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## N571: Evaluating Economic Value, Uncertainty and Risk for Upstream Development Projects

Format and Duration  
Classroom - 8 Days

Instructor(s): Pete Smith

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### Summary

introduces economic evaluation techniques that are used in the oil and gas business to assist decision making. The aim is to develop an understanding of economic evaluation techniques and their related financial concepts; thus, allowing volumes to be converted to value and valuing whether, for example, additional reservoir appraisal is worthwhile. The fundamentals of estimating value throughout subsurface, drilling, facilities, production cost and economics is covered. The aim is to build a fundamental understanding of economic evaluation, including time value of money, discounting and NPV, project cash flow analysis, price negotiation and taxation.

The course also covers probabilistic and deterministic approaches to oil and gas asset evaluation, as applied to project approval, appraisal, reservoir surveillance, and production forecasting. The aim is to deepen the understanding of the complex and varying risks involved in delivering accurate estimates of production, reserves, and value to key internal and external stakeholders, and hence enhance decision making capability. The underlying conjecture is that if a greater understanding of risks and uncertainty can be developed then unwanted surprises in delivering estimates of production, reserves, and value can be lessened.

### Learning Outcomes

Participants will learn to:

1. Understand the principles of economic analysis, such as the time value of money, discounting, and other project cash flow measures.
2. Calculate the economic indicators Net Present Value and Rate of Return along with the Cost of Capital (Weighted Average Cost of Capital).
3. Formulate problems probabilistically and systematically assess risks & uncertainties.
4. Understand risk ranking and bow-tie models to manage risks through project life.
5. Develop decision trees to lay-out the logic and evaluate the robustness of the decision.
6. Recognise the various types of heuristics and biases and be able to distinguish between them.
7. Select variables in a probabilistic evaluation to manage uncertainty by acquiring additional data (appraisal) or design of interventions (contingency) within a Value of Information (Vol) framework.
8. Appreciate the pertinence of Bayes Theory when evaluating risk mitigation cost.
9. Develop decision trees to lay-out the logic of the decision and evaluate the robustness of the decision.

### Training Method

A classroom course with lectures supported by worked examples, case studies, and hands-on exercises. The course includes many practical applications and group exercises to develop understanding.

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### Who Should Attend

The course is designed for petroleum, reservoir, and drilling engineers, and geoscientists working in multidisciplinary teams.

### Course Content

#### *Part 1*

##### Day 1

- Heuristics questionnaire
- Introduction
- Petroleum economics
- Principles of cash flow analysis and discounted cash flow
- The concept of value
- Basic process of economic evaluation, inflation, time value of money, nominal & effective interest rates, discounted cash flow, net present value (NPV), internal rate of return (IRR), profitability index (PI), cumulative net cash-flow

##### Day 2

- Heuristics & biases theory
- Heuristics of probability estimation: Ground rules for estimation
- Making decisions: Use of decision trees/ link between studies and decisions
- Business decisions
- Decision trees
- Risk management bow-tie models

##### Day 3

- Estimating capex and opex
- Fiscal analysis: Tax models (royalty-profit models and PSC's)
- Analysis of the tools required to evaluate the worth of a business opportunity: Building the financial model
- Gas price negotiation exercise

#### *Part 2*

##### Day 4

- Risk and uncertainty fundamentals
- Influence Diagrams and Boston Squares to identify key risks
- Estimating ranges: Improving estimates by calibration

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- Decisions with uncertainty
- Probability distributions
- Basic statistics
- Combining uncertainties
- Statistics and distributions: Key types and parameters
- Combining Distributions: Parametric method

### Day 5

- Exploration risking
- Estimating probabilities: Improving estimates by calibration
- Finding a deterministic value that represents a distribution
- Combining distributions: Monte-Carlo Method, impact of portfolio choices

### Day 6

- Resource Assessment: Categorization and classification of petroleum resources
- Correlations and dependent variables: How best to incorporate them
- Sensitivity models for reserves and production: Estimating uncertainties
- Importance: Which variables to focus upon

### Day 7

- Bayesian Revision: Value of additional data
- Mitigation techniques: Bayes Theory
- The value of Information: Value of study, cost of delay, opportunity cost
- The value of appraisal or intervention
- The value of planning and flexibility

### Day 8

- Production Forecasting: Uncertainties in quarterly/annual forecasts
- How to improve the estimation process by learning: Train wrecks
- Risk management
- Cost uncertainty
- Timing uncertainty: Schedule uncertainty and critical path analysis
- Overview of course and close-out