QUANTITATIVE ANALYSIS OF A PROSPECT TO DETERMINE WHETHER IT IS DRILLABLE

VITO A. GOTAUTAS[1]

ABSTRACT

One of the greatest difficulties for a new oil geologist or even for the more experienced ones is the inability to rate the percentage chance for a prospect to be a financial success. This is because there is a minimum of 52 parameters that must be considered in a quantitative manner for each prospect analysis. These 52 parameters are defined and an equation is derived so that the relative value of one parameter to any of the other 52 parameters is easily attained. The values thus attained are used to define the per cent chance that a prospect has a trap, hydrocarbon accumulation and the resultant Composite Chance Factor.

The percentage chance that a prospect has a trap is found by adding the values of the pertinent parameters defining the specific type of trap being considered. This is done by the author for all types of traps, and the results are plotted on graphs. The maximum number of points for any type of trap is assigned a 100 per cent chance. Any lesser number of points yields a lesser per cent chance factor which may be read directly on the graph. A linear relationship is used for plotting Parameter Point Values versus Per Cent Chance For Trap occurrence on the graph.

The percentage chance that a prospect will have an accumulation of hydrocarbons is found in the same manner used in determining the percentage chance that a prospect has a trap.

The Composite Chance Factor is the product of the Percentage Chance For a Trap and Percentage Chance For Hydrocarbon Accumulation. It is evident that without a trap no hydrocarbon accumulation will take place. Also, given a trap without a hydrocarbon accumulation the prospect will be an economic failure.

Economics are mathematically related to The Composite Chance Factor by the following formula:

Number of wells, each having the same Composite Chance Factor, that must be drilled for any given Composite Chance Factor, (eliminates all but one per cent or less chance for failure due to bad luck) to find profitable amounts of hydrocarbons.	X	Absolute minimum desired return on investment	=	Profit to Risk Investment

The statistical number of wells that must be drilled to find at least one economically successful prospect, based on the minimum desired return, is calculated using probability equations and tables.

The absolute minimum desired return on investment is calculated to be 4 per cent compounded annually over an 18 year period. Eighteen years is considered to be a good average number of years in which any given pay sand will be depleted. Although 4 per cent is the absolute minimum return on investment, the Profit to Risk Ratio and the Number of Necessary Wells is also calculated for a 6 per cent minimum desired return on investment. The Composite Chance Factor, Profit to Risk Investment and Minimum Number of Wells necessary to find at least one economic success for any given Composite Chance Factor for a 4 or 6 per cent desired return on investment is given on the graph captioned "Absolute Minimum Economic Limit of All Types of Prospects." Thus, once the Composite Chance Factor and the Profit to Risk Investment are determined, the subject graph will indicate whether the prospect will meet the desired minimum return on investment. This graph will also indicate the minimum statistical number of wells that must be drilled for a given Composite Chance Factor to be assured of at least one economic discovery that will return to the investor all the money invested or budgeted for investment on the Minimum Number of Wells, plus the desired minimum interest on monies invested.

A corporation or individual investor can cease to speculate when prospecting for oil and invest fully expecting to realize a certain minimum desired return on the investment. In order to do this, the investor must decide the maximum and minimum limits of the Composite Chance Factor for the type prospects to be drilled. The Minimum Number of Wells that must be drilled to eliminate speculation is easily extrapolated by referring to the Absolute Minimum Economic Limit of All Types of Prospects Graph. If the investor spreads his money evenly over the necessary number of wells, he is statistically assured that he will make at least one economic discovery.

A close study of the Absolute Minimum Economic Limit Graph reveals that the only difference between wildcat, extension and development prospects is the Composite Chance Factor. It is evident from the graph that the higher the Composite Chance Factor, the smaller is the necessary Profit to Risk Ratio in order for a prospect to rate above the minimum desired return on investment. It is apparent that all categories of prospects can be economically evaluated, not just the wildcat prospect.

A summary sheet is used to record all the data pertinent to the geological quantitative analysis of a prospect. A formula is derived to integrate all the information on the summary sheet into a prospect grade. Thus, if multiple prospects are available, the grade yields an order of drilling preference.

[1]Independent and Consulting Geologist, Lafayette, Louisiana