How could you possibly predict the value of 3-D seismic before you shoot it?

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Introduction

It is relatively easy to estimate the cost of acquiring, processing and interpreting 3-D seismic data, but what about predicting its value? Some prediction is needed in order to make a business case for acquiring the additional data.

The Value of Information (VOI) can be estimated by combining a number of conventional and unconventional financial and statistical analytical methods. The VOI will ultimately depend on two key components:

- the possible impact on the amounts and timing of expenditures and revenues, and on the resulting Net Present Value (NPV) of the anticipated cash flow stream; and

- the possible impact on the Probability of Scientific Success (Ps).

Published historical information from several companies shows that 3-D data has reduced structural uncertainty, increased reserves by identifying by-passed pay zones, improved drilling success rates, reduced the number of development wells required through optimum well positioning, led to faster development programs and faster payout, and terminated numerous prospects. The impact of these effects can be estimated based on industry experience.

This leads to evaluating how the additional data might impact the drilling and capital expenditure program. This could range anywhere from condemning the prospect to drilling a significantly larger number of wells and building proportionately larger gathering and processing facilities, which in turn could delay revenues and expenditures. When the realm of possibility is understood, the impact on the Net Present Value of the anticipated cash flow stream can be determined.

Understanding the potential impact on the cash flow stream makes it possible to determine the Expected Value of Perfect Information (EVPI). Since no information is perfect, the EVPI will represent an upper limit on the VOI. Residual uncertainty will determine the actual value of the additional information.

This leaves the possible impact on the Probability of Scientific Success. There are a number of methods for estimating this impact including Delphi methods, Monte Carlo simulation, and the Collvard method developed by Ethetton and Brumbaugh. Regardless of which method is used, internal consistency will be critical to producing a reliable estimate.

Once the possible impact on NPV, on the Probability of Scientific Success, and the EVPI are known, the Value of Information can be predicted using a conventional Decision Tree method. It then remains to compare the VOI with the cost to determine whether to proceed.

The combined prediction method will be illustrated with an example.

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