BayesTree™

Prospect risking using seismic amplitudes

QINTEGRAL

QUALITY DECISIONS

Bayesian approach promotes consistent risking while also helping to polarize a prospect portfolio - helping to ensure that you drill your best wells first.

SPEED

Prospects can be risked in about one hour, once the geological risking and QI work is settled.

COST EFFECTIVE

Pay only for the time you need. Currently run as a consultancy service on an hourly rate.

ABOUT QINTEGRAL

Founded in 2018 by Dr Jarrod Dunne, we leverage extensive practical experience in using seismic amplitudes and AvO for a wide range of E&P activities around the world. We offer consultancy services and software solutions with a mindset to truly integrate geological and geophysical information to make better subsurface decisions.

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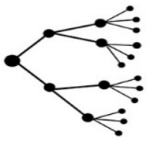
So you've found some interesting AvO, or perhaps a flatspot, at some of your prospects? Meanwhile other prospects don't appear to have any degree of amplitude support. How do you meaningfully adjust individual prospect risks to polarize your portfolio and ultimately make the best drilling decisions?

BayesTree is QIntegral's proprietary (Windows) software for updating prospect risk assessments following a multi-faceted seismic amplitude analysis. It is fully integrated with traditional geologic risking and uses scenario-thinking and Bayes' rule to achieve consistent and rigorous risk updates across a prospect portfolio.

Geological Risks	
Element	**Probability**
Source, Migration & Timing	0.95
Trap Presence	0.75
Reservoir Presence	1.00
Reservoir Quality	0.90
Seal Adequacy	0.40
Oil Generation & Preservation	0.00



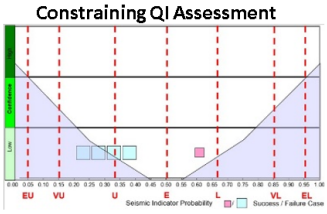
Geophysical Scenarios		
Name	**Probability**	**Success Case?**
HiQRes HiSat Gas	0.26	Yes
LoQRes HiSat Gas	0.03	No
LoQRes LoSat Gas	< 0.00	No
HiQRes Brine	0.64	No
LoQRes Brine	0.07	No

How does it work?

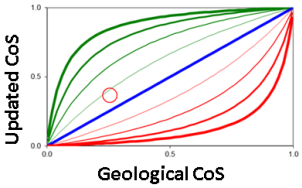
The first step is to break out the geological risking into a decision tree that suggests plausible scenarios that might explain the observed amplitude response. The geophysical knowledge level is then assessed to later constrain the application of Bayes' rule for risk modification. Characteristics of the observed amplitude are systematically compared to each scenario and summarized using the Sherman Kent "words of estimative probability".

QI Assessment	
Confidence	**Match to Seismic Response**
Low-Medium	< Likely
Low-Medium	Unlikely
Low-Medium	< Unlikely
Low-Medium	> Unlikely
Low-Medium	> Very Unlikely

Constraining QI Assessment



Bayesian risk modification curves



Updated (Geophysical) Risks		
Name	**Probability**	**Success Case?**
HiQRes HiSat Gas	0.37	Yes
LoQRes HiSat Gas	0.02	No
LoQRes LoSat Gas	< 0.00	No
HiQRes Brine	0.57	No
LoQRes Brine	0.04	No

Scenario probabilities are updated using Bayes' rule and then collated into success and failure risks. Proposed risk modifications can be compared to drilling results from analogue basins using hindsight assessment of seismic amplitude indicators. Better QI helps reduces the number of 'false positives'; reveals pay that was previously 'hidden' and thus justifies larger risk modifications.

Measurement	Drilling Result (at seismic indicator level): Hydrocarbon Discovered	Hydrocarbon Not Discovered
Seismic Indicator Observed	True Positive → DHI	False Positive
Seismic Indicator Not Observed	False Negative → Hidden Pay	True Negative

Getting started

Risking is an iterative process, to be updated as new information becomes available. **BayesTree** can begin to impact your exploration planning as soon as there is a basic understanding of the geological risks (Charge, Reservoir, Seal, etc.) and after some rudimentary seismic interpretation has been done. Our **QI Triage** service may assist in this regard, however we can also work with studies already completed. **BayesTree** is best run collaboratively, with **QIntegral** acting as a facilitator or perhaps as a "devil's advocate" within a team review. An open mind and a laptop is all that is required.