

AVO crossplots as an aid to AVO interpretation

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Amplitude Variation with Offset (AVO) analysis is a tool used to help identify changes in lithology and pore fluids. In a typical analysis, two AVO attributes are extracted from pre-stack seismic data: attribute A, a measure of the p-wave reflectivity and attribute B, a measure of the change in p-wave reflectivity with offset. These two attributes may then be combined in a number of ways to highlight regions of anomalous reflectivity. Crossplotting B against A is a useful technique for establishing whether or not a seismic response is anomalous.

In many cases non-hydrocarbon bearing rocks yield points on an AVO crossplot that lie on a trend. Potential hydrocarbon bearing rocks may then be interpreted as lying away from this trend. An important issue is whether the trend and the position of a point along or away from the trend can yield quantitative information on the rock or reservoir properties. It can be shown that a point, or a trend, on an AVO crossplot does not uniquely define the properties of the rocks unless strong assumptions are made. However, the trends can sometimes be used to isolate changes in the reservoir properties from changes in the cap rock properties.

A simple example from a field in the Malay basin highlights some of the intricacies of AVO interpretation. The AVO crossplot of the reflection from the top of a reservoir in this field shows a number of trends. These trends can be used to identify changes in the properties of the reservoir rocks and to pinpoint the fluid contacts. In addition, intra-trend variations can be interpreted as indicating changes in the properties of the cap rock.
