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

Complete

Course feedback

Marked out of 9.00

Flag question

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Next activity

Resit Exam 5 April 14:00 − 17:00 ►

Marked out of 6.00

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Quizzes

Resources

Started on Monday, 19 February 2024, 9:02 AM

Time taken 2 hours 34 mins Question 1

Completed on Monday, 19 February 2024, 11:36 AM

State Finished

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

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

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.

/ Exam

- The Law of Total Probability relates marginal probabilities to conditional probabilities. ■ Multiattribute Value Theory (MAVT) always assigns equal weigths to all attributes.
- The independence axiom of Expected Utility Theory (EUT) is based on empirical observations of how people will choose in different situations.

The Expected Value of Sample Information cannot be larger than the Expected Value of Perfect Information.

- 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.
 - oxdot The Conditional Value-at-Risk measure $CVaR_{lpha}[X]$ describes the expected value of random variable X on the condition that this value is lower than or equal to $VaR_{lpha}[X]$. A decision maker with a strictly convex utility function is classified as risk-seeking in the sense of Expected Utility Theory.
- For a decision maker with a linear utility function, the certainty equivalent of a random variable equals the expected value of the random variable.

- \square 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.

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

Question 2

The company is risk-neutral in its investment decision making. What is the expected monetary value of the company's **optimal** decision? Give your answer in thousands of euros using two decimals. (Currency symbol is not needed in the answer.) **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.

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.

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.

In this problem, you get three tries such that after each incorrect try, one third (33%) of the maximum points is deducted. 1.00 Answer:

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.

Question 3

The company is risk-neutral in its investment decision making. (Note: the parameter values may be different than in the previous question.)

The company is risk-neutral in its investment decision making. (Note: the parameter values may be different than in the previous question.)

probability that the study gives an unfavourable result given that the market actually has a downturn is 0.8.

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.)

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

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

Answer:

Question 4 Flag question Marked out of 12.00 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 7.5 thousand euros but if there is a downturn, the external project will cause a loss of 2 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.

gives either a favourable or an unfavourable result. Based on historical data, the probability of the study giving a favourable result given that the remote market actually has an upturn is 0.8. The

To obtain more accurate information about the probability of the remote market experiencing an upturn, the company can purchase a market study at cost 0.4 (in thousands of euros). The market study

In this problem, you get three tries such that after each incorrect try, one third (33%) of the maximum points is deducted. Answer: 2.90

What is the expected monetary value (in thousands of euros) corresponding to the optimal decisions through the decision tree? Use two decimals. (Currency symbol is not needed in the answer.)

Flag question Marked out of 9.00 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 8.6 thousand euros but if there is a downturn, the external project will cause a loss of 2.1 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 0.6. The company is risk-neutral in its investment decision making.

Question 5

unfavourable result given that the market actually has a downturn is 0.8. (Note: the parameter values may be different than in the previous question.) What is the expected value of sample information (where sample information is given by the market study)? Give your answer in thousands of euros using two decimals. (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.

To obtain more accurate information about the probability of the remote market experiencing an upturn, the company can purchase a market study. The market study gives either a favourable or an

unfavourable result. Based on historical data, the probability of the study giving a favourable result given that the remote market actually has an upturn is 0.8. The probability that the study gives an

Answer: 0.08

Consider a random variable X such that P(X=3)=0.55, P(X=5)=0.2 and P(X=9.9)=0.25, and a decision maker with the utility function $u(t)=rac{1}{4}t^2$. What is the value of CE[X]? Report your answer using two decimals.

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

5.87 Answer:

Question **6**

▼ Flag question Marked out of 9.00 Complete

Question 7

X follows UNI(-10,30) Y follows UNI(10,30)

The CDFs of these random variables are illustrated in the figure below.

Consider three decision alternatives, whose payoffs are modelled by random variables:

Z is a discrete r.v. and has two possible values: $f_Z(10)=0.5,\ f_Z(20)=0.5.$

20 Which of the stochastic dominance relationships listed below are true? Each incorrect answer eliminates the points of one correct answer. a. Y FSD X b. X SSD Z c. Y SSD X d. X FSD Z

✓ h. Z SSD X i. Z FSD X ☑ j. Y FSD Z

e. X SSD Y

f. Z FSD Y

g. Z SSD Y

k. X FSD Y ✓ I. Y SSD Z

Question 8

value:

Answer:

value:

probability: 0.1

6.3

What is the value of $VaR_{30\%}[X]$? Use one decimal in your answer. Note: only one try is possible in this problem.

Consider a random variable X with the following distribution:

0.1

0.1

Consider random variable X with the following probability distribution:

18.4

0.1

15.2

0.15

12.6

0.05

17.6

0.05

10.8

0.1

18.2

0.12

Financial

value

 (w_1)

0.5

u1(x1)

0.00

1.00

0.1

13.6

0.1

16.9

0.12

13.6

0.08

15.6

0.08

The figure below contains a spreadsheet model where a financier is evaluating investment projects using an additive multiattribute utility model with three attributes.

Attribute weights

0.25

Attribute-specific utilities

u2(x2)

0.00

1.00

Financial Strategic

Strategic | Competence

fit (w₂) of team (w₃)

0.25

Competence

of project

team

u3(x3)

0.00

1.00

Overall utility

u(x1,x2,x3)

0.00

1.00

19.9

0.1

Question 9

17.1 11.9

probability: 0.1 0.1 0.15 What is the value of $CVaR_{30\%}[X]$? Report your answer using two decimals. Note: only one try is possible in this problem.

Project proposals

x^0

X^*

Answer: 5.13

Question 10

value (k\$)

x1

0

100

Attribute-specific performances

x2

poor

wow

 $u(x_1, x_2, x_3) = \sum_{i=1}^{3} w_i u_i(x_i)$ $u_1(x_1) = \sqrt{\frac{x_1}{100}}$

Strategic fit Competence of

project team

x^A 0.50 0.50 0.00 0.38 25 poor x^B 75 0.87 0.40 1.00 0.78 good x^C 0.25 20 great 0.45 0.60 0.44 x^D 0.75 40 0.63 0.75 1.00 wow What is the the **overall utility** of the project $x^E = (35, good, 2)$? Report your answer using two decimals. In this problem, you get three tries such that after each incorrect try, one third (33%) of the maximum points is deducted. 0.46 Answer:

Question 11

The figure below contains a spreadsheet model where a financier is evaluating investment projects using an additive multiattribute utility model with three attributes.

Attribute weights

0.25

Strategic | Competence

fit (w₂) of team (w₃)

0.25

Financial

value

 (w_1)

0.5

Project proposals x1 x2 x3 u1(x1) u2(x2) u3(x3) u(x1,x2,x3) u1(x1,x2,x3) x^0 0 poor 1 0.00		Attribu	Attribute-specific performances		Attrik	ute-speci	fic utilities					
Project proposals x1 x2 x3 u1(x1) u2(x2) u3(x3) u(x1,x2,x3) x^0 0 poor 1 0.00 0.00 0.00 x^* 100 wow 5 1.00 1.00 1.00 x^A 25 poor 3 0.50 0.00 0.50 x^B 75 good 5 0.87 0.40 1.00 0.78 x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed). The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed). The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed). The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed). The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed). The level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,governed).			Strategic fit			_	of project	Overall utility				
x^0 0 poor 1 0.00 0.00 0.00 0.00 x^* 100 wow 5 1.00 1.00 1.00 1.00 x^A 25 poor 3 0.50 0.00 0.50 0.38 x^B 75 good 5 0.87 0.40 1.00 0.78 x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 Then assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,googneterred. What was the DM's response? Report your answer using one decimal.	Project proposals	x1	x2	х3	u1(x1)	u2(x2)		•				
x^A 25 poor 3 0.50 0.00 0.50 0.38 x^B 75 good 5 0.87 0.40 1.00 0.78 x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 then assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x1, such that the alternatives (x1,good,1) and (0,googleferred. What was the DM's response? Report your answer using one decimal.		0		1								
x^B 75 good 5 0.87 0.40 1.00 0.78 x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 then assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,go befored. What was the DM's response? Report your answer using one decimal.	X^*	100	wow	5	1.00	1.00	1.00	1.00				
x^B 75 good 5 0.87 0.40 1.00 0.78 x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 hen assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,go eferred. What was the DM's response? Report your answer using one decimal.	x^A	25	poor	3	0.50	0.00	0.50	0.38				
x^C 20 great 2 0.45 0.60 0.25 0.44 x^D 40 wow 4 0.63 1.00 0.75 0.75 hen assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,go eferred. What was the DM's response? Report your answer using one decimal.												
nen assessing the attribute weights for this model the decision maker (DM) was asked to assess the level of financial value x ₁ , such that the alternatives (x ₁ ,good,1) and (0,goeferred. What was the DM's response ? Report your answer using <u>one decimal.</u>	x^C	20	_	2	0.45	0.60	0.25	0.44				
eferred. What was the DM's response ? Report your answer using <u>one decimal.</u>	x^D	40	wow	4	0.63	1.00	0.75	0.75				
	erred. What was	the DM's re	e sponse ? Rep	oort your answer (using <u>one c</u>	decimal.			, such that the	e alternativ	ves (x ₁ ,go	ood,1) and

Finish review

Aalto University

Previous activity

■ Assignment 3

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