



## ISM-E1004 - Business Analytics 2, Lecture, 8.1.2024-19.2.2024

<b>State</b>	Finished
<b>Completed on</b>	Monday, 19 February 2024, 11:36 AM
<b>Time taken</b>	2 hours 34 mins

**Question 1**

The following list contains statements that are either true or false. Which of the statements are true?

Grading: each incorrect answer eliminates the points of one correct answer.

Select one or more:

- ☐ A certain optimisation problem has a convex objective function and its decision variables are integer valued. Such an optimisation problem is classified as a convex problem.
- ☐ The Expected Value of Sample Information cannot be larger than the Expected Value of Perfect Information.
- ☒ The Law of Total Probability relates marginal probabilities to conditional probabilities.
- ☐ Multiattribute Value Theory (MAVT) always assigns equal weights to all attributes.

- The independence axiom of Expected Utility Theory (EUT) is based on empirical observations of how people will choose in different situations.
- If  $X$  dominates  $Y$  in the sense of First-degree Stochastic Dominance and  $Y$  dominates  $Z$  in the sense of First-degree Stochastic Dominance, then  $Z$  dominates  $X$  in the sense of First-degree Stochastic Dominance.
- The Conditional Value-at-Risk measure  $CVaR_{\alpha}[X]$  describes the expected value of random variable  $X$  on the condition that this value is lower than or equal to  $VaR_{\alpha}[X]$ .

- ☒ A decision maker with a strictly convex utility function is classified as risk-seeking in the sense of Expected Utility Theory.
- ☐ If  $X$  dominates  $Y$  in the sense of First-degree Stochastic Dominance, then the cumulative distribution function of  $X$  can be strictly above the cumulative distribution function of  $Y$  at some points.
- ☒ For a decision maker with a linear utility function, the certainty equivalent of a random variable equals the expected value of the random variable.
- ☐ The cumulative distribution function  $F_X(x)$  denotes the probability that the value of random variable  $X$  is greater than or equal to  $x$ .

☐ Value-at-Risk 10% for a normally distributed random variable does not depend on the mean of the random variable, only on its variance.

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**Question 2**

[Flag question](#) Marked out of 6.00 Complete

A company is considering whether to invest into a high-risk external project or a virtually risk-free internal project. The profit from the external project depends on whether a remote economic market experiences an upturn or a downturn. If there is an upturn, the external project will yield a profit of 6.3 thousand euros but if there is a downturn, the external project will cause a loss of 4.9 thousand euros. The internal project will yield one thousand euros regardless of the market developments. The company has estimated the probability of there being an upturn in the remote market to be 0.5. The company is risk-neutral in its investment decision making.

**NOTE:** It is recommended that you solve this problem using Excel and formulate the problem in a decision tree in a way that it is easy for you to change the parameter values (profits and probabilities). The same problem (and extended versions thereof) with possibly different parameter values will be discussed in subsequent questions.

In this problem, you get three tries such that after each incorrect try, one third (33%) of the maximum points is deducted.

Answer: 1.00

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**Question 3**

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A company is considering whether to invest into a high-risk external project or a virtually risk-free internal project. The profit from the external project depends on whether a remote economic market experiences an upturn or a downturn. If there is an upturn, the external project will yield a profit of 6.3 thousand euros but if there is a downturn, the external project will cause a loss of 2.6 thousand euros. The internal project will yield one thousand euros regardless of the market developments. The company has estimated the probability of there being an upturn in the remote market to be 0.3. The company is risk-neutral in its investment decision making. (Note: the parameter values may be different than in the previous question.)

What is the **expected value of perfect information** (in thousands of euros)? Use two decimals in your answer. (Currency symbol is not needed in the answer.)

In this problem, you get three tries such that after each incorrect try, one third (33%) of the maximum points is deducted.

Answer: