Decision Making

BUS 735: Business Decision Making and Research

- Specific goals:
 - Learn how to conduct regression analysis with a dummy independent variable.
- Learning objectives:
 - LO5: Be able to use stochastic operations research models to answer business questions that involve uncertainty.
 - LO7: Have a sound familiarity of various statistical and quantitative methods in order to be able to approach a business decision problem and be able to select appropriate methods to answer the question.

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 - Expand facilities.
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Decision Making Without Probabilities

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Decision	Good Economic Conditions	Bad Economic Conditions
Expand	\$150,000	-\$10,000
Renovate	\$90,000	\$10,000
Do nothing	\$70,000	\$40,000

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- Maximax Decision:
 - Compute the best (maximum) outcome for each choice (very optimistic).
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- **Regret** is the difference between the payoff of a given decision and the best decision under a given scenario.
- Example: Suppose you chose to do nothing and there ended up being good economic conditions.
 - Best decision given good economic condition is to expano Profit = \$150,000.
 - Profit from doing nothing given good economic condition is \$70,000.
 - Regret = \$150,000 \$70,000 = \$80,000.
- Minimax Regret Decision:
 - Compute regrets for every cell in table..
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Regrets Table:

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Regrets Table:

Decision	Good Economic Conditions	Bad Economic Conditions	Maximum
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Renovate	\$60,000	\$30,000	\$60,000
Do nothing	\$80,000	\$0	\$80,000

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- Compute weighted average of each decision (with equal weights).
- P(Good Economic Conditions) = P(Bad Economic Conditions) = 0.5.
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Do nothing	\$70,000	\$40,000	\$55,000

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- Take a weighted average again, but choose an arbitrary weight for the best-case value.
- Coefficient of optimism, given by α , is a measure of the decision makers optimism.
- Best-case weight = α , worst-case weight = (1α) .
- Suppose $\alpha = 0.2$ (very arbitrary).

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Expand	\$150,00	-\$10,000	\$22,000
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Criterion	Decision
Maximax	Expand
Maximin	Do nothing
Minimax Regret	Expand
Equal Likelihood	Expand
Hurwicz ($\alpha = 0.2$)	Do nothing

- Dominant decision: when same choice is made for every criterion considered.
- Dominated decision: when choice is never made for every criterion considered.

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- Suppose probabilities for good economic conditions and bad economic conditions are known.
- Suppose P(Good Economic Conditions) 0.6, P(Bad Economic Conditions) = 0.4.

- Maximum expected value = \$86,000. Decision = Expand!
- A risk neutral decision maker should make this decision.

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Expected Values: Probabilities Known

- Suppose probabilities for good economic conditions and bad
 - Suppose P(Good Economic Conditions) 0.6, P(Bad Economic Conditions) = 0.4.

Decision	Good Economic	Bad Economic	Expected
	Conditions	Conditions	Value
Expand	\$150,00	-\$10,000	\$86,000
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- Regrets Table:

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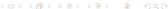
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- Suppose you could purchase "perfect information" about what will happen. How much would you pay?
- If you were told good economic conditions:
 - Decision = Expand, Profit = \$150,000
- If you were told bad economic conditions:
 - Decision = Do nothing, Profit = \$40,000.
- A priori expected profit (given you will make a perfect decision):
 - Expected Profit = (0.6)(\$150,000) + (0.4)(\$40,000) = \$106.000.
- Expected profit from maximizing expected value = \$86,000.
- \bullet EVPI = \$106,000 \$86,000 = \$20,000.
- Not coincidentally, EVPI = EOL.

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Expected Value of Perfect Information

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- Expected profit from maximizing expected value = \$86,000.
- \bullet EVPI = \$106,000 \$86,000 = \$20,000.
- Not coincidentally, EVPI = EOL.



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Bayesian Analysis

- Bayesian analysis: decision making using additional information which alter conditional probabilities.
- Suppose P(good economic conditions), P(bad economic conditions) are simply based on past history.
- Suppose your the Minneapolis Federal Reserve Bank issues an economic report (which they do) that indicates whether they have a positive economic outlook or a negative economic outlook.
- This is useful information, but not perfect information.
- Define the following events:
 - P: positive economic report
 - N: negative economic report
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- Of course, P(P) = 1 P(N), P(G) = 1 P(B).

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- Suppose past experience indicates the Federal Reserve report accurately forecasts...
 - good economic conditions 80% of the time, and
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- Conditional probabilities:

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