CAMP Forecasts 2016*

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31 December 2015

Abstract

This note presents Centre for Applied Macro- and Petroleum Economics (CAMP) forecasts for key Norwegian macroeconomic variables for 2016. The forecast for 2016 are based on the model put forward in Bjørnland and Thorsrud (2015). The model is updated using data including 2015Q3. Forecasts are made for 20015:Q4 and throughout 2016. In this note we present the forecasts and describe the model briefly. Overall, we find 2016 to be a year with weak growth in the Norwegian economy. GDP mainland Norway is predicted to grow by just 0.5 percent, while value added in manufacturing is predicted to contract by close to 1 percent.

JEL-codes: E37 E47
Keywords: Forecasting, oil, macroeconomics

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1 Introduction

Below we present the 2016 forecasts for key Norwegian macroeconomic variables from the Centre for Applied Macro- and Petroleum Economics (CAMP). The forecasts are the outcome of a project that aims to build human knowledge of macroeconomic models and their forecast performance. Previous years (2013 and 2014), the forecasts were purely model based, i.e. they did not contain judgement from the authors. Instead we used combination methods to reconcile competing forecasts. That is, rather than arrive at a single specification, we entertained a wide variety of models and then weighted together the output from these models using statistical loss functions.[1]

This year we give forecasts based on a specific model presented in Bjørnland and Thorsrud (2015). The model was developed to explicitly analyse the spillovers from the oil and gas sector to the domestic economy in Norway. In the model we assume activity in the petroleum sector may change due to, say, new technology, the discovery of new resources or changing oil prices, see eg. Corden (1984). The model was initially estimated for the period 1996-2012, but is now updated using data until 2015:Q3. In our original work we show that shocks (unexpected events) to the resource (petroleum) sector has implied significant and positive productivity spillovers on non-resource sectors in Norway the two last decades. These effects have not been captured by previous analyses.[2] We claim that the identification of the shock to the booming resource sector is important to properly capture the interaction between the resource sectors and the different branches of the economy.

In addition, the model allows for different shocks to the oil price to affect the resource sector, as well as the Norwegian mainland economy. We document that when a change (i.e. fall) in the oil price is associated with a decrease in global demand, there are large and negative spillover effects on the Norwegian economy, and vice versa when global demand increases. However, oil price decreases unrelated to global activity have smaller effect on the Norwegian economy, in part because of substantial real exchange rate depreciation and increased competitiveness (and vice versa for an oil price increase).

The analysis in Bjørnland and Thorsrud (2015) is based on a period characterised by a strong boom in the petroleum sector, and subsequent large spillovers to the non-oil sectors. Even the financial crisis turned out to have only a minor negative effect on the Norwegian economy, in part because oil prices and demand from the petroleum sector recovered quickly from 2009, and thus became an engine for growth in the post-financial crisis years. Now, however, oil prices have fallen by more than 50 percent, and looks to remain low for some period ahead. Investment in the petroleum sector has declined by more than 15 percent in 2015, and will continue to decline in 2016, according to forecasts by Statistics Norway. What will the effect on the Norwegian economy be if oil prices remain low and demand from the petroleum sector grows only modestly?

[1] For a previous report, see e.g. http://www.bi.edu/cmeFiles/report2013Forecast.pdf

[2] More than 35 percent of the business cycles and about 50 percent of the productivity changes in the mainland economy are explained by activity in the resource sector. What is more, value added and employment both increase in the non-traded relative to the traded sectors, suggesting a two-speed transmission phase. The most positively affected sectors are construction, business services, and real estate.

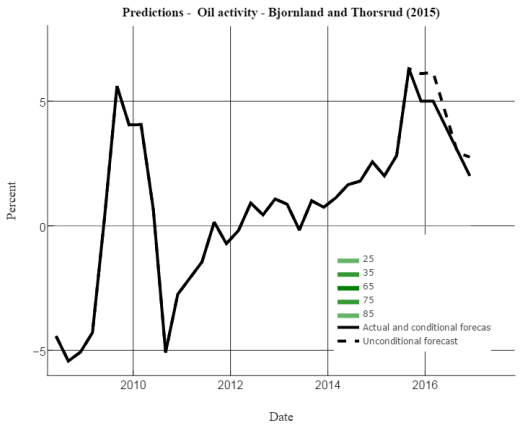
In this note we present the forecasts for 2016 based on the model in Bjørnland and Thorsrud (2015). The forecasts are conditional on oil prices remaining low throughout 2016 and on weak demand from the petroleum sector and sectors closely related to the petroleum sector. The forecasts are presented in Section 2, while we provide some details on the estimated model in Section 3.

2 Forecasts for 2016

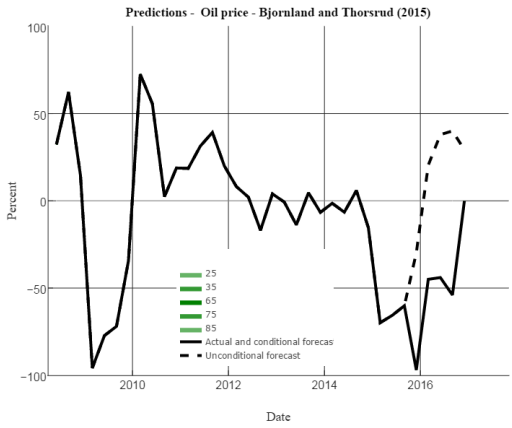
In this section we describe the CAMP forecasts. The forecasts of nine important macroeconomic variables are presented for the fourth quarter of 2015 until the end of 2016. To construct the conditional forecast we make two subjective predictions. First, we assume that the real price of oil (based on Brent crude oil) will stay persistently low throughout 2016 at 36 dollar per barrel. This expectation is slightly lower than what future prices, i.e., the market, indicated at the time these forecasts were made, and implies a year on year growth in the price of oil as indicated by the solid black line in Figure 1b. As seen in the figure, the unconditional forecast produced by the model implies a much faster mean reversion than what we condition on. We also condition on a somewhat more muted growth in the petroleum sector, and sectors closely related to the petroleum sector (denoted oil activity, see also the description in Section 3), than what the unconditional model predictions imply. Both the conditional and unconditional petroleum sector projections are illustrated in Figure 1a. The rest of the model variables are left free to move as predicted by the model, but, of course, conditional on the projections illustrated in Figure 1.

Figure 1. Forecasts of factors

(a) Oil activity



(b) Oil price



Note: The forecasts are displayed as year on year changes. Unconditional forecast (dotted lines), conditional forecasts solid lines.

Table 1. Forecasts for 2016

	2015	2016				
	Q4	Q1	Q2	Q3	Q4	**Average 2016**
GDPmainland	0.5	0.6	-0.1	0.4	0.9	**0.5**
INVESTmainland	-1.5	2.8	-0.9	0.1	3.8	**1.5**
EMPLmainland	0.6	-0.1	0.5	0.3	0.4	**0.3**
CPI	0.1	1.0	1.1	1.0	1.9	**1.3**
Interest rate	1.1	1.1	1.1	1.1	0.8	**1.0**
Exchange rate	-3.2	5.5	7.3	6.6	1.6	**5.3**
Productivity	2.1	2.0	1.0	1.3	0.8	**1.3**
Manufacturing	-2.1	-2.1	-1.1	-0.8	0.3	**-0.9**
EMPLmanuf	-3.2	-2.9	-2.5	-2.8	-1.7	**-2.4**

Note: All quarterly forecasts are displayed as year on year changes, except the interest rate that is in levels. In the last column we report yearly forecasts for 2016. GDPmainland: gross domestic product mainland Norway % growth, INVESTmainland: real investments mainland Norway % growth, EMPLmainland: employment mainland Norway % growth, CPI: consumer price index % growth, Interest rate: interest rate 3 month Nibor %. Exchange rate: BIS effective exchange rate index % change, Productivty: productivity mainland Norway % growth, Manufacturing: Manufactuing production % growth, EMPLmanuf: employment manufactuing % growth

Table 1 gives a summary in the form of quarterly and annual conditional forecasts of the main variables and Figure 2 displays the forecasts for these variables.

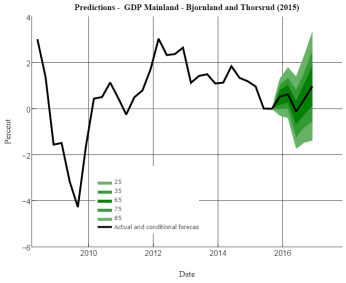
Overall, 2016 will be a year with weak growth in the Norwegian economy. On average, GDP in mainland Norway is predicted to grow by only 0.5 percent, while employment in the mainland economy is predicted to grow by a weak 0.3 percent. While some industries will see positive growth rates in 2016, value added in manufacturing is predicted to contract by close to 1 percent. As a consequence, employment in the manufacturing sector will decline by 2.4 percent.

Some of the negative effects from the oil price decline on the Norwegian economy has been offset by a strong depreciation (decline) in the exchange rate the last 1-2 years (see Figure 2f). In particular, the currency depreciation has increased competitiveness, which has benefited other tradable sectors. This is in line with our model predictions as discussed in Section 1. In particular, an oil price decline unrelated to global activity (say due to increased oil supply), will have smaller effect on the Norwegian economy as the exchange rate will depreciate substantially. Yet, the magnitude of the depreciation the last year has been somewhat larger than the model can account for. Still, we predict the exchange rate to continue to depreciate by the end of 2015 and into 2016, but then gradually appreciate somewhat, on average 5 percent in 2016 relative to 2015.

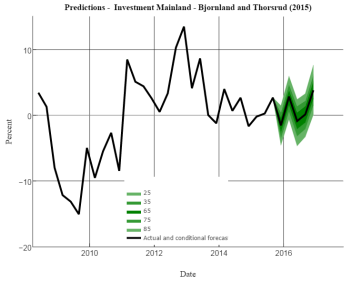
Finally, we predict that the three month interest rate will remain at one percent through most of 2016, declining to 0.8 by the end of the year.

Figure 2. Forecast of variables

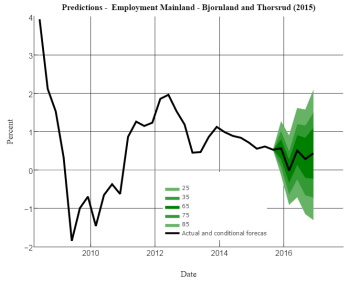
(a) GDPmainland



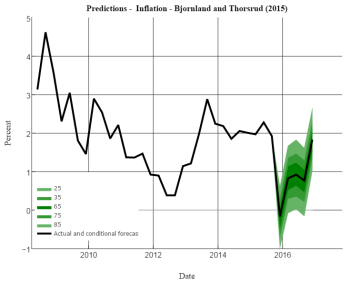
(b) INVESTmainland



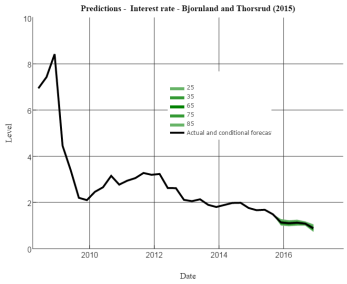
(c) EMPLmainland



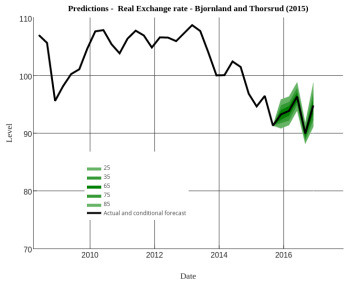
(d) CPI



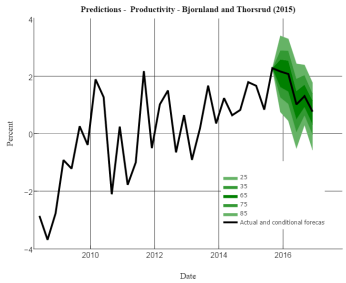
(e) Interest rate



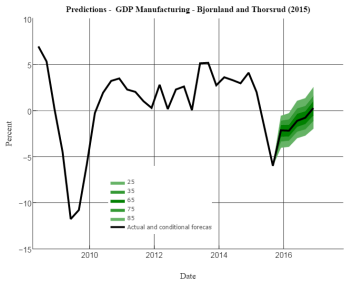
(f) Exchange rate



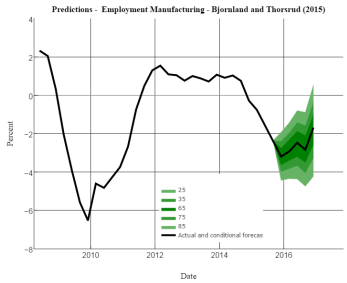
(g) Productivity



(h) Manufacturing



(i) EMPLmanufacturing



Note: All forecasts are displayed as year on year changes, except INTR and the Exchange rate, which are in levels. The fancharts represent quantiles of the posterior predictive distribution. See Table 1 for details about the variable definitions.

3 The Model and some theoretical background

The traditional literature on the Dutch disease typically predicts an inverse long run relationship between the exploitation of natural resources and the development in the traded sector (i.e., manufacturing), see Corden (1984) for an overview of the literature. The negative effect comes about from a movement of resources out of the traded and non-traded sector and into the booming sector that extracts the natural resource (*Resource Movement Effect*). There will also be indirect (secondary) effects of increased demand by the sectors that produce goods and services for the booming sector (*Spending Effect*). This will cause a real appreciation that will hurt the traded sectors.

A limitation of the traditional Dutch disease literature is that is assumes productivity to be exogenous. However, in some resource-rich countries, the exploitation of natural resources could have substantial productivity spillovers to the other sectors in the economy. For example, as the development of offshore oil often demands complicated technical solutions, this could in itself generate positive knowledge externalities that benefit some sectors. If these sectors trade with other industries in the economy, then there are likely to be learning-by-doing spillovers to the overall economy.

In Bjørnland and Thorsrud (2015), we first develop a theory model that allows for direct productivity spillovers from the resource (petroleum) sector to both the traded and non-traded sector. In addition, we assume there is learning by doing (LBD) in the traded and non-traded sectors, as well as learning spillovers between these sectors. While the introduction of the direct productivity spillover is new, the LBD mechanism is similar to that developed in Torvik (2001). Our model has two implications for the dynamic adjustment after a resource boom. First, when the resource boom crowds in productivity spillovers in the non-resource sectors, productivity (and production) in the overall economy will increase. Second, learning-by-doing spillovers between the traded and non-traded sectors may enforce this mechanism, by allowing productivity in the non-traded sector to increase relative to the traded sector. Hence, we could expect to see a two-speed adjustment in the process, with the non-traded sectors growing at a faster pace than the traded sector.

3.1 Theory meets empirical model

In the empirical model, aimed at addressing the theoretical assumptions discussed above, we assume that a shock to the resource sector (resource boom or oil activity) can be thought of as happening as either an (unpredicted) technical improvement in the booming sector, represented by a favourable shift in the production function, or, as a windfall discovery of new resources. In addition we will also allow real commodity prices to potentially affect activity in the resource sector (either through a shock to global demand or to supply), as well as the mainland economy. Hence, we separate between a windfall gain due to activity and prices, and let the data decide on the relative importance of these shocks in estimating Norwegian business cycle fluctuations.

In terms of estimation, the empirical analysis uses a Bayesian Dynamic Factor model. The dynamic factor model includes four factors with associated shocks that have the

potential to affect all sectors of the economy. Two shocks will be related directly to the Dutch disease literature: a *resource boom/oil activity shock* and a *commodity price shock* (we use the terms resource booms and oil activity shocks interchangeably). Here, the former is similar to the exogenous shocks to activity in the resource sector, while the latter is what is commonly used in the empirical (time series) literature on Dutch disease. In addition, we allow for a *global activity shock* and *domestic (non-resource) activity shock*. The global activity shock controls for higher economic activity driven by international developments. Importantly, the global shock also allows for higher commodity prices due to increased global demand for commodities. As such, the commodity price shocks themselves should be interpreted as shocks unrelated to global activity, that can change the commodity price on impact. Lastly, the domestic activity shock controls for the remaining domestic impulses (tradable and non-tradable) contemporaneously unrelated to the resource sector.

The factors and shocks will be linearly related to a large panel of domestic variables, including both tradable and non-tradable sectors of the economy. Generally, within the DFM framework, the factors are latent. In our application two of the factors are treated as observables, namely global activity and the real commodity price. The two domestic factors are treated as unobservable and have to be estimated based on the available data.

3.2 Data

To accommodate resource movement and spending effects, we include a broad range of sectoral employment and production series. Although we can construct labour productivity estimates directly from our model estimates (since we include both production and employment at the sectoral level), we also include productivity as an observable variable. Naturally, we also include the real exchange rate, which is a core variable in the Dutch disease literature. To account for wealth effects, and to facilitate the interpretation and identification of the structural shocks, we also include wage and investment series, the terms of trade, stock prices, consumer and producer prices, and the short term interest rate.

In Norway, the real commodity price is the real price of oil, which is constructed on the basis of Brent Crude oil prices (U.S. dollars).[3] The commodity price is deflated using the U.S. CPI. We measure global or world activity as the simple mean of four-quarter logarithmic changes in real GDP in Denmark, Germany, the Netherlands, Sweden, the UK, Japan, China, and the U.S. This set of countries includes Norway's most important trading partners and the largest economies in the world.

In sum, this gives a panel of roughly 50 international and domestic data series, covering a sample period from 1996:Q1 to 2012:Q4 (Norway). See Table 2 for details on data and abbreviations.

[3]Note that while we focus on Norway in this note, the model is also estimated for Australia.

Table 2. *Descriptive statistics*

	Sector	Norway		Australia		Variable in National Accounts
		Mean	**Std.**	**Mean**	**Std.**	
GDP	Res. extraction	-0.63	6.28	3.73	4.10	Oil and natural gas extraction/mining
	Res. service	6.89	25.65	4.25	12.84	Service activities in oil and gas/mining
	Manufacturing	1.56	3.53	1.03	3.44	Manufacturing
	Construction	3.04	5.02	4.37	7.44	Construction
	Retail	4.39	3.46	3.64	2.18	Wholesale and retail trade
	Transp. ocean	-5.32	16.22			Ocean transport
	Transportation	1.03	5.26	3.66	3.25	Transport activities excl. ocean transport
	Hotel and food	1.76	4.84	2.70	3.80	Accommodation and food service activities
	Financial	3.90	7.88	4.70	3.77	Financial and insurance activities
	Real estate	9.20	10.81	2.66	4.46	Real estate activities
	Scientific	4.12	4.75	4.96	4.43	Professional, scientific and technical activities
	Business	6.79	6.91	3.49	5.29	Administrative and support service activities
	Non-resource	2.79	1.95	3.12	1.73	Total excl. oil and gas extraction/mining
	Public	1.64	1.46	2.65	2.89	General government
Employment	Res. extraction	2.43	5.32	4.69	9.98	See above
	Res. service	11.14	14.30			
	Manufacturing	-0.59	3.35	-0.57	3.14	
	Construction	3.95	4.05	2.81	4.77	
	Retail	1.28	1.99	1.72	2.75	
	Transp. ocean	0.91	2.79			
	Transportation	0.70	2.22	1.50	4.36	
	Hotel and food	1.10	2.70	2.52	3.79	
	Financial	-0.13	2.92	0.85	4.47	
	Real estate	5.98	6.61	2.53	7.25	
	Scientific	3.61	3.75	4.00	5.12	
	Business	5.66	6.32	3.65	6.36	
	Non-resource	1.33	1.54	1.66	1.70	
	Public	1.33	0.92	2.29	4.25	
Other	Wages resource	9.90	6.87	5.13	3.00	Wages petroleum sector/mining
	Wages public	6.04	1.77	4.16	1.40	Wages public
	Wages non-res.	6.06	2.38	4.20	1.55	Total excl. wages to petroleum sector/mining
	Invest. res.	4.52	22.62	12.01	25.47	Investment petroleum sector/mining
	Invest. non-res.	4.06	8.60	5.60	12.43	Total excl. invest. in petroleum sector/mining
	Exchange rate	0.57	4.79	0.11	2.05	BIS effective exchange rate index, broad basket
Int.	World activity	2.78	1.90	4.54	2.10	See text, Section 3.2
	Com. Price	9.01	33.11	2.89	15.64	Commodity price. See text, Section 3.2

Note: The table lists the core variables used in the benchmark model. All activity, investment, wages and employment series are collected from the Quarterly National Accounts database of Statistics Norway and Statistics Australia, respectively. The international series are from Datastream. The real exchange rates are from the Bank of International Settlements (BIS). The moments are computed based on the transformed variables, i.e., $log(x_{i,t}) - log(x_{i,t-4})) \times 100$. *See Section 3.2 for the details.*

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