36109 Assignment 1 B: Digging for Gold

Student Name: Shalimar Chalhoub

Student ID: 14071892

Submitted on: 12 Sep 2022

Table of Contents

List of Tables

List of Figures

Introduction and Company Overview

This report displays the findings of a five-year strategy to maximize the long-term viability of **Indeep.** With the legal challenge that the company is facing, many steps are taken in order to conclude the best time for that legal challenge to be taken. Another major point covered in this report is the best time to recruit freelance exploration teams along with our own internal exploration team in order to find a new claim and further our revenue.

An in-depth study of every year's possible outcome will be demonstrated along with the most likely outcomes of each year, followed by the best scenario moving forward based on each preceding year's results in order to build the best five-year strategy to maximize the company's viability.

It is important to note that there is only a 50% chance of winning the case, and if won, there is no longer need to pay the legal team any further fees, however, if the case is lost, no more future revenue can be generated.

As for the above-mentioned additional exploration team, they cost $400,000 per team, and each team only has 15% of making a discovery.

Breakdown of Best 5 Year Plan

After many simulations and looking at a lot of results, the best possible outcome would come from doing the below steps:

1. Year 1 and Year 2 do not deploy additional teams and defer the legal case

2. At Year 3 hire 6 new teams

3. At Year 4 Settle the case

4. The revenue at year 5 will have a mean of $30.59M

Summary of All Possible Outcomes

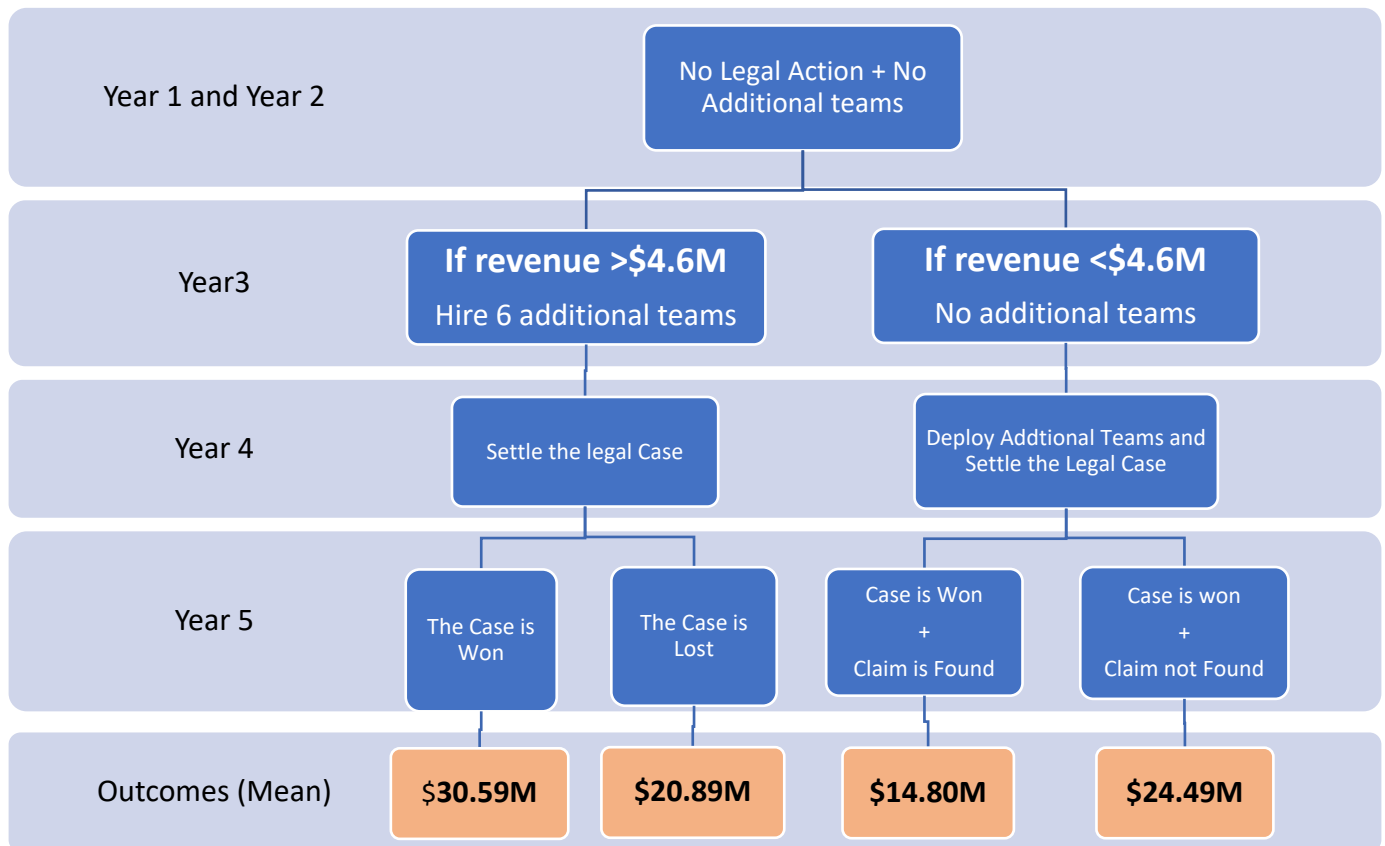|				
Year 1 and Year 2		No Legal Action + No Additional teams		
Year3		**If revenue >$4.6M** Hire 6 additional teams		**If revenue <$4.6M** No additional teams
Year 4		Settle the legal Case		Deploy Addtional Teams and Settle the Legal Case
Year 5	The Case is Won	The Case is Lost	Case is Won + Claim is Found	Case is won + Claim not Found
Outcomes (Mean)	$30.59M	$20.89M	$14.80M	$24.49M

Table 1- Summary of All Possible Outcomes

Yearly Breakdown of Financial Situation

Each year, there is a change in the prices per ounce of Gold as well as a change in claim production and below is a breakdown of year-by-year financial situations.

It is important that 32% of gold sold each year will be deducted as expenses.

1. Year1 Financial Summary and Simulation

The table below represents the financial summary at the beginning of Year1

	Minimum	**Most Likely**	**Maximum**
Initial Budget	$2,200,000	$2,200,000	$ 2,200,000
Gold Price/Ounce	$1800	$1800	$1800
Claim	100 ounces	1000 ounces	1800 ounces
Annual Fees	$500,000	$750,000	$1,000,000
Legal Fees	$500,000	$750,000	$1,000,000

Table 2- Year1 Financial Summary

After running the Monte Carlo Simulation on the above table, it was seen that:

- There is only a **10% chance of making more than $2.45M**

- The **Most Likely Outcome Range is [$1.55M - $1.9M**]

Since the most likely outcome is less than the original budget that means that some money from the original budget was used and thus, **no legal action or additional exploration team can be used in Year1.**

2. Year2 Financial Summary

The table below represents the financial summary at the beginning of Year2

	Minimum	Most Likely	Maximum
Initial Budget	Revenue from Year1	Revenue from Year1	Revenue from Year1
Gold Price/Ounce	$1550	$2000	$2300
Claim	85 ounces	1300 ounces	3060 ounces
Annual Fees	$500,000	$750,000	$1,000,000
Legal Fees	$500,000	$750,000	$1,000,000

Table 3- Year2 Financial Summary

After running the Monte Carlo Simulation on the above table, it was seen that

The **Most Likely Outcome Range is [$1.4M - $2.3M]**

Same as Year1, since the revenue is not high enough to be able to tackle a legal case, we will postpone it.

3. Year3 Financial Situation

The table below represents the financial summary at the beginning of Year3

	Minimum	Most Likely	Maximum
Initial Budget	Revenue from Year2	Revenue from Year2	Revenue from Year2
Gold Price/Ounce	$1330	$2200	$2800
Claim	72.25 ounces	1690 ounces	5202 ounces
Annual Fees	$500,000	$750,000	$1,000,000
Legal Fees	$500,000	$750,000	$1,000,000

Table 4- Year 3 Financial Summary

After the Monte Carlo simulation, it was seen that the results are as follows:

Mean	10%	42%	75%
$4.1M	> $8.1M	>$4.6M	>$1.97M

Table 5- Monte Carlo Results on year 3

Year 3 Plan A - Given Revenue >$4.6M

If the revenue in Year 3 is more than $4.6M, than, 6 new discovery teams will be deployed, which will raise probability of discovering a new claim from **15% to around 70%**

The 6 new teams will cost $2.4M and thus, even if the new claim in not found, Year3 will still have produced $2.2M which is equal to the opening budget, and worst-case scenario is that we restart with the same conditions as Year1.

We can have 2 outcomes from year3 Plan A

- Discover a new claim and start earning double

- Not discover a new claim and start from Year1 again.

Year 3 Plan - B Given Revenue <$4.6M

If the revenue in Year3 is less than $4.6M than we do not deploy any additional teams and we defer the legal case another year.

4. Year4 Financial Situation

The table below represents the financial situation at the beginning of Year4

	Minimum	Most Likely	Maximum
Initial Budget	Mean revenue from Year3	Mean revenue from Year3	Mean revenue from Year3
Gold Price/Ounce	$1050	$2400	$3300
Claim	61.4125 ounces	2197 ounces	8843.4 ounces
Annual Fees	$500,000	$750,000	$1,000,000
Legal Fees	$500,000	$750,000	$1,000,000

Table 6- Year 4 Financial Summary

Year4 will have a different scenario based on what we did in Year3. But for all of the scenarios, we are going to tackle the legal challenge in Year4.

Year 4 Plan A - Given Year 3 Plan A

If a new claim has been discovered in Year3, that will start doubling the revenue and thus the company will tackle the legal case this year, even if it failed, there is a new claim that will develop new income

Below is the income for that situation in Year4

Mean	10%	20%	75%
$12M	> $21M	>$17.27M	>$7.05M

Table 7- Monte Carlo Results on Year 4 Plan A

If the law suit is won, Year5 will continue with double revenue and without the legal costs

If no additional teams were deployed in Year3, then we have to deploy them this year in addition to the lawsuit in order to secure a revenue for next year even if the case is lost

Mean	10%	20%	75%
$5.85M	> $14.2M	>$10.99M	>$1.23M

Table 8- Monte Carlo Results on Year 4 Plan B

5. Year5 Financial Situation

The table below represents the financial situation at the beginning of Year5

	Minimum	**Most Likely**	**Maximum**
Initial Budget	Mean revenue from Year4	Mean revenue from Year4	Mean revenue from Year4
Gold Price/Ounce	$800	$2600	$3800
Claim	52.201 ounces	2856.1 ounces	15033.78 ounces
Annual Fees	$500,000	$750,000	$1,000,000
Legal Fees	$500,000	$750,000	$1,000,000

Table 9- Year5 Financial Summary

Just like year4, year5 will have different outcomes based on which plan was taken in Year4, and since we tackled the lawsuit in year4, there is no additional legal costs on Year5.

Year5 Outcome A - Given Year4 Plan A

If we tackle the lawsuit, we have a 50% chance of winning (keeping both claims) or losing (having only one claim), and below are the outcomes at the end of year 5 for both cases

Case	Mean	10%	20%	75%
Lawsuit Lost	$20.89M	> $38.27M	>$31.21M	>$11.27 M
Lawsuit Won	$30.59M	>$56.52M	>$45.89M	>$16.22M

Table 10 - Monte Carlo Results on Year 5 Outcome A

The best-case scenario we can have at the end of Year 5 is that the lawsuit is won in that case.

Year5 Outcome A - Given Year4 Plan B

In this plan, we are doing the lawsuit as well as trying to discover a new claim. If both fail, then the revenue stops at Year4.

If the Lawsuit is lost and a new claim is found, we will go back as we were in Year1 and start again from scratch

Otherwise, we have 2 scenarios below:

Case	Mean	10%	20%	75%
Lawsuit Won + Claim not Found	$14.80M	> $31.68M	>$24.95M	>$12.82 M
Lawsuit Won+ Claim Found	$24.49M	>$49.87M	>$39.56M	>$10.38M

Table 11- Monte Carlo Results on Year 5 Outcome B

Conclusion

The beat possible scenario at the end of Year 5 is when we hire additional team in Year 3 to find a new claim and later on solve the case in Year 4 and if everything is in our favor, we close Year 5 with more than $30.59M, there is a 10% of making more than $56M at the end of Year5

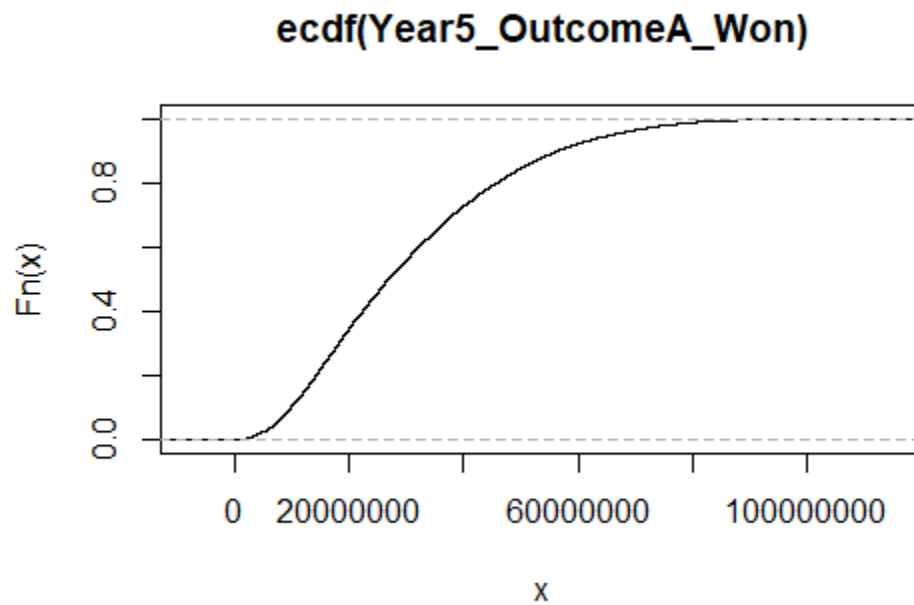Below is the histogram and the ecdf of the best outcome for year 5
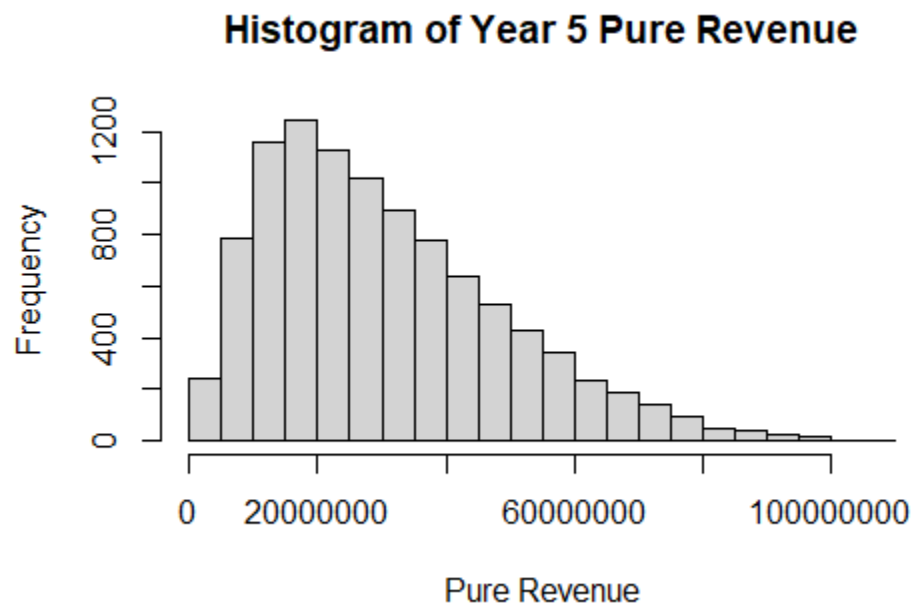

Figure 1- ECDF Year 5 Best Outcome

Figure 2- Histogram Year 5 best Outcome