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Watching It Work: A Demonstration of the Effects of Lognormality on the Exploration Portfolio

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By actually witnessing the simulation and outcome of a 20-well model exploration portfolio, geoscientists and their managers can grasp the scope and implications of the lognormal distribution of prospect reserves and chance of success.

Most knowledgeable explorationists (and some of their managers) now accept the principle that prospect reserves distributions are lognormal, reflecting natural processes of multiplication (acres x average net pay; feet x HC-recovery; bbls/acre-foot). Accordingly, the distribution of most corporate "balanced" portfolios is also approximately lognormal.

What is remarkable is that many corporate officers and high-level exploration managers have not grasped the implications of this principle as it impacts magnitudes and timeframes of corporate exploration results. In particular, they do not seem to understand the expected natural pattern of annual portfolio outcomes: frequent mediocre annual results punctuated occasionally by exceptionally good years and bad years. It will be demonstrated that such fluctuations may have nothing whatsoever to do with geotechnical or management skill. Rather they are the natural consequence of repeated sampling from natural lognormal prospect reserves distributions. Moreover, statistical tests can distinguish good or bad luck from predictive bias.

A common result of management's ignorance of the lognormal principle is continual and excessive management reorganization of ongoing exploration programs in the well-intentioned but mistaken belief that such "tweaking" will improve year-to-year exploration results. Exploration is inherently a sustained long-term process plagued by short-term interferences. There are indeed effective criteria by which exploration performance can be judged, distinguishing luck from skill. However, annual discovery rate is not an effective criterion unless the portfolio contains about 100 trials or more. Accordingly, assessing exploration performance may require one to more than five years, depending on the size and aggressiveness of the firm.

Biographical Sketch

Dr. Peter R. Rose is a certified petroleum geologist who was Staff Geologist with Shell Oil Company; Chief, Oil and Gas Branch of the U.S. Geological Survey; and Chief Geologist and Director of Frontier Exploration for Energy Reserves Group, Inc. (now BHP Petroleum (Americas, Inc.). In 1980, he established his own independent oil and gas consulting firm, Telegraph Exploration, Inc. His clients include most major U.S. companies and many prominent independents. Dr. Rose has explored for oil and gas in most North American geological provinces and has published and lectured widely on U.S. resource assessment, basin analysis, play development, prospect evaluation, and risk and uncertainty in exploration. He has taught extensively at the professional level and was a 1985/1986 AAPG Distinguished Lecturer. Since 1989 he has been deeply involved in design and implementation of comprehensive exploration risk analysis systems for the executive management of several major oil companies. ■