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Oil & Natural Gas Projects

Exploration and Production Technologies

Center for Petroleum Asset Risk Management (PARM)

DE-AP26-03NT30860

Program

This project was selected as a small purchase to provide DOE with state-of-the-art information on Asset Risk Management in the petroleum industry.

Project Goal

The goal of the project is to develop and apply methods that will improve the ability of the hydrocarbon industry to improve capital efficiency.

Performer

University of Texas at Austin
Austin, TX

Chevron Producing Company
Houston, TX

Statoil
Stavanger, Norway

Devon Energy
Oklahoma City, OK

Pioneer Energy
Dallas, TX

Pecon Energia
Buenos Aires, Argentina

Project Results

This ongoing project has revealed new ways to evaluate options in reserve estimation, in value of information, and in evaluating asset portfolios.

Benefits

Hydrocarbon evaluation has been done historically in a deterministic manner. That is, even though it is widely acknowledged that there are substantial uncertainties in prediction, decisions are made on the basis of fixed information. This work will show whether the operators' decision-making can be improved if this uncertainty is accounted for.

Background

The primary incentives for the work are the following observations:

- Until the recent price increase, the exploration and production (E&P) sector has underperformed all other major business sectors in efficiency of capital use.
- Estimates of recovery are pervasively too small. In the case of reserve estimates, such underprediction has led to some notorious cases involving major oil companies.
- Techniques exist for making decisions under uncertainty. For the most part, these have not been brought into the E&P industry.
- The worth of many types of E&P information is not quantitatively established.

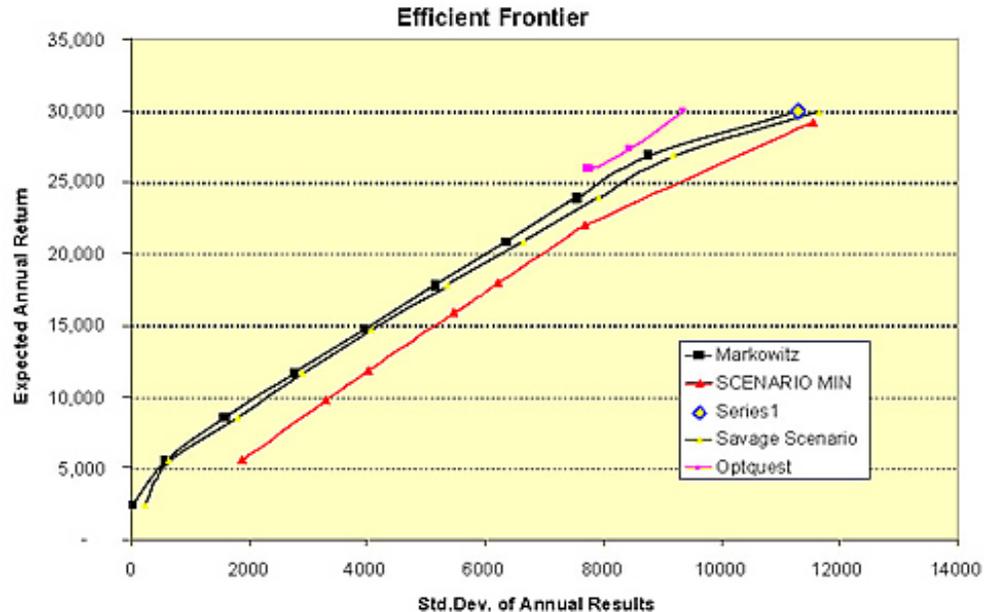
Project Summary

The project has two main objectives:

- Validation of alternative approach for evaluating real options. Brandao, et al. have shown that the formalism in incorporating the value of choice into decisions can be represented by a binary lattice. This supplants the far more complicated Black-Scholes approach with one that is more transparent and easier to use with other decision-making tools.
- Forecasting hydrocarbon prices. Hahn and Dyer have applied a mean-reverting stochastic process to oil prices. Because it is statistical, it is well suited for the evaluation of projects under certainty.

Current Status

The project is ongoing. DOE supported the initial stages of the project. The current work is completely industry-supported.



A calculated trade-off between risk (horizontal axis) and profitability (vertical) from the work of Faya. This is based on a hypothetical portfolio of oil-producing projects. Such a plot is useful in determining the amount of uncertainty associated with a given rate of return.

Publications

The project does not require annual reports. The following are theses or dissertations that are completed or are nearing completion:

Hahn, Warren, Dyer, Jim, Incorporating Mean-Reverting Price Forecasts into Exploration and Production

Valuation, April 2005.

Brandao, Luis, Dyer, Jim, Hahn, Warren, Using binomial decision trees to solve real option valuation problems, May 2005.

D'Addosio, Pierangela, Analysis of risk cultures, August 2005

Portillo, Maria, Optimizing gas production under uncertainty, August 2005

Lawal, Azeez, A sensitivity analysis of the uncertainties of oil production, August 2005

Hultszsch, Paul, Estimating the benefits of options in reserve estimation, December 2005

Faya, Luis, Using portfolio optimization for oil field assets, May 2006.

Min, Namhon, The value of oil field information, May 2007.

Project Start: October 2003

Project End: April 2005

Anticipated DOE Contribution: \$95,000

Performer Contribution: \$230,000 (67% of total)

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