Oil and Gas Exploration and Production - Phase 2
Blue team 12

Sophee Li, Chris Nobblitt, John Pamplin, Jerry Liao

Executive Summary

The objective of this report is to assess the possible costs of a single dry oil well and the net present value (NPV) of a single wet oil well for Compagnie Pétrolière et Gazière, INC. Based on 500 thousand simulations, the median NPV of a single wet well is $15,332,033 and the median cost of a single dry well is $930,940. There is a 0.1% chance we spend more than $1,101,389 on a dry well.
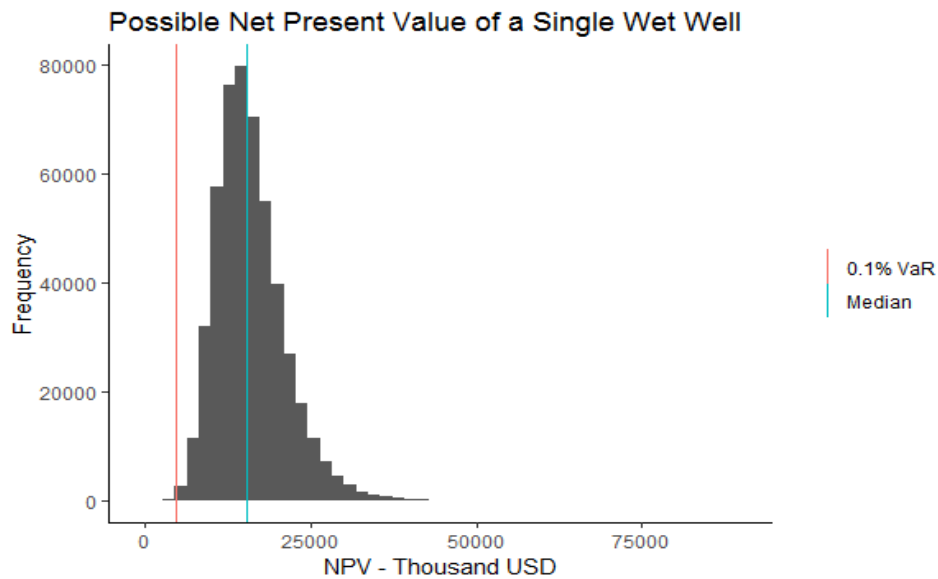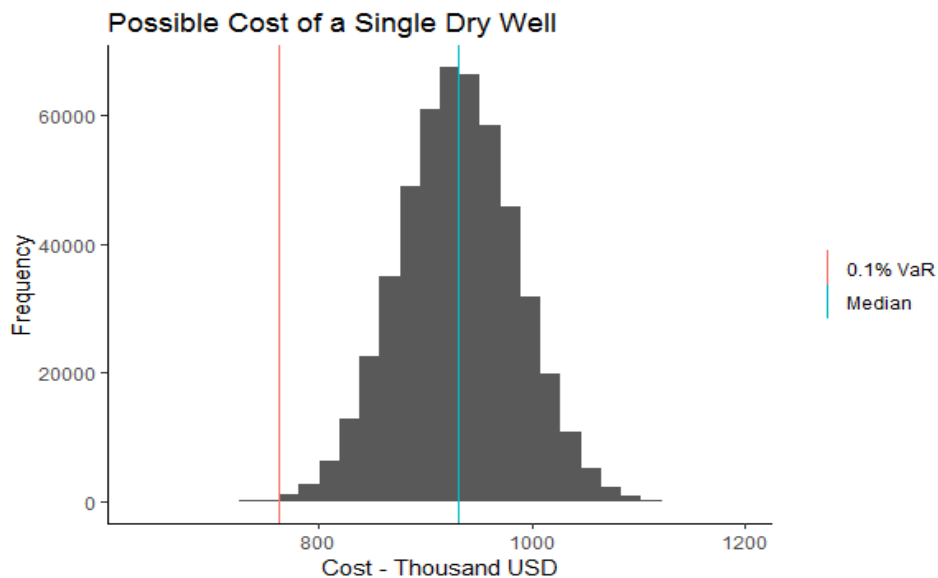

Figure 1.

Figure 2.

Analysis

Each well site incurs initial costs before oil extraction, regardless of having oil (a "wet" well) or not (a "dry" well). These initial costs encompass leasing land, seismic measurement, drilling, and professional overhead. If the well is determined to be wet, project engineers must set up the infrastructure needed to optimally extract oil.

Drilling costs were estimated using historical drilling costs for crude oil, natural gas, and dry wells from 1960 to 2007. With this data, the arithmetic return was calculated for each year. Years prior to 1991 were discarded due to changes in the drilling industry and 2007 was discarded as it was an outlier. The historical data from 1991 to 2006 was used to create a kernel density estimate to predict years 2006 to 2012. For years 2012 to 2015 a triangle distribution was created with an average of -9.17% return, a maximum return of -22%, and a minimum return of -7% was used. For years 2015 to 2018 a triangle distribution was created with an average of 5% return, a maximum return of 6% and a minimum return of 2% was used.

We estimated the oil production of a wet well in barrels per day, drawn from a lognormal distribution with a mean of 420 barrels per day and a standard deviation of 120 barrels. We expected the production rate to decrease annually at a constant rate, drawn uniformly from 15% to 32%. We assumed that production rate and the rate of decline were correlated with a coefficient of 0.64. As the production rate increases or decreases, the rate of decline tends to also increase or decrease respectively.

The projected revenue was calculated by multiplying price with the production volumes. We used the data from the World Bank from EIA as our predicted oil price, and the production volumes are based on our simulation. We then obtained our Net Revenue Interest (NRI), which follows a normal distribution with a mean of 75% and a standard deviation of 2%. Our final revenue is NRI subtracting tax, which is 4.6% of the revenue.

We simulated the operating cost per barrel using a normal distribution with a mean of $2.25 per barrel and a standard deviation of $0.3 per barrel. We multiplied the unit cost with the production volumes to get the operating costs. Our formula for final net revenue is as followed:

$Final\ Net\ Revenue = Revenue * (1 - Net\ Revenue\ Interest) * (1 - Severance\ Tax) - Operating\ Cost - Overhead\ Cost - Lease\ Cost$.

Based on 500,000 times simulation (Figure 1 and Figure 2), we have a 50% chance to make at least $15,332,033. At worst case, we can still make $638,760 from a wet well. In terms of dry wells, they will cost us at least $930,940 at 50% probability. There is a 0.1% chance we spend more than $1,101,389 on the dry well. If this scenario happens, it will cost us $1,117,279 on average. At the worst case, we may lose $1,191,630.

Conclusion

Our analysis gives Compagnie Pétrolière et Gazière, INC a big picture of the potential income and risk from working a wet well and the potential shortfall from drilling a dry well. Based on our simulation, it really depends on the probability of drilling a dry well to decide whether to invest in drilling wells. We suggest the company collect more data about the distribution of the dry well to inform better decision.