

Exercise 2

20.9.2022

#1 Utility assessment and expected utility

The year is 2030 and you are in the supercomputer business. Your firm currently produces a machine that is relatively expensive (list price \$6 million) and relatively slow (for supercomputers in the 21st century). Speed of supercomputers is measured in gigaflops per second (gps), where one “flop” is one calculation. Thus, 1 gps = 1 billion calculations per second. Your current machine is capable of 150 gps. If you could do it, you would prefer to develop a supercomputer that costs less (to beat the competition) and is faster.

You have an R&D decision to make based on two alternatives. You should choose one or the other of the following projects as the budget constraints prevent you from engaging in both.

- A. **The super-supercomputer:** This project involves the development of a machine that is extremely fast (800 gps) and relatively inexpensive (\$5 million). But this is a risky project. The engineers, who have been involved in the early stages, estimate that there is only a 50% chance that this project would succeed. If it fails, you will be stuck with your current machine.
- B. **The better supercomputer:** This project would pursue the development of an \$8 million machine capable of 500 gps. This project is also somewhat risky. The engineers believe that there is only a 40% chance that this project will achieve its goal. They quickly point out, however, that even if the \$8 million, 500 gps machine does not materialize, the technology involved is such that they would at least be able to produce a \$5 million machine capable of 350 gps.

a) Build a decision tree representing the situation.

To decide between the two alternatives, you have made the following assessments:

- I. The best possible outcome is the \$5 million, 800 gps machine, and the worst outcome is the status quo \$6 million, 150 gps machine.
- II. If you had the choice, you would be indifferent between alternatives X and Y shown in Figure 1 (a).
- III. If you had the choice, you would be indifferent between alternatives X' and Y' in Figure 1 (b).

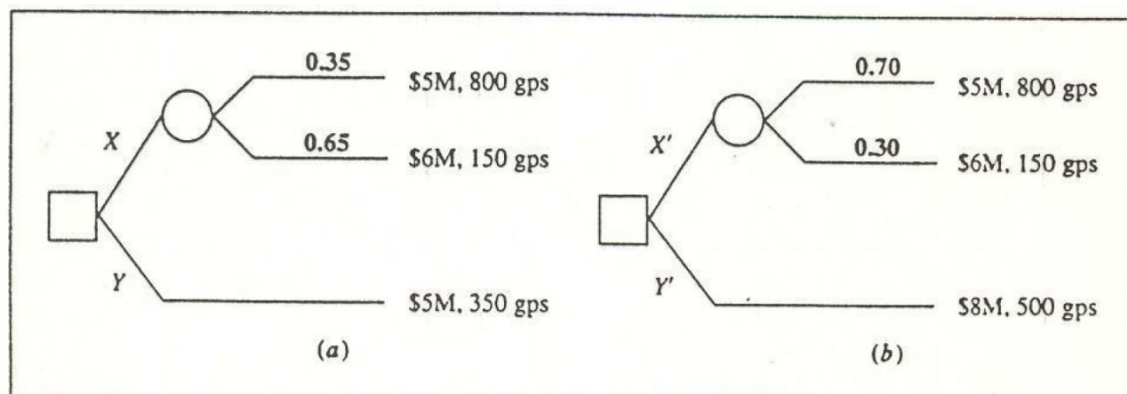


Figure 1

- b) Using assessments I, II and III, decide between projects A and B. Justify your decision.
- c) Explain why project A appears to be riskier than project B. Given that A is riskier than B, would you change your answer to part a? Why or why not?
- d) Suppose that you meet an experienced and insightful colleague who can predict with 100 % accuracy the success and failure of both projects under consideration. How much more utility can you expect to gain if you could make your selection between A and B only after discussing with this colleague?