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|  | **BOSTON**  **UNIVERSITY** | **METROPOLITAN COLLEGE**  **DEPARTMENT OF ADMINISTRATIVE SCIENCES** |

**AD 616: Enterprise Risk Analytics**

**Assignment 5**

**What to submit?**

Please submit (i) a word file explaining in detail your answers to each question (you can use screenshots of the R to explain your answers) AND (ii) An R file and and an Excel file. For each question, make sure you develop the model and present the simulation results – R file should be self-explanatory. **The assessment of your work will include both the accuracy and the clarity of your word file and the R/Excel File.**

A real estate speculator is considering buying property at a resort island for $400 thousand. The local government is considering a proposal to rezone the property for commercial use, which has the potential to increase its value drastically. Once the government makes its decision, the speculator would lose the chance to purchase the property. As it stands, there’s a 30% chance the property will be rezoned. If it were rezoned, there’d be a 20% chance the speculator can incite a bidding war over the property and sell it for $3 million; there’d be a 40% chance he could interest a developer in the property and sell it for $1.8 million, and even if neither possibility played out, he could still sell it for $700 thousand. If the property isn’t rezoned, there’s a 25% chance he could resell it and recoup $300 thousand, but failing that, he would be stuck with a useless property, which would increase his liability by an additional $100 thousand.

The real estate developer discusses his options with a trusted consultant, who offers to look into the political situation on the island for a flat fee of $50 thousand. The consultant has a good reputation; she has a 90% probability of correctly identifying that a property is going to be rezoned, and a 70% probability of correctly identifying that the motion to rezone a property will fail.

While he’s considering her offer, she mentions another possibility: if he’s willing to pay her an additional $75 thousand (for a total of $125 thousand), she’ll use that money to make some generous campaign contributions to some of the island’s key government officials in exchange for future considerations. She estimates, with this strategy, the chance the property would be rezoned after the speculator’s purchase would increase to 60%, but there would be a 5% chance one of the island’s less enterprising functionaries would catch wind of her efforts. In this instance, the speculator would end up losing the amount he paid her, eating the cost of the property, and paying an additional $1.5 million in fines.

Use a decision tree to answer the following questions (Excel recommended):

1. What is the investor’s optimal decision under the EMV rule? What is the EMV of the investment opportunity?
2. Assume the investor has a risk tolerance of $2 million. Using the utility curve we discussed in class, what is his optimal decision? What is the certainty equivalent of that decision?
3. As it turns out, the consultant was just joking about bribing the government; this is not a decision alternative after all. What is the expected value of the information the consultant can provide?

Develop a Monte Carlo simulation to answer the following question:

1. Now assume, instead of knowing exactly what his payoffs and liabilities are, he only knows that they’ll be lognormally distributed, with mean and sd according to the following table:

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| Outcome | Payoff | Liability |
| Rezone: Bidding war |  | - |
| Rezone: Sell to developer |  | - |
| Rezone: Sell w/out developer |  | - |
| Fail: Resell |  | - |
| Fail: Unsellable | - |  |
| Caught attempting bribery | - |  |

He still knows the exact costs of purchasing the property, bribing officials, and paying the consultants’ fees. What is the probability the speculator will lose at least $200 thousand assuming he acts according to the EMV rule, as in part (a)?

For one point of extra credit, what is the probability the speculator will lose at least $200 thousand if he maximizes his expected utility with a risk tolerance of $2 million, as in part (b)?