



# An event study analysis of oil and gas firm acreage and reserve acquisitions



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## ABSTRACT

We examine the impact of the announcement of acquisition of oil and gas acreage and reserves on the share price of US listed oil and gas firms. While there is evidence of information asymmetry related differences in the share market reaction on announcement of acquisition of acreage or reserves, we also identify greater sensitivity to crude oil price volatility for acreage acquisitions, consistent with the creation of valuable real options on acquisition of acreage. This is not evident to the same extent with acquisition of reserves. For example, acreage investment announcements reveal a statistically significant 1.22% premium (3-day CAR) in periods of high crude oil volatility compared with periods of low volatility. The premium on reserve acquisitions across these periods is a statistically insignificant 0.12%. This is supported in a multiple regression setting, with share price sensitivity to crude oil price volatility being higher for acreage acquisitions than for reserve acquisitions. Our sample consists of 1391 separate acreage or reserve acquisition announcements made by oil and gas firms listed on the U.S. equity market over the period from 1992 to 2011.

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## 1. Introduction

The event study approach of [Ball and Brown \(1968\)](#) and [Fama et al. \(1969\)](#) is used to assess the impact of open market acreage and reserve acquisition announcements on oil and gas producer share price. We pay particular attention to the impact of information asymmetry, firm characteristics (reserve production ratio and finding and discovery reserve replacement ratio) and the impact of real options created when investing in these assets.<sup>1</sup>

There are three key findings in this study. First, consistent with asset acquisition literature, oil and gas firm value increases on average on announcement of open market acquisition of acreage and reserves. Second, there is a greater share price reaction on announcement of acquisition of reserves relative to acreage, consistent with higher levels of information asymmetry associated with acreage acquisitions ([Myers and Majluf, 1984](#)). Third, using oil price volatility to proxy for the impact of valuable real options created on acquisition of acreage

or reserves, we find evidence of valuable real option effects on announcement of acquisition of acreage. This effect is not evident on announcement of acquisition of reserves. Indeed, there is a statistically significantly greater share market return to announcement of acreage acquisition in periods of high crude oil price volatility relative to periods of low volatility. This marks an important contribution to the literature. The existing literature has focused either on the link between oil and gas firm reserves and equity returns ([Boyer and Filion, 2007](#)) or more recently on the link between commodity price volatility and oil and gas firm investment decisions ([Henriques and Sadorsky, 2011](#)). There is little evidence of a direct link between volatility and share returns in the oil and gas literature to date. One exception is the work of [Grullon et al. \(2012\)](#), though this study takes a quite different approach to analysis of the impact of real options.

Open market acquisition of reserves and acreage accounts for a large part of oil and gas firm capital expenditures. Indeed, open market asset acquisitions accounted for approximately 85% of the global oil and gas industry asset purchases in 2012 with corporate acquisitions accounting for the remaining 15%.<sup>2</sup> We focus on two broad classes of acquired resource, acreage and reserves. We rely on the IHS Herold (Herold

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<sup>1</sup> Open market acquisition of reserves has been investigated previously as a motive for acquisition of a target company in M&A transactions ([Ferguson and Popkin 1982](#); [Ng and Donker 2013](#)). Further, we do not attempt to analyse the development of reserves resulting from exploration activity as this is not feasible given present disclosure rules.

<sup>2</sup> This estimate is based on information from the 2012 Ernst and Young global oil and gas transaction review supplemented with data from IHS Herold. [http://www.ey.com/Publication/vwLUAssets/Global\\_oil\\_and\\_gas\\_transactions\\_review\\_2012/\\$FILE/Global\\_O&G\\_transactions\\_2012.pdf](http://www.ey.com/Publication/vwLUAssets/Global_oil_and_gas_transactions_review_2012/$FILE/Global_O&G_transactions_2012.pdf).

hereafter) definitions of reserves and acreage, where reserves are defined by Herold as resources that are commercially recoverable and ready for development and acreage is defined as resources that may contain reserves.

While there are options to extract created on acquisition of both acreage and reserves there is generally a greater time to exercise of options attached to acreage as well as there being considerably more uncertainty about production levels to be achieved from acreage on announcement of acquisition. Thus, we argue that the real option to develop and exploit a resource accounts for a greater portion of the value of acreage than of the value of reserves. In short, the holder of acreage has the right to explore the acreage and identify the reserves that the acreage contains. Thus, in order to identify real option effects, statistical tests focus on the differences that exist between these two classes of acquisition. This study contributes to the oil and gas industry literature as it provides new insights into the importance of real options in open market acquisition of resources and extends the previous literature dealing with the link between investment decisions and the volatility of underlying oil and gas price.

Real options are generally recognised as having an impact on the value of the firm (Dixit and Pindyck, 1994) and so the value of the firm should also reflect the impact of real options attached to the assets that it acquires. When management acquires acreage they acquire the right to develop the acreage and thus identify the level of reserves that exist within the acreage. Further, acreage real options are compound options. The exercise of the development option in acreage results in the identification of reserves. Once acreage is developed to identify the reserves therein, the oil and gas firm has the right either to sell or to develop these newly identified reserves. Given the compound nature of the acreage option, we expect the real option effect to be greater for acreage than for reserves and, indeed, we find evidence to support this proposition. We also find that the share market sensitivity to volatility is greater on announcement of acquisition of acreage than it is on announcement of acquisition of reserves.

Our focus on just one industry, the oil and gas industry, simplifies the process of controlling for confounding effects in analysis. For example, one possible confounding effect arises from the existence of information asymmetry, given the nature of acreage and reserves and the importance of information asymmetry in the oil and gas industry. It is argued that the acquisition of reserves provides a more costly signal of firm strength than the acquisition of acreage. Thus, the market will tend to reward the announcement of acquisition of reserves more strongly than the acquisition of acreage. It is important to control for this effect as we expect real options to have a greater impact on the value of acreage than on the value of reserves. Further, track record and reserves in place will explain differences in the value effect of acquisition of acreage relative to reserves. These alternative explanations for share market reaction to open market asset acquisition announcements are particularly important in the oil and gas industry and so we include these commonly accepted ratios to control for confounding effects in our multiple regression analysis.<sup>3</sup>

We use the event study method in analysis of the impact of the announcements of oil and gas firm open market acreage and reserve acquisitions. The analysis identifies statistically significant real option effects on announcement of resource acquisition. These results are robust to information asymmetry, track record, reserve levels and firm characteristic effects. Our sample includes 1391 open market acquisitions by 192 US listed oil and gas firms over the period from 1992 to 2011. The following section gives an overview of the literature. Data

and methodology are discussed in Section 3 and analysis results reported in Section 4. Finally, conclusions are provided in Section 5.

## 2. Literature review

We review the literature on real options, particularly for oil and gas firms. This is followed by a discussion of the signalling literature as an alternative explanation for the share market response to oil and gas firm asset acquisition announcements. Finally, the literature associated with track record and existing reserves is discussed as these oil and gas firm characteristics will also have an impact on the share price on announcement of open market asset acquisition.

### 2.1. Real options and volatility

The value of a real option, consistent with options in general, is sensitive to volatility in the value of the underlying asset (Hull, 2015). Yet, it is generally not possible to observe the volatility of the value of the assets that underlie real options. As a result a proxy is generally chosen. In the oil and gas industry, perhaps the best proxy is crude oil price volatility (Henriques and Sadorsky, 2011). There is a literature that focuses on the link that exists between crude oil price volatility and equity returns and we draw on this literature in the following discussion.

There are three broad areas of research dealing with the relation between crude oil price volatility on equity prices. The first tests the link between commodity price volatility and equity market returns with commodity price volatility included as one of a range of possible explanatory factors. The second addresses the question of whether commodity price volatility is related to the making of investment decisions consistent with the existence of real options. The third, tests for real option value driven variation in the relation between commodity price volatility and equity returns. In this third area of the literature, it is argued that as a firm acquires or creates more commodity-related real options through its investments its value becomes more sensitive to commodity price volatility. Conversely, as the firm exercises its commodity related real options, its value becomes less sensitive to commodity price volatility. We explore this last question with a particular focus on US oil and gas firm investment in acreage and reserves within an event study framework.

Much of the early work dealing with equity return sensitivity to crude oil data dealt with the relation between share price returns and crude oil prices (Faff and Brailsford, 1999; Sadorsky, 1999, 2001) though there is some initial analysis that dealt with the impact of crude oil price volatility on real equity market returns and this relates to the first area of research. For example, Sadorsky (1999) reports variance decompositions that show crude oil price volatility has little impact on US real equity returns, though Masih et al. (2011) find evidence of negative relation between crude oil price volatility and equity market returns in their study of the Korean equity market.

There are two questions that arise from these early studies. First, should we expect to see a link at the market level? It is possible that crude oil price volatility is more relevant to the equity returns of particular industries than to the market as a whole. Indeed, Elyasiani et al. (2011), analysing US industry level equity returns, identify a positive link between crude oil volatility and equity returns particularly for oil and gas related industries. This is also found by Cong et al. (2008) who find evidence of a positive relation between crude oil price volatility and equity returns for the mining sector and petrochemical sector in China. Second, could the link between crude oil price volatility and equity returns vary across countries in some sense? Ramos and Veiga (2011), given the importance of industry effects, investigate the relation between crude oil price volatility and oil and gas industry equity returns across 34 countries. For the full sample, they find a positive relation between crude oil price volatility and oil and gas industry equity

<sup>3</sup> In particular, the development reserve replacement ratio provides a proxy for track record and the reserve to production ratio provides a proxy for the level of reserves that the oil and gas firm holds.

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