



# Decision Analysis for Petroleum Exploration

*John R Schuyler, Paul D Newendorp*

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This is a major rework of Paul Newendorp's 1975 best-seller, which became the standard reference in the field. This book is now structured as a handbook of over 330 important concepts in risk and economic decision analysis. As the title suggests, well over half the examples apply to petroleum exploration investment decisions. Perhaps 80% of the topics are generally applicable to capital investment, project management, and operations decisions.

Topics in the book represent a composite of evaluation practices and problem-solving approaches now commonly used in oil & gas and other capital-intensive industries. Several important and practical techniques were first published in the first edition.

Decision analysis methods apply to any type of decision. The emphasis here is on quantitative methods useful in capital investment decisions and decisions to acquire additional information. This will be of special interest to anyone involved in the evaluation of property acquisitions, geophysical surveys, prospect drilling, and field development decisions. This book is intended for petroleum geologists, engineers, geophysicists, evaluation and planning analysts, and managers. This is not a first book in decision analysis. We presume the reader has a general familiarity with management, economics, decision analysis, and knowledge of the oil & gas industry.

As a handbook we are focusing on what is most important and practical. Major topic areas include the decision analysis process, key concepts in probability and statistics (including Bayes' rule and easy equivalents), decision policy (including risk policy expressed as a utility function), popular economic metrics and concepts, project and enterprise modeling, decision tree analysis, Monte Carlo simulation, and various special topics. Value of information problems receive special attention. Over 270 figures help illustrate the concepts.

The expected value (EV) concept is central throughout. Most often we assume a decision policy that maximizes EV. Most of the discussion presumes a business context and measuring outcome as net present value (NPV). We also describe approaches for multi-criteria decision making including HSE.


Expected monetary value ( $EMV = EV - NPV$ ) is the principal decision criterion used in most examples. The EV calculation incorporates judgments about risks and uncertainties expressed as probabilities and probability distributions. EV is the cornerstone of formal, quantitative analysis for decisions under uncertainty. The key calculation methods are decision trees and Monte Carlo simulation. Small decision trees can be solved with a hand calculator, while larger trees and Monte Carlo simulation usually require a computer. Software supporting these methods is now widely available as Microsoft® Excel® spreadsheet add-ins and for other platforms.

The material is organized into seven sections: Decision Analysis Process, Probability and Statistics, Decision Policy, Economic Matters, Modeling, Decision Tree Analysis, and Monte Carlo Simulation. Throughout, real-world exploration examples are presented to illustrate the risk and decision analysis methods.

This revised 3.0 edition features a larger page format, an updated and expanded bibliography, and an extensive glossary. We also offer additional material online, including extended discussions, software

resources, and example Excel spreadsheets.

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