Assignment 3

11/22/2021

Summary

This problem addresses a consulting firm called AppShop that must decide what the best route is to compete for a major contract. The three options at hand are to take a payment proposed by the client that is lower than the company's but would not include a bonus, an even lower level payment with a prospective bonus at the end of the case, or bid on a RFP where the benefits are dependent on the clients savings during the project. Our approach was to calculate the present expected value for each possible route, which demonstrated that while the first option presents the highest expected value, the client opposed that path. Therefore, I recommend that AppShop take the second option, which is taking the lowest payment per month but with a large bonus on the end as a reward for excellent work.

Analysis

My approach was to calculate the expected present value of the future payment using the present value formula. We chose to include Option 1 purely for context, since it is stated that this payment is not acceptable by the client. For Options 2 and 3, I looked at the value for each month, and if there was an additional payment at the end of the time frame, we calculated the present value of that as well. For the 4th option, I ran a simulation with 10000 tries to calculate a triangular distribution model in reference to the possible bid to the RFP. For each option I used the numbers provided in the case to make appropriate calculations and estimates.

Option 1, presented by the team

```r
library(extraDistr)
library(glue)
o1list <- 0

for (i in 1:24){
  o1list[i] <- (175000-140000)/(1.005^i)
}
o1pv <- sum(o1list)
o1pv <- round(o1pv, digits = 2)
glue('The present value of AppShops proposal is {o1pv}.')
```

```
The present value of AppShops proposal is 789700.32.
```

Option 2, presented by the client

```
o2list <- 0

for (i in 1:24){
  o2list[i] <- (155000 - 140000)/(1.005^i)
}
o2pv <- sum(o2list)
o2pv <- round(o2pv, digits = 2)
glue('The present value of the clients proposal without a bonus is {o2pv}')
```

```
The present value of the clients proposal without a bonus is 338442.99
```

Option 3, also presented by the client

```
o3list <- 0

for (i in 1:24){
  o3list[i] <- (125000 - 140000)/(1.005^i)
}
o3pv <- (0.3 * sum(o3list)) + (0.7 *(sum(o3list) + (1500000/1.005^24)))
# the guaranteed monthly pay plus the chance for a bonus
o3pv <- round(o3pv, digits = 2)
glue('The present expected value of the clients proposal with a chance for a
',
     'bonus is {o3pv}.')
```

```
The present expected value of the clients proposal with a chance for a bonus
is 593101.96.
```

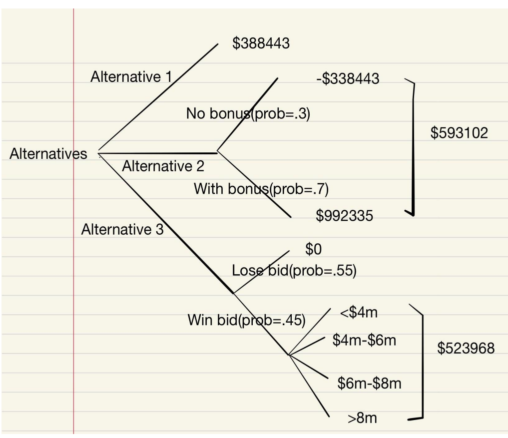
Option 4, the open FRQ

```
o4list <- 0
o4slist <- 0 #to simulate the spread of the bonus, savings
o4blist <- 0 #bonus based on the above

for (i in 1:24){
  o4list[i] <- (150000 - 140000)/(1.005^i)
}

sims <- 10000 #number of simulations
o4slist <- rtriang(n = sims, a = 3200000, b = 12800000, c = 5600000)
#creates triangular distro according to the predictions

for (i in 1:sims){
  if ( o4slist[i] < 4000000){
    o4blist[i] <- 0
  } else if ( o4slist[i] < 6000000){
    o4blist[i] <- (o4slist[i] - 4000000) * 0.2
```

```
  } else if ( o4slist[i] < 8000000){
    o4blist[i] <- 400000 + ((o4slist[i] - 6000000) * 0.4)
  } else {
    o4blist[i] <- 1200000 + ((o4slist[i] - 8000000) * 0.6)
  }
}
o4bmean <- mean(o4blist) #take the mean of it
o4bmpv <- o4bmean/(1.005^24) #get the present value
o4pv <- ((0 * 0.55) + (0.45 * (o4bmpv + sum(o4list))))
#there is a 55% chance they don't get a contract, and with no alternative
#presented, we must assume that the alternative is not working
o4pv <- round(o4pv, digits = 2)
glue('The present expected value for the RFQ, with a chance for a performance
',
     'bonus and for not winning the bid, simulated {sims} times, is {o4pv}.')
```

```
The present expected value for the RFQ, with a chance for a performance bonus
and for not winning the bid, simulated 10000 times, is 522256.14.
```

Illustration



Conclusion

I recommend that AppShop take the second offer made by the client, which is to receive a slightly lower monthly payment but be rewarded with a large bonus at the end. A possible pitfall is that these numbers are based off of some estimates - for example, the team at AppShop concludes that they have a 0.7 probability of receiving the bonus, but this number comes from their guess as to how satisfied their client will be. Therefore, the predictions here are based on guesses as to how the project will go. An obvious risk in choosing this option is not performing well enough to receive the bonus, in which case the consulting team would lose quite a bit of money. Another risk in a business context is having to put in more hours of work than they initially calculated in order to do well enough to receive the bonus, rather than receive a slightly higher monthly pay regardless of hours. However, given that the expected present value for Option 3 is the highest, I believe that this is the correct route for AppShop.