Oil and Gas Exploration and Production - Phase 3
Blue team 12

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Executive Summary

The purpose of this report is to assess the "dry-hole" risk for the Compagnie Pétrolière et Gazière company. The risk was calculated by calculating the proportion of oil producing wells ("wet wells") compared to total wells drilled. This was done by examining the distributions of events that are needed for a productive well which are: 1. Hydrocarbons must be present, 2. A reservoir must be developed in the rock formation to hold hydrocarbons, 3. An impermeable seal must be available to trap the hydrocarbons in the reservoir and prevent them from migrating somewhere else, 4. A structure or closure must be present that will cause the hydrocarbons (sealed in the reservoir) to pool in a field where the drill bit can penetrate.

With these risk factors taken into account we predict with 95% certainty that the proportion of producing wells will not be less than 52% in 2019. The estimated shortfall given the worst 5% of events occur is 45% wet wells. This means that in the worst 5% of outcomes the mean proportion of oil producing wells is expected to be 45%. The distribution of the proportion of productive wells, value at risk, and the expected shortfall can be seen in Figure 1.
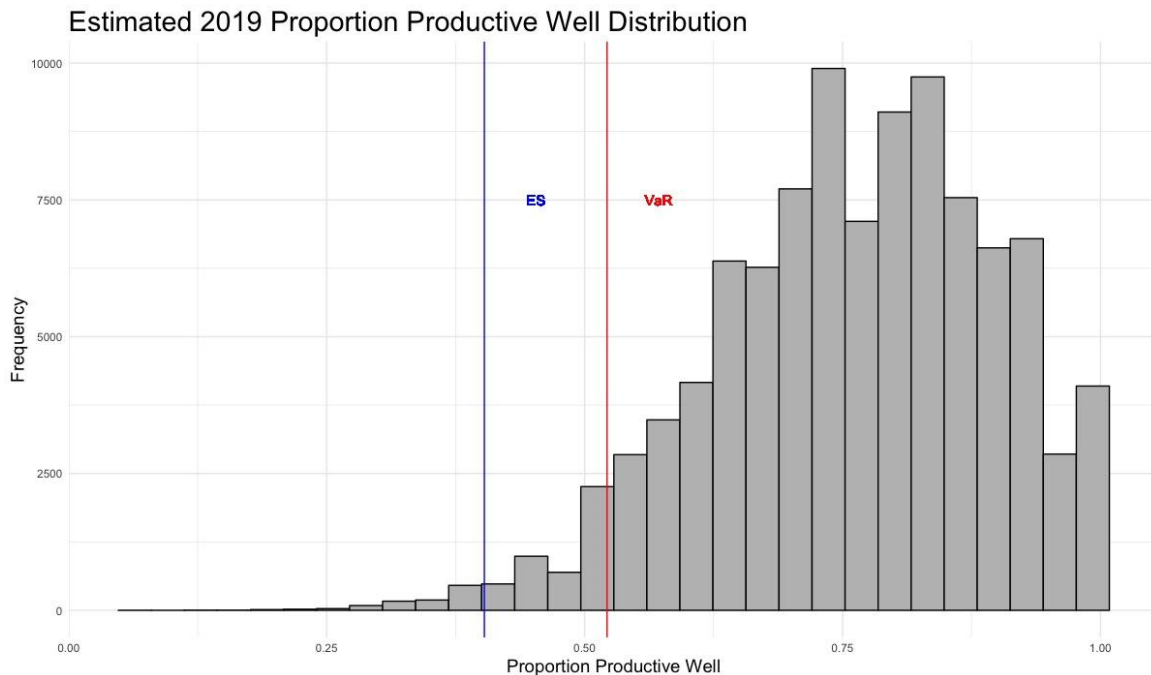

Figure 1. 2019 Proportion of Productive Wells

Analysis

The largest risk for the Compagnie Pétrolière et Gazière company is drilling a dry-hole as this event costs millions of dollars. The factors that go into a potential dry hole are as follows: hydrocarbons present, structure, reservoir, and seal. The distribution for hydrocarbons present and reservoir follows a truncated normal distribution with centers at 99% and 80% and standard deviations of 5% and 10% respectively. Each distribution was created with 100,000 points and can be seen in Figures 2 and Figures 3. The distributions for structure and seal were modeled with a uniform distribution of 1 and a standard deviation of 0.
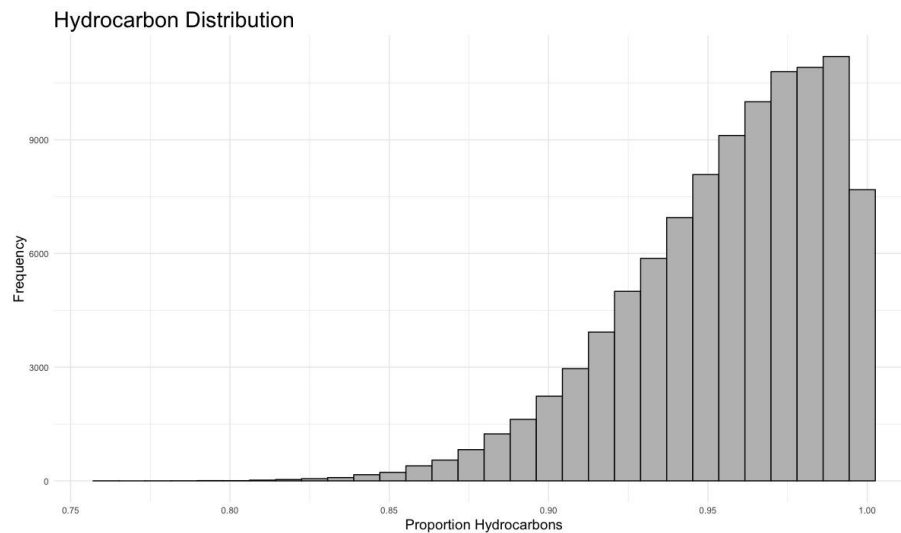

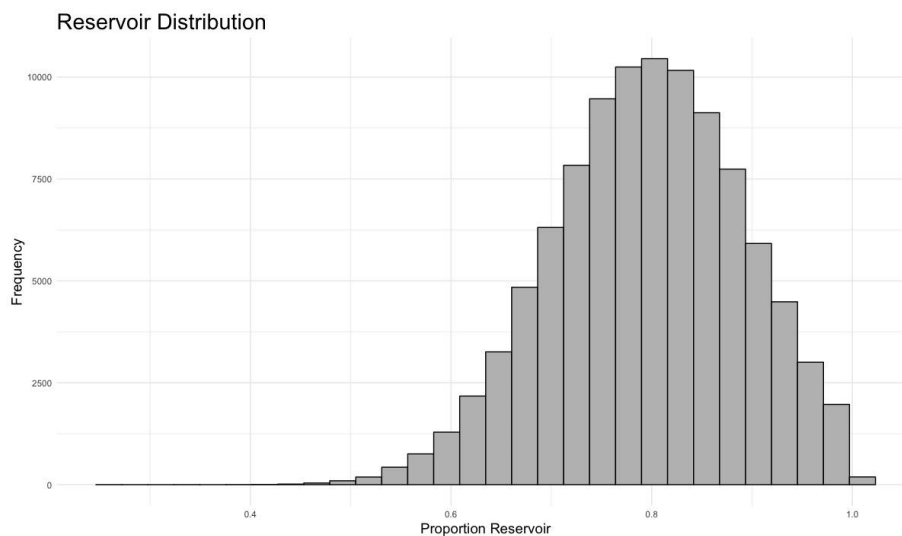Figure 2. Hydrocarbon Distribution

Figure 3. 2019 Reservoir Distribution

The risk factors are independent from one another and the probability of drilling a producing well is the product or each risk factor. The expected number of wells drilled followed a uniform distribution between 10 and 30 wells.

The expected proportion of producing wells was determined with simulation that used a binomial distribution with the expected number of drilled wells and probability of a producing well. The simulation was run 100,000 times and the output distribution can be seen in Figure 1. The resulting 5% value at risk for the proportion of producing wells in 2019 is 52% wet wells and the estimated shortfall given the worst 5% of events occur is 45% wet wells.

Recommendation

Our analysis gives Compagnie Pétrolière et Gazière, INC the expected distribution of productive wells drilled in 2019. In addition, we give the 95% value at risk and expected shortfall given that the worst 5% of events occur. This will help to improve the strategic planning and to reduce the risk for Compagnie Pétrolière et Gazière, INC during their 2019 planning. While this analysis gives the expected proportion of producing wells, we would also recommend a comprehensive report be generated to combine all aspects of the risk associated with well drilling in 2019.