Cost Overruns in Norwegian Oil and Gas Projects: A Long-tailed Tale

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See footnote at end of text.

Given the significant reduction in oil prices during the recent years, a renewed focus and interest for the cost aspect of the oil and gas industry has emerged. Delivering at or below the estimated cost is considered a pivotal criterion, alongside quality, delivery on schedule and production attainment, for evaluating the success of project execution. The presence of cost overruns[1] has the potential to distort the profitability ranking of the investment opportunity set. Subsequently, the company might allocate capital sub-optimally. As such, further insight into the drivers of cost overruns can be useful for oil and gas companies undertaking large investments.

The literature is saturated with examples of in-depth case studies on oil and gas projects on the Norwegian Continental Shelf (NCS), see for instance NOU (1999:11), Norwegian Petroleum Department (2013) and Office of the Auditor General (2003). However, limited effort has been devoted to studying cost overruns on the NCS through an empirical approach. In Oglend, Osmundsen and Lorentzen (2016), we attempt to address this shortcoming of the literature, by utilizing a multivariate longitudinal econometric analysis to examine the drivers of cost overruns in Norwegian development projects in the oil and gas sector. A unique and detailed dataset of 238 longitudinal observations, consisting of 80 different projects between 2000 and 2013, is applied. The data was extracted from the national budget and the Norwegian Petroleum Directorate.

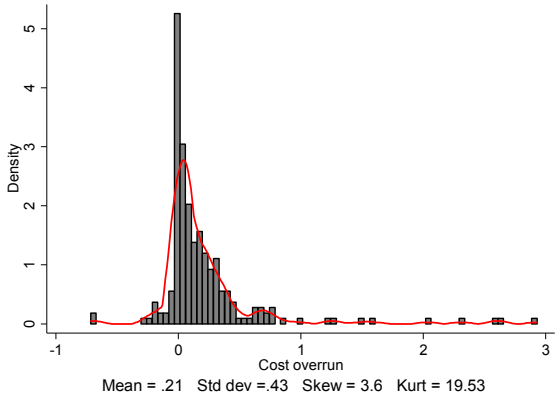

Figure 1: Cost overrun distribution

Analysis of the statistical moments of the distribution of the cost overruns reveals that projects in the oil and gas sector on the NCS conform with findings in the transport infrastructure projects (Flyvbjerg et al, 2002). In accordance with Flyvbjerg's categorization of cost overrun theories, as the distribution exhibits both a positive mean and skewness with temporal stability, it is likely that the underlying driver or the root cause of the cost overruns is not exclusively technical. The observed statistical moments appear to be consistent with the distributional predictions from psychological biases and strategic reporting theories. Further analysis of the temporal dynamics reveals that cost overruns tend to accumulate throughout the project lifetime. By disaggregating the distribution of the cost overruns, the distribution of the initial in-progress cost overrun is far more symmetric and centerd around zero compared to the distribution of the realized cost overrun. This finding is in line with the ex-ante expectation, however, unlike conventional wisdom, the current control estimates do not converge towards the true cost with declining volatility. Rather, the updates or changes in the estimate (transitional cost overrun) are initially small, but tend to increase as the project reaches its maturity. That is, the cost estimate errors are increasing as the project uncertainty, presumably, should be monotonically decreasing. Whether this finding is caused by strategic reporting, lack of effort in updating the estimates or other unspecified dynamics, remains to be explained.

Univariate regression analysis reveals that there is a positive relation between cost overruns and various proxies for economic activity. For instance, cost overruns tend to increase when oil prices, investment on the NCS, rig rates or number of employees in the sector increase. While the effect is significant, it is moderate. However, the unexpected change in the economic activity (approximated through a random walk) appears to have a greater impact. With the exception of the project size, experience and execution time, project specific variables, related to technical complexity and operator and ownership characteristics, appear to be predominantly insignificant. The combination of these two findings seems to indicate that cost overruns are driven by the element of surprise.

Through a forward selection, we specify a multivariate model consisting of four explanatory variables: the unexpected change in the number of employees in the sector (SecEmpSur); the transitional cost

overrun (TraCO) – speed of the information updating in the control estimates; the project size (ProInvestEndInv); and the amount of experience exhibited by the project operator (exp). The specified model yields a considerable explanatory power of approximately 45 percent, which is considerable given the volatile nature of cost overruns. However, despite the effort of predicting the cost overruns, inspection of the residual unpredicted cost overrun reveals that the positive skewness persists. More research is required in order to fully uncover and explain the dynamics of cost overruns.

This table displays the regression output from a model with cost overrun as the dependent variable and four independent variables. The explanatory variables are (1) the sector employee surprise (SecEmpSur), calculated as the relative difference between the number of employees on the NCS today and at the time of the decision, (2) the transitional cost overrun (TraCO) between two subsequent periods, (3) the inverse of the project realised investment size (ProInvestEndInv) in NOK, and (4) the operator's experience in terms of the number of licenses it holds.

Regressor	Coefficient	t-value	p-value	Own R2	Cumulative R2
SecEmpSur	1.77	3.29	0	0.2938	0.2938
TraCO	0.8	6.28	0	0.2676	0.4189
ProInvestEndInv	-188.91	-1.66	0.1	0.0627	0.4456
log(exp)	-0.06	-2.22	0.03	0.0535	0.4467

Note: random effect panel data with cluster- and heteroscedasticity-robust standard errors

Table 1: Multivariate model results

Footnote

[1] A cost overrun is here defined as the inflation-adjusted deviation between realised and estimated costs.

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