

### **Threshold Effects on Prospect Risking**

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Most companies exploring for oil and gas continuously try to develop and improve their risk analysis process to consistently and properly risk prospects. One of the most significant impacts on prospect risking is the presence of seismic amplitude anomalies that are Direct Hydrocarbon Indicators (DHI's). The technology and methods to identify and risk seismic amplitude anomalies have improved considerably through the years, especially with the use of AVO (Amplitude versus Offset), modern seismic acquisition and processing techniques, and advanced interpretation systems and workflows. To properly evaluate DHI prospects, a systematic risk analysis process is required so companies can make better decisions related to their exploration portfolio.

For the past eight years, a consortium of oil companies in the US and Europe has developed a work process to interpret and risk seismic amplitude anomalies on exploration and development prospects. Approximately 150 prospects have been reviewed and documented in a database where the geological risk factors, seismic and rock physics data quality, and amplitude anomaly characteristics (as many as 37) have been analyzed to calculate the probability of geological success (Pg - flowable hydrocarbons). The drilling results for each prospect were compared to the calculated Final Pg, a function of the Initial Pg (geology) and DHI Index (impact of the anomaly characteristics modified by data quality).

The Final Pg and DHI Index compared to drilling result trends indicate a DHI Threshold Effect on prospects at the high end of the risk spectrum and a low Pg Threshold Effect at the low end of the spectrum. In other words, on the upper end of the spectrum there is a point at which a significant amount of the risks have been reduced to dramatically increase the Final Pg and DHI Index. On the lower end of the spectrum there is a threshold below which essentially all the wells are dry holes. Using these database trends, Pg can be calibrated to a wide range of 5% to 95% Final Pg. Therefore in DHI prospects, geoscientists should be more optimistic in analyzing the prospect risk if Final Pg and DHI Index are above certain threshold levels. Conversely, the low end of the risk profile prospects in the portfolio should probably be farmed out or not drilled with an overall goal of upgrading the exploration portfolio.