*Roy Endré Dahl, Sindre Lorentzen, Atle Oglend and Petter Osmundsen* **Can oil price developments explain cost overruns in petroleum projects?**

Roy Endré Dahl, University of Stavanger,
4036 Stavanger, Norway
e-mail: roy.e.dahl@uis.no

Sindre Lorentzen, University of Stavanger,
4036 Stavanger, Norway
e-mail: sindre.lorentzen@uis.no

Atle Oglend, University of Stavanger,
4036 Stavanger, Norway
e-mail: atle.oglend@uis.no
Petter Osmundsen, University of Stavanger,
4036 Stavanger, Norway
e-mail: petter.osmundsen@uis.no

## Overview

Development projects in the oil industry often have cost overruns. A potential driver of cost escalations is the state of the business cycle. Lack of capacity and expertise in a tight supplier market can yield cost inflation and difficulties in managing projects. A proxy for the state of the business cycle is the oil price. Through analysis of data from Norwegian development projects in the petroleum industry, we investigate the relationship between oil price and cost overruns.

## Methods

Unique data availability is an essential ingredient here. Oil companies operating in Norway have to report annual cost details of development projects to Norwegian authorities. Existing work on oil investment on the Norwegian continental shelf relates only to exploration. It has focused on the relationship between drilling activity and such investment drivers as the oil price, recoverable resources and licensed acreage (see, for example, Mohn and Osmundsen, 2008; 2011 and Mohn 2008). Drilling activity is modelled in terms of an error-correction model, where investment drivers are assumed to be uninfluenced by drilling activity. Using the concept of co-integration (Engle and Granger, 1987; Hendry and Juselius, 2000), the error-correction model has the benefit of explicitly separating short-run adjustments from the long-run equilibrium relationships. We extend the current literature by analysing development project costs using panel data methods.

**Results**

A hypothesized cause of cost overruns is underestimating cost increases related to business cycle effects. We test this hypothesis empirically using the oil price as a proxy for the state of the business cycle. Although this direct method cannot distinguish between the potential multitude of causes for a correlation between oil price and cost overruns, it will allow us to confirm in the positive whether any statistical relationship exists.

Table 1 shows results from panel data estimation on 80 investment projects from 2000 to 2013. The dependent variable is cost overruns, measured as the percentage difference between initial estimates and updated cost estimates. Independent variables are the oil (Brent) price and the percentage change in oil price from start to end of project development. This is defined as oil price surprise. The model is estimated using random effects generalized least squares with robust standard errors.

**Table 1.** Estimation results, Cost Overruns and Oil price

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| Variable | Coefficient | t-value |  | p-value |
| Intercept | -0.00186 | -0.04 |  | 0.967 |
| Oil Price | 0.00178 | 1.69 |  | 0.092 |
| Oil Price Surprise | 0.31419 | 5.18 |  | 0.000 |
|  |  |  |  |  |
| R2 (overall) | 0.0934 |  |  |  |

**Note:** Random effects estimates with robust standard errors.

The results show a positive relationship between oil-price and cost overruns. The magnitude of the effect depends on the initial oil price at project start. At an initial price of $100/barrel, a $1 increase in price is associated with a 0.5 percentage point increase in cost overrun. At an initial price of $50/barrel, the effect is a 0.8 percentage point increase.

In terms of significance and explanatory power, the oil price surprise is more important than the oil price level. This suggests cost overruns depend more on the development of the oil prices during the project development than the given oil price any year of implementation. This is consistent with adjustments in prices of services due to oil price developments from initial levels.

Somewhat surprising, the explanatory power of the oil price appears weak (R2 of 0.0934). In addition, although there is a positive correlation, this still leaves unexplained the channels by price influences cost overruns, including its role in association with heterogeneous project characteristics such as ocean and drilling depth, reservoir volume and operator characteristics. Furthermore, identifying the precise role of the business cycle is complicated by the high correlation between oil price and other economic variables relevant to investments costs, such as rig rates and number of and wages for employees in the sector.

## Conclusions

Identifying causes for cost overruns is challenging. However, if reliable causes can be found, this will enable oil companies and governments to establish more consistent plans that can account for known drivers of cost escalations. We investigated the role of the oil price and cost overruns in petroleum investments on the Norwegian continental shelf. As was expected, we find a positive relationship between oil price and cost overruns. However, less expected, the price does not have substantial explanatory power. More research is needed before we can exclude oil price as a major driver for cost escalations.

**References**

Engle, R. F. and Granger, C.W.J. (1987), “Cointegration and error-correction: representation, estimation and testing “, *Econometrica* 55, 251-76. begin\_of\_the\_skype\_highlighting

Hendry, D.F. and Juselius, K. (2000), “Explaining cointegration analysis: part 1”, *The Energy Journal*, 21, 1-42.

Mohn, K (2008), “Efforts and Efficiency in Oil Exploration: A Vector Error-Correction Approach”, *Energy Journal* 29, 4, 53-78.

Mohn, K. and P. Osmundsen (2011), ”Asymmetry and uncertainty in capital formation: an application to oil investment”, *Applied Economics,* Volume 43, Issue 28, November 2011, pages 4387-4401. begin\_of\_the\_skype\_highlighting

Mohn, K. and P. Osmundsen (2008), ”Exploration economics in a regulated petroleum province: The case of the Norwegian continental shelf”, *Energy* *Economics* 30, 303-320.

Sims, Christopher A. "Macroeconomics and reality." *Modelling Economic Series. Clarendon Press, Oxford* (1990).