent years

Signs of systematic errors in forecasts are normally discernible after a period of time. It can for example take time to capture changes in underlying trends in the economy. In this section, we therefore look at the forecasts of the main macroeconomic aggregates since the oil price fall in 2014. In this period the most main overall tendency was weaker-than-expected developments in wage and productivity growth and the krone exchange rate. For productivity and the exchange rate, this was also the case in 2018 and 2019. However, the wage growth projection was approximately

accurate. The past two year lower-than-expected productivity growth primarily reflects stronger-than-projected employment growth.

Productivity growth in Norway and internationally began to decrease in the mid-2000s and estimates of trend productivity growth have been adjusted downwards over time. Among possible explanations for persistently lower productivity growth, forward lower investments along with a slower pace of innovation and diffusion of technology than previously have been cited.<sup>5</sup>

Underlying growth in productivity is a key aggregate in explaining growth potential and ability to pay wages over time. Following developments in trend productivity growth in real time is nevertheless very demanding. A common approach is to estimate trend productivity growth with the help of filtering techniques. In practice this implies that estimated trend productivity will at all times lie near average productivity growth over the past couple of business cycles. In a period with falling trend productivity growth, the projections may then systematically overestimate actual productivity growth. Statistics Norway and simple models did not capture the decline in productivity growth the past 10 years either.

Lower productivity growth contributed to our underestimation of capacity utilisation during the first years of the recovery from 2016 (Chart 7b). Potential growth was overestimated, but GDP growth for mainland Norway also turned out slightly higher than expected.

The decrease in productivity growth probably partly explains the historically moderate wage growth observed in recent years. Deterioration of the terms of trade in the wake of the oil price fall in 2014 and weak profitability in parts of the business sector have also contributed.<sup>6</sup> Long-term futures prices in the oil market also fell and indicated that the fall in oil prices was more permanent.

A persistently lower oil price implies a decline in Norway's oil revenues and wealth, which could in isolation require an improvement in competitiveness. Normally this would require an adaptation of the real wage level and exchange rate.<sup>7</sup>

In our projections these mechanisms are reflected in a gradual downward adjustment of wage and exchange rate forecasts over time (Chart 16). The ability to pay wages in the Norwegian economy fell more in the aftermath of the oil price fall than we had assumed.

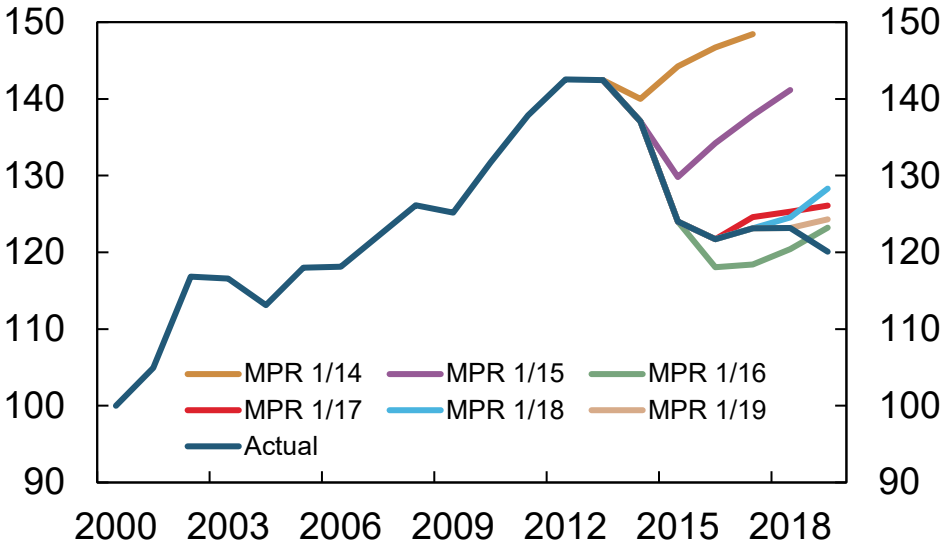
---

<sup>5</sup> See for example OCDE (2019), *OECD Compendium of Productivity Indicators 2019*, OECD Publishing, Paris.

<sup>6</sup> For a more detailed review, see Brubakk, Hagelund and Husabø (2018), *The Phillips curve and beyond – Why has wage growth been so low. Staff Memo No 10/2018, Norges Bank*

<sup>7</sup> See box *The long-term real exchange rate level in Monetary Policy Report 1/19* for a more detailed review of the relationship between the equilibrium exchange rate and the oil price.

Chart 16. Relative labour costs in a common currency. Index, 2000 = 100



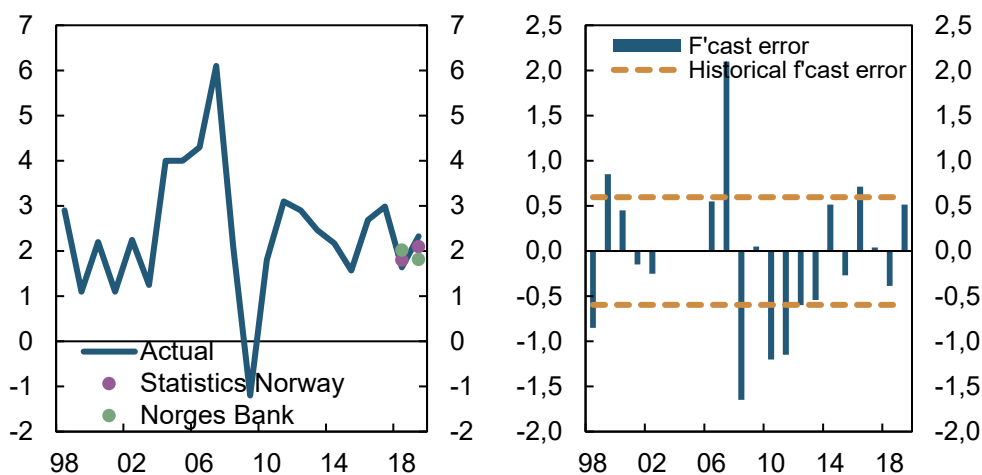
Sources: OCDE, Statistics Norway and Norges Bank

3. Summary

Economic developments in 2018 and 2019 were closely in line with forecasts from the start of 2018 and 2019, respectively. From a historical perspective, the projections of the main macroeconomic aggregates were overall relatively accurate.

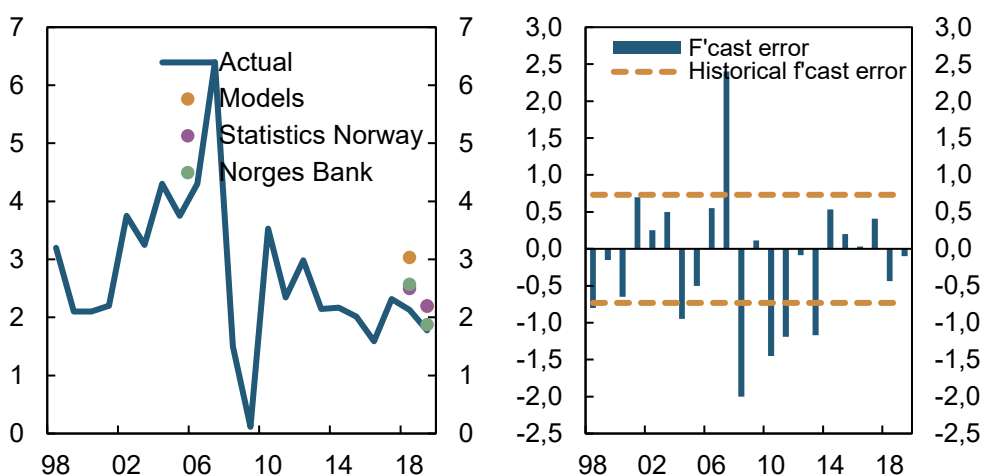
If we consider at the projections since the oil price fall in 2014 as a whole, the main tendency is that wage and productivity growth have been lower than projected and that the exchange rate has been weaker than expected. This was also the case in 2018 and 2019 for the exchange rate and productivity, while projections for wage growth were accurate.

Annex charts 1a and b Demand, mainland Norway.<sup>3</sup> Annual growth. Percent. 1998 – 2019



Sources: Statistics Norway and Norges Bank

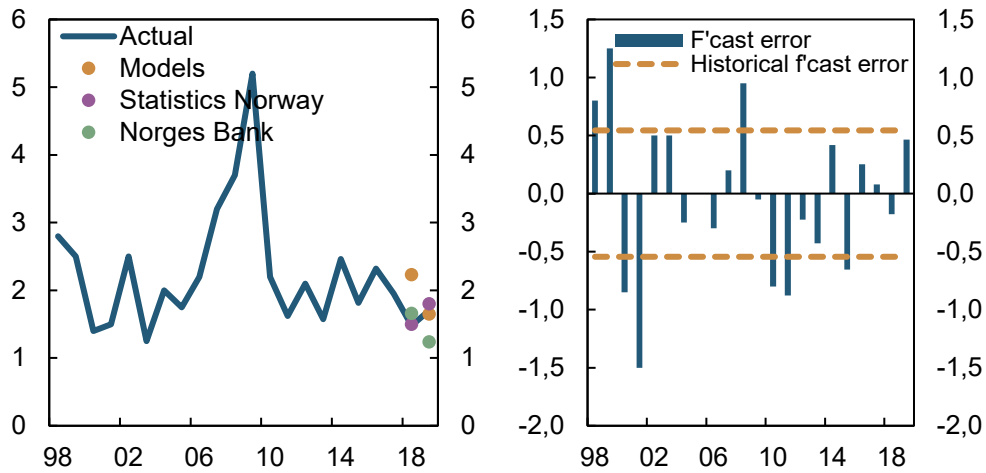
Annex charts 2a and b Private consumption.<sup>3</sup> Annual growth. Percent. 1998 – 2019



Sources: Statistics Norway and Norges Bank

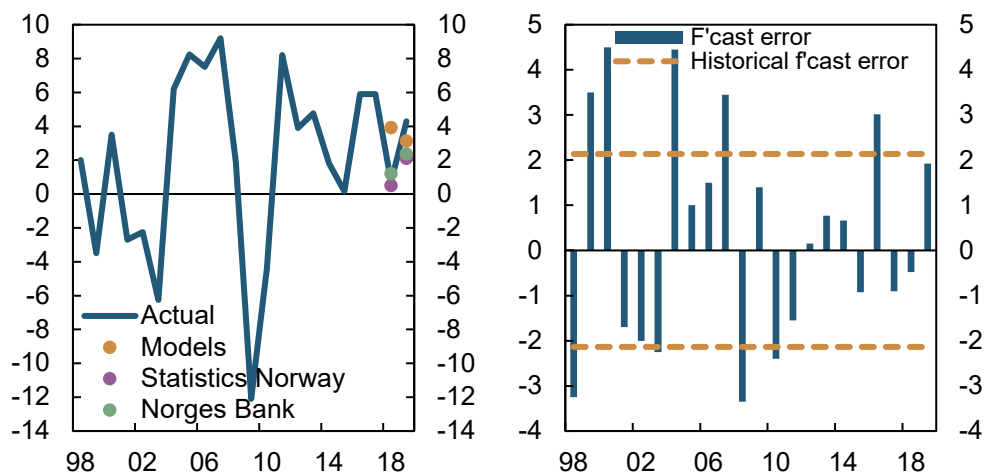


Annex charts 3a and b Public consumption. 3 Annual growth. Percent. 1998 – 2019



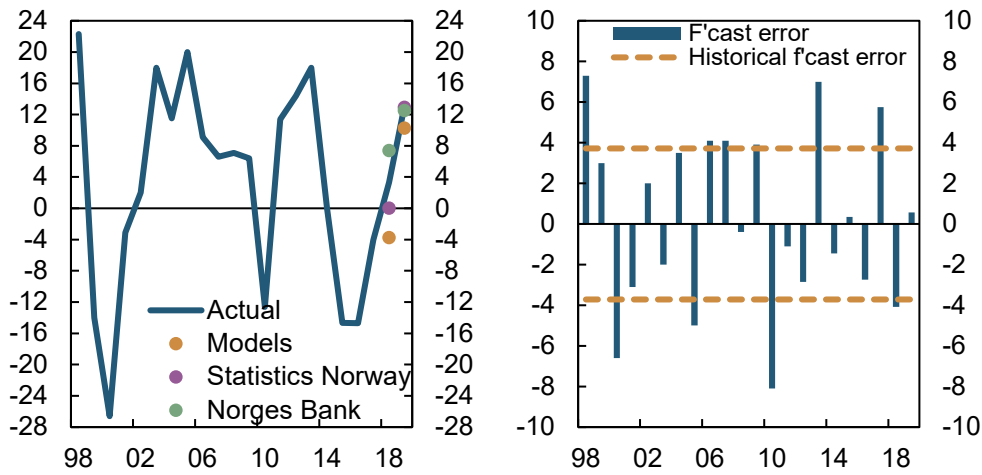
Sources: Statistics Norway and Norges Bank

Annex charts 4a and b Investment, mainland Norway. 3 Annual growth. Percent. 1998 – 2019



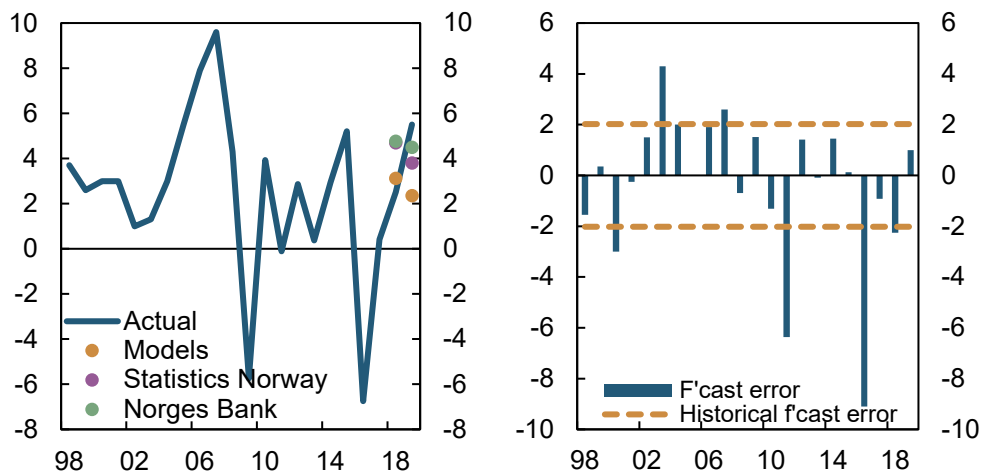
Sources: Statistics Norway and Norges Bank

Annex charts 5a and b Petroleum investment.<sup>3</sup> Annual growth. Percent. 1998 – 2019



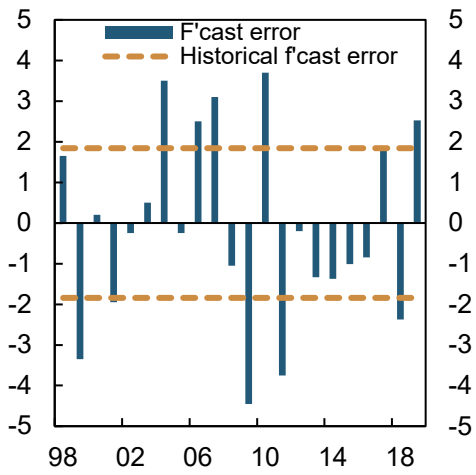
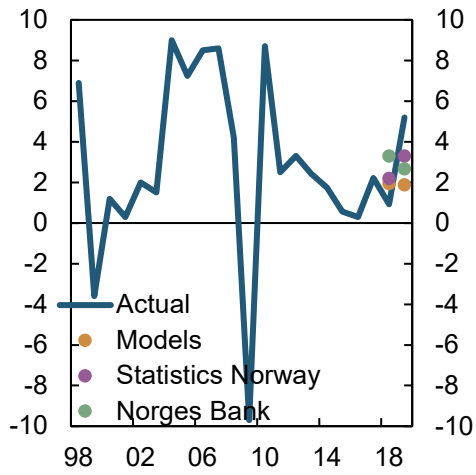
Sources: Statistics Norway and Norges Bank

Annex charts 6a and b Mainland exports.<sup>3</sup> Annual growth. Percent. 1998 – 2019



Sources: Statistics Norway and Norges Bank

Annex charts 7a and b Imports.<sup>3</sup> Annual growth. Percent.



Annex table 1 Projections for 2018 and 2019 from Monetary Policy Report 1/18 and 1/19 and actual developments. Percentage growth unless otherwise stated.

	MPR 1/18	Actual 2018 <sup>1</sup>	MPR 1/19	Actual 2019 <sup>1</sup>
<b>Prices and wages</b>				
CPI	2.1	2.7	2.3	2.2
CPI-ATE	1.5	1.6	2.3	2.2
Annual wages	2.9	2.8	3.3	3.5
<b>Real economy</b>				
GDP	1.9	1.7	2.4	1.2
GDP, mainland Norway	2.6	2.5	2.7	2.4
Output gap, mainland Norway (level)	-0.2	-0.2	0.6	0.2
Employment, persons, ONA	1.3	1.6	1.4	1.7
Unemployment, LFS (rate, level) <sup>2</sup>	3.8	3.8	3.6	3.7
Registered unemployment (rate, level)	2.3	2.5	2.3	2.3
<b>Demand</b>				
Demand, mainland Norway <sup>3</sup>	2.0	1.6	1.8	2.3
-- Household consumption <sup>4</sup>	2.6	2.1	1.9	1.8
-- Business investment	7.2	1.8	4.1	5.7
-- Housing investment	-6.0	-6.0	0.0	-0.5
-- Public demand <sup>5</sup>	1.5	2.4	1.4	2.7
Petroleum investment <sup>6</sup>	7.4	3.3	12.5	13.1
Mainland exports <sup>7</sup>	4.8	2.5	4.5	5.5
Imports	3.3	0.9	2.7	5.2
<b>House prices and debt</b>				
House prices	-0.7	0.7	2.4	2.6
Household credit (K2) <sup>8</sup>	6.2	5.5	5.4	5.0
<b>Interest rates and exchange rate</b>				
Policy rate (level)	0.6	0.6	1.1	1.1
Import-weighted exchange rate (I-44)	103.7	104.6	104.4	107.6
Money market rates among trading	0.4	0.4	0.6	0.5
<b>Oil prices</b>				
Oil price, Brent Blend, USD per barrel	65	71	66	64

- 1) First publication in 2018 and 2019
- 2) Labour force survey
- 3) Household consumption, private gross fixed investment in mainland Norway and public demand.
- 4) Includes consumption by non-profit institutions.
- 5) Public consumption and gross investment.
- 6) Extraction and pipeline transport.
- 7) Traditional goods, travel and tourism, petroleum services and other services from mainland Norway.
- 8) Credit growth is estimated as four-quarter growth at year-end.
- 9) Based on three-month money market rates.