Forecastability of petroleum investments

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Overview

Has the downturn in offshore petroleum investments come to a stop? Will we now see investment growth after cost reductions and increased oil price and reduced oil price volatility as a consequence of the OPEC production cut agreement? These are among the questions addressed in this paper that attempts to forecast future aggregate oil and gas investments on the Norwegian Continental Shelf (NCS). The ability to predict future movements in aggregate investment might prove useful for the government in their decision-making. The petroleum sector exerts a prevalent influence over the Norwegian economy (NOU 1999:11). Thus, cyclicalities in oil and gas investments could be a denominator of the overall domestic business cycle. From a governmental point of view, it is of great interest to employ measures to smoothen the business cycles; however, the timing of such measures is crucial. For instance, implementing measures aimed at halting a business boom might prove ill-advised if the economy on its own accord is about to revert into a downturn. As such, providing a model capable of forecasting future movements in investment could prove helpful in the timing of measures aimed at smoothing the cycles. In Norway, oil investment predictions are also necessary for budgetary purposes as the Norwegian state has a direct interest in many of the fields, via the fully state owned company Petoro.

Methods

The aim of this paper is twofold. First, we attempt to identify the statistical properties of oil and gas investments on the NCS. Second, we investigate the feasibility of the statistical approach for forecasting future aggregate oil and gas investment in Norway with an ex post (pseudo) out-of-sample accuracy evaluation.We investigate the effect of three different exogenous predictors on the aggregate investments, specifically the crude oil price (Brent), the realized volatility of the crude oil price and the USD/NOK exchange rate. A unique and detailed dataset containing data from 109 different fields on the NCS between 1970 and 2015 was employed. See Figure 1 for the historical development in aggregate oil and gas investments on the NCS. A set of 1080 autoregressive distributed lag models are evaluated pseudo out-of-sample and tested for data mining by utilizing a Diebold-Mariano (2002) hypothesis test and the model confidence set procedure by Hansen and Lunde (2011).

Results

The main results are as follows. First, we find that it is indeed possible but challenging to outperform the parsimonious random walk benchmark in an out-of-sample environment. Second, lags of investment growth, crude oil price growth and realized volatility is found to be adequate predictors for the investment growth. Finally, there is a clear benefit from re-estimating the models coefficient at every step. The best fit is provided by the model ADL(3,2,1,0), i.e., the best model contains oil price growth (one year lag), oil price volatility (two years lag) and previous years' investment growth (three years lag).

Figure 1: Historical investments in the oil and has industry on the NCS (1971-2015)
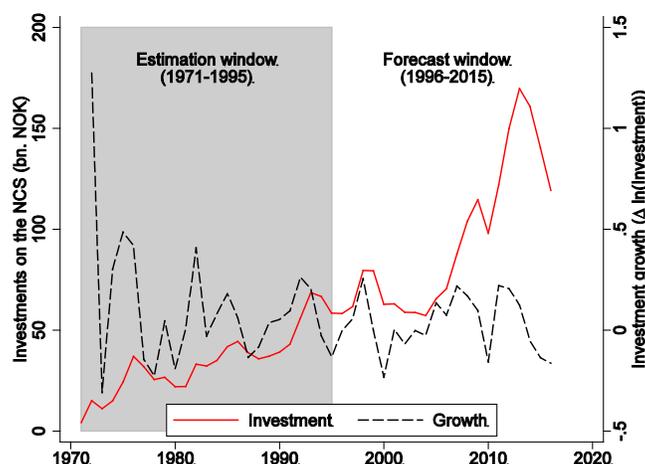
Conclusions

Recent investment cuts are not only due to reduced oil price but also increased oil price volatility. We show that volatility is an important, negative driver of investment. This is according to our ex ante expectations. First, in terms of real options, the value of waiting increases as the volatility increases and the market becomes more erratic. Second, given the capital intensive nature of oil and gas investments, it is quite plausible that increased volatility makes decision-makers more hesitant to commit, as they are concerned to protect dividend commitments and would like to limit debt exposure. The agreement in OPEC over productions cuts is expected to reduce the volatitlity of the oil price (Schmidbauer and Rösch, 2012; Mensi et al, 2014), thus calling for an increase in investments on the NCS.

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