Exercise 4

4.10.2022

#1 Risk measures

Let us revisit the three investment opportunities A1, A2, and A3 from Problem #3 of Exercise 3. The probability distributions of the investment opportunities are re-represented below. Compute VaR-10% and CVaR-10% for all three alternatives. How do the results reflect the ones that were obtained in Exercise 3?

Probability	0.05	0.05	0.1	0.2	0.3	0.15	0.1	0.05
A1	1	1.5	2	2.5	4	6	7	7.5
A2	1.5	3	4	4.5	6	9	9.5	10
A3	5	5.5	6	6.5	7	8	9	10

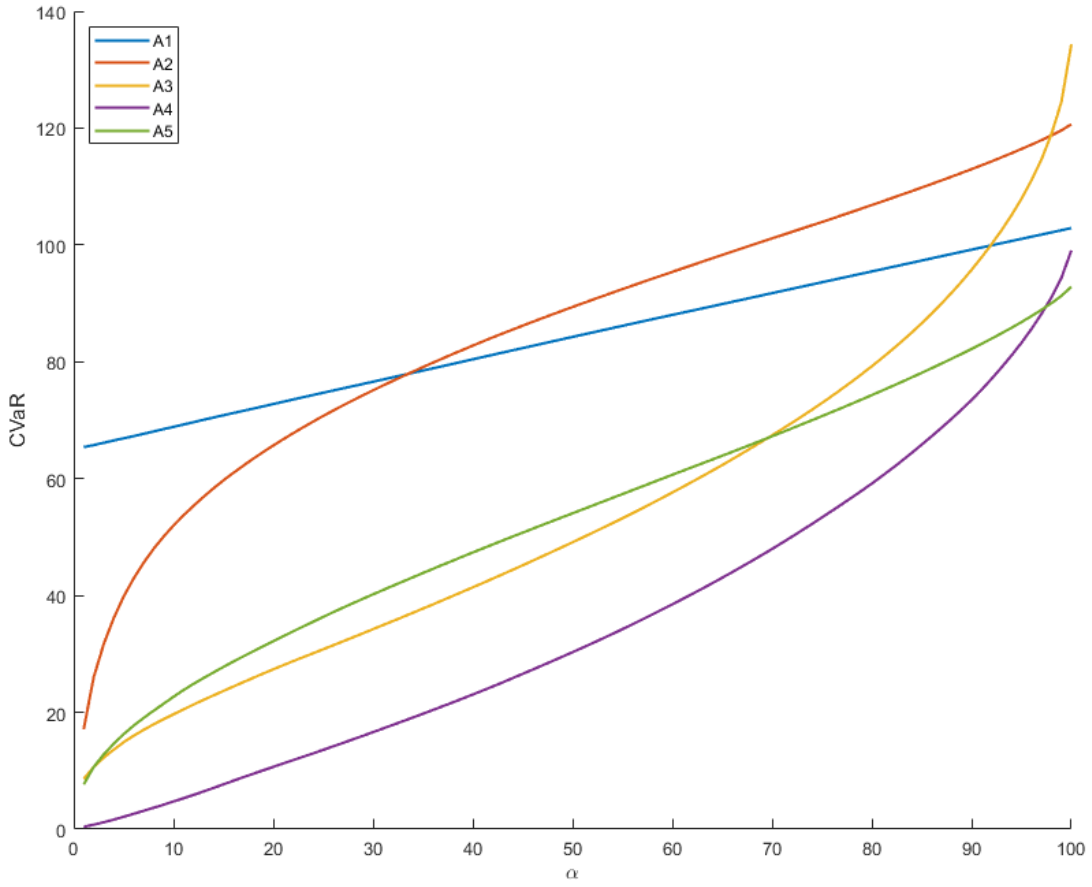
#2 Risk measures with Matlab

The DM is considering five different investment opportunities A1-A5. Their monetary outcomes follow probability distributions as follows:

A1	$\mathrm{UNI}(65,140)$
A2	$N(120,40^2)$
A3	$LogN(4.5,0.9^2)$
A4	$Exp(100)$
A5	$Weib(105,2)$

Some of the probability distribution functions are coded into variables pd1, …, pd5 in the "Ex_4_task2_template" -file.

a) Fill in the missing code for variables pd2, pd3 and pd5.
b) Plot the PDFs of A1, A2, A3 and A4 between values 0 and 200 in a single figure.
c) Using Monte Carlo simulation with 5000 samples, compute the expected value, 1% VaR, 5% VaR, 10% VaR, 1% CVaR, 5% CVaR and 10% CVaR for each investment opportunity.
d) Visualize the results of task c) for all five investment opportunities on a figure of 6 scatter plots with expected value on the horizontal and a risk measure on the vertical axis. Label the points A1-A5.
e) Based on the figure, which investment opportunities seem better than others and why?
f) The figure below illustrates the investment opportunities' CVaR for all $\alpha \in \{1\%, 2\%, \ldots, 100\%\}$ Which investment opportunities could not be selected by a risk averse DM? Why?
g) In the template, fill in the code which creates the given figure.
h) Plot the CDFs of A1 and A5 between values 0 and 300 in a single figure.
i) Plot the CDFs of A2 and A3 between values 0 and 600 in a single figure.


A1
A2
A3
A4
A5
CVaR
α
0
20
40
60
80
100
120
140
0
10
20
30
40
50
60
70
80
90
100