Assignment of Session 1:

1. Suppose that each of two investments has 3% chance of a loss of $20 million, a 2% chance of a loss of $2 million, and a 95% chance of a profit of $2 million during a one-year period. They are independent of each other.

a) What is the VaR for one of the investments when the confidence level is 96%?
b) What is the expected shortfall for one of the investments when the confidence level is 96%?
c) What is the VaR for a portfolio consisting of the two investments when the confidence level is 96%?
d) What is the expected shortfall for a portfolio consisting of the two investments when the confidence level is 96%?
e) Show that, in this example, VaR does not satisfy the subadditivity condition whereas expected shortfall does.

2. Suppose that we back-test a VaR model using 1,000 days of data. The VaR confidence level is 99% and we observe 15 exceptions. Should be reject the model at the 95% confidence level (i.e., 5% significance level)? Use the one-tailed test in the lecture note.

3. The change in the value of a portfolio in three months is normally distributed with a mean of $500,000 and a standard deviation of $3 million. Calculate the VaR and ES for a confidence level of 99.5% and a time horizon of three months.