Case Study Logistics

Due: Friday December 7th, 2018

The case study will give you practice applying the concepts you are learning in MS&E 252.

You are from the XYZ consulting company (you can create your own name). William Jaeger of Freemark Abbey Winery has hired your company to help him make a production decision. A storm is approaching the winery and Jaeger is not sure if he should wait for the storm or harvest the grapes immediately. Sometimes after a warm rain the grapes are attacked by botrytis mold. This mold helps to produce botrytised Riesling, which is highly valued by wine connoisseurs.

You can find the related Harvard case study here: http://bit.ly/XnxsAD

Meeting with your TA

Teaching assistants will be available to meet groups between **November 12th and November 30th**. The time and location will be made available by an announcement on Canvas. In your meeting, the teaching assistant will play the role of Mr. Jaeger.

Your task is to:
1] Assess Mr. Jaeger's belief about rain
2] Assess Mr. Jaeger's risk-attitude

Assume that Mr. Jaeger does not know decision analysis and is not comfortable with probabilities. You will be using the Probability Wheel to make the assessments. An electronic version of the probability wheel is available on Canvas->Files->Case Study. Please refer to the "weight of the lectern" exercise in class to familiarize yourself with this tool.

This is also an opportunity for groups to receive feedback and ask clarification questions. To make the most of this meeting, **please bring your decision tree** and show it to the TA. You can build your model before the interview using 0.5 as probability of rain and a Delta u-curve with risk tolerance of $50,000 for Mr. Jaeger. **Please note that your assessments about Mr. Jaeger's beliefs and risk attitude will supersede the temporary assignments given above and anything that the Harvard case study states.** Your effort and preparation for this meeting will count toward your case study grade. **Specifically, you will be graded on how you assess Mr. Jaeger's beliefs on the probability of rain and his risk attitude.**

Report

You must provide Mr. Jaeger with a report that summarizes your conclusions and recommendations. Your report should consist of:

- A Decision Support Tool that will show your main assumptions and conclusions. It will be given to Mr. Jaeger himself and should assume **no knowledge of decision analysis**.
- A series of slides (no more than 15) to support your conclusions. The slides should be aimed at **an audience who is familiar with decision analysis** at the MS&E 252 level.

Please note that your decision support tool/slides should highlight your most interesting and insightful results in an intuitive and readable fashion. Keep in mind that more information is not necessarily better. Mr. Jaeger is a busy individual who wants to make a quick and well-informed decision. He expects you to respect his time and earn your salary by clearly identifying the important information so that he doesn't have to do it himself. He requests that if you have any less important results or technical details, you place them in the support slides.

If you feel that your slides are not explicit enough, you can add written comments for each slide.

Your report should at least comprise the following elements:

- The details of the decision basis (information, alternative, preferences).
- A decision diagram including the decisions to buy the spores and the SuperDoppler.
- A decision tree including the decisions to buy the spores and the SuperDoppler. Make sure that we can read the tree. If needed, please feel free to break up the tree and show it on several slides.
- Sensitivity analysis to the three most material uncertainties (varying one at a time).
- Sensitivity analysis to the risk-aversion coefficient, plotted symmetrically around zero.
- Value of information – should William Jaeger rent the SuperDoppler weather detector?
- Value of control – should William Jaeger buy the spores from Borz?
- **Final recommendation – what do you recommend William Jaeger do?**

Hints

1) Issue raising and categorization

Read the Freemark Abbey Case and write down the issues that come to mind:

- What are the principal **concerns** of William Jaeger?
- What **choices** can he make?
- What **uncertainties** does he face?
- What does he want?

In addition to the information provided in the case, the following additional information might be useful in your analysis:

- The same process that results in increased sugar content for botrytised Riesling results in a decrease in juice volume.
- If it rains and the botrytis does not form, the rainwater will be absorbed by the vines, swelling the grapes. This would result in a less valuable "thin" wine.
- Jaeger always has the alternative of not bottling substandard wine to avoid harming its reputation for future years. It could sell the grapes in bulk to another wine maker. This alternative would bring in less revenue but would save the winery's reputation.
- If Jaeger decided not to harvest the grapes immediately and the storm did not strike he would leave the grapes to ripen more fully. While waiting for the sugar level to rise, the acidity levels must also be monitored. If the acidity falls below a critical level, the grapes must be harvested immediately whatever the sugar content.
- The costs to the winery are about the same for each possible wine style and are small relative to the wholesale price.
- The storm will produce either a light, warm rain or no rain at all.

You are welcome to take your own perspective on the case. Include whatever issue you judge relevant that may not be mentioned in the problem statement.

Finally, categorize issues as decisions, uncertainties, values and others (facts or process issues).

2) Sorting decisions

Sort the decisions that appeared in the issue raising process as follows:

- Decisions already made.
- Decisions that are going to be the focus of this analysis. That is, the decisions your recommendation will be about. We will call these decisions "strategic decisions".
- Subsequent decisions. These decisions will not be considered in the present analysis, but only later in the future, once the above decisions have been made.

Once the "strategic decisions" have been selected, you should select uncertainties. Keep in your analysis only those uncertainties that are relevant to the strategic decisions.

3) Decision Diagram

Once you have framed your problem, you should know which decisions and which uncertainties you are going to consider in your analysis. It is then time to build a decision diagram to make explicit the relationships that connect uncertainties, decisions, and values. The decision diagram is extremely important since it will be used as a communication and explanatory tool to support your modeling effort. The decision diagram to be turned in should include the **decisions to buy the spores and rent the radar**.

Here are a few tips for building your decision diagram:

- Start with the value node.
- Add the uncertainties.
- Add the decisions that are within the project frame.
- Make sure you add arrows to indicate important relationships in the diagram. Be careful not to add superfluous arrows.
- Check that you have no cycle.

4) Decision Tree

Build William Jaeger's decision tree. Make sure that you check the ***coherence between your decision tree and your decision diagram***. All the distinctions considered in the decision diagram, and only those, should appear in the decision tree. If you detect a problem at this point, it may be good to go back and work again on your decision diagram.

When constructing your decision tree, please make the following assumptions:

- The grapes will swell 7.5% if it rains and if the botrytis does not form.
- If Freemark Abbey harvested the grapes now, they would obtain 1,000 cases (12,000 bottles).
- William Jaeger estimates that the damage to Freemark Abbey's reputation from bottling and marketing an inferior wine (such as the "thin wine") would cost $25,000 in advertising to mitigate.
- William Jaeger estimates that a botrytis wine would help improve Freemark Abbey's reputation – a reputation value worth $15,000.
- Wines other than the thin wine or the botrytis wine do not affect Freemark Abbey's reputaion.
- If the acid level stays above 0.7%, the grapes will either ripen to 20% or 25% sugar content, with equal probability.
- If the acid level drops below 0.7%, the grapes must be harvested immediately at a sugar content of 19%.
- In the first pass of your analysis, you may assume that Freemark Abbey is risk-neutral; however, you should also perform some sensitivity analysis on their risk tolerance.

Evaluate the decision tree:

- Roll back the tree
- Should Jaeger harvest now or wait?

5) Value of information and control

a) The Napa Valley SuperStation rents its SuperDoppler weather detector to vineyards throughout the valley. The detector is portable and can be brought right to the vineyard. This would result in very accurate local forecasts and the SuperDoppler can be considered a symmetric detector. The SuperStation charges $1,000 per use and Mr. Jaeger can only rent it one time before the storm do to high demand. Should Jaeger rent it?

b) Harvey Borz of Borz's Overnight Mold Spores sells botrytis spores and guarantees that if you use his spores and if it rains, botrytis mold will develop. One application would be enough to treat Freemark Abbey's Riesling grapes and would cost $10,000. If he chooses to use Harvey's services, Jaeger must pay the $10,000 up front (before the storm), but if he does that 24 hours before the predicted storm, the spores will arrive and can be applied just before the rain starts, thereby ensuring that botrytis will form immediately after the warm rain. Should Jaeger buy the spores? His staff is strongly in favor of buying the spores.

Consider the cases where: 1) only the SuperDoppler is rented; 2) only the spores are bought, and; 3) where first the SuperDoppler is rented and then Mr. Jaeger has the ability to decide on buying the spores when he gets the report of the SuperDoppler.

6) Use of Analytical Tools

You might find it useful to resort to some analytical tool for your modeling. Here are two options:

a) Simple Decision Tree: An Excel plug-in written by one of our past TAs that is the tool of choice for at least some of us. Available on Canvas->Files->Case Study. Please refer to the guide in the same folder for how to use the add-in.

b) TreePlan: Allows you to draw your decision tree and works fairly well. You can download a trial version from http://www.treeplan.com/trial.

Please note that you will be graded based on your fundamentals, and not on the tool you use. If you find any other tool than what we've mentioned, please feel free to use it.

7) Bayesian Updating

You have been provided with some data on the probability of rain and the probability of the spores, you are expected to use this data in conjunction with what you obtain from the interview to formulate your probability assessment

Final words

If your decision basis is incomplete or you need to make extra assumptions (in addition to those mentioned in the "Issue raising and categorization" part above) in order to make a recommendation, make sure you state this information clearly. Even though Jaeger did not take any time to verify the quality of the information himself, he generally trusts his staff to provide reliable estimates.

Also, when writing your report, please beware of a mistake that people often make when presenting a piece of analysis to someone else – many people usually focus on "the steps they took" instead of emphasizing "the insights and conclusions they reached".

Freemark Abbey has high expectations of your consulting firm (not related to your steep fee structure, of course). They expect you to be experts in decision making and be able to fill in any holes in the decision basis (specifically related to this decision situation) that Mr. Jaeger may have left open.

We reiterate that Freemark Abbey expects a clear and concise report. The effectiveness of your slides will be judged by their content and clarity, not by their quantity.

Good luck!

The DA1 Teaching Team