

Real-estate developer problem

Suppose that a real estate developer (you) must decide on a plan for developing a certain piece of property. After a careful consideration, the developer has ruled out “do nothing” option and is left with the following list of acceptable alternatives:

- a. RESIDENTIAL project
- b. SMALL COMMERCIAL project
- c. LARGE COMMERCIAL project

The main factor that will influence the profitability of the development is what is built on a neighbouring property. The question is whether or not a shopping centre (SC) is built there, and the size of it if one is built. This means the situation is as follows:

- i. no shopping centre is built
- ii. medium size shopping centre is built
- iii. large shopping centre is built

1. *Structure the problem. What is the decision matrix going to look like?*
2. *Which decision rules can you possibly use?*
3. *Which one decision rule would you use and why?*

Imagine the payoff table looks as follows:

Profit (mil Euro)	No shopping centre	Medium SC	Large SC
RESIDENTIAL	4	16	12
SMALL COMMERCIAL	5	6	10
LARGE COMMERCIAL	-1	4	15

4. *Use your preferred decision rule to solve the problem. Which alternative would you choose?*

Imagine further, that the probabilities of the neighbouring property project are as follows:

- no shopping centre $p = 0,2$
- medium size shopping centre $p = 0,5$
- large shopping centre $p = 0,3$

5. *Which decision rule would you use under these circumstances and why?*
6. *Apply the rule. How would your decision change?*

7. *Structure the problem using the decision tree.*
8. *Use the tree to solve the problem; use expected value rule to find the best decision.*

Now imagine further that real estate developer has several options that might be considered after the initial decision. For instance, regardless of which of the three original alternatives he/she chooses, the worst payoff will result if no shopping centre is built. Hence, it might be prudent for the developer to plan for that contingency. Thus, the developer might consider certain options. Suppose that the developer states that he/she would consider these additional alternatives in the event that no shopping centre is built on the neighbouring property:

- A. Do nothing
- B. Develop a small shopping centre
- C. develop a park

9. *Develop a new decision tree representing the additional options.*

Now imagine ever further, that the new options will yield the following payoffs:

- if a residential project had been built, small centre will yield profit of 7 mil E, a park will yield 8 mil E;
- if a small commercial project had been built, small centre will mean profit of 7 mil E, a park will mean a profit of 3;
- if a large commercial centre had been built, small centre will bring 14 mil E, a park will bring 10 mil E.

10. *Valuate the newly developed tree and use it to solve the problem.*