Exam: Finansiell Risk, MVE 220/MSA400
Thursday June 1, 2017, 08:30 - 12:30
Jour: Ivar Simonsson, ankn 5325

Allowed material: List of Formulas, Chalmers allowed calculator.

Scoring: Multiple choice questions, only one correct answer. Correct answer gives 2 points, no answer ("don't know") gives 0 points and wrong answer gives -0.5 points (more than one answer automatically gives -0.5 points).

Fill out the first page, and turn in the entire exam. Only what you have written on the first page counts for the grade.

Uppgift	a	b	c	d	e	f (Don't know)	Points
1	☐	☐	☐	☐	☐	☐	
2	☐	☐	☐	☐	☐	☐	
3	☐	☐	☐	☐	☐	☐	
4	☐	☐	☐	☐	☐	☐	
5	☐	☐	☐	☐	☐	☐	
6	☐	☐	☐	☐	☐	☐	
7	☐	☐	☐	☐	☐	☐	
8	☐	☐	☐	☐	☐	☐	
9	☐	☐	☐	☐	☐	☐	
10	☐	☐	☐	☐	☐	☐	
11	☐	☐	☐	☐	☐	☐	
12	☐	☐	☐	☐	☐	☐	
13	☐	☐	☐	☐	☐	☐	
14	☐	☐	☐	☐	☐	☐	
15	☐	☐	☐	☐	☐	☐	

Signature:

Name (print):

1 Consider the following statements from "behavioural economics":

1 According to *prospect theory*, if a person is given $20 she will be more happy than if she is first given $40 but then $20 is lost.

2 People typically tend to overestimate the probability of likely events, and underestimate the probability of unlikely events.

3 *Mental accounting* is a rational way to approach economic decision making by dividing money into different categories, i.e, savings and bonuses, and treating money in different categories differently.

4 Investors tend to overreact to new information and data.

5 *Herd behavior* also refers to people being more influenced by the social context in which they act than they believe themselves to be.

Which of the following is true?

(a) ☐ Statement 1 is wrong, the others are correct

(b) ☐ Statement 2 is wrong, the others are correct

(c) ☐ Statement 3 is wrong, the others are correct

(d) ☐ All the statements are correct

(e) ☐ None of the above

(f) ☐ Don't know.

2 Consider the following statements:

1 AIG is a global insurance company.

2 The US government had to bail out AIG to prevent a collapse of the company.

3 There are two main credit rating agencies, Standard & Poor's and Moody's.

4 CDO is an abbreviation of "Common Debt Obligation".

5 A CDS is a bilateral contract between two parties that gives the buyer of the derivative insurance on default of a underlaying bond.

6 To be able to buy a CDS one must own the the underlying bond.

Which of the following is true?

(a) ☐ All the statements are correct

(b) ☐ 2, 6, are correct; 1, 3, 4, 5 are wrong

(c) ☐ 4, 5, 6 are correct; 1, 2, 3 are wrong

(d) ☐1, 3, 5 are correct; 2, 4, 6 are wrong

(e) ☐ None of the above

(f) ☐ Don't know.

3 Consider the following statements:

1 In Markowitz portfolio theory, risk is measured by the variance of the return from a portfolio,

2 In Markowitz portfolio theory there is only one optimal portfolio.

3 A main issue with applying Markowitz's portfolio theory is that one has to make predictions about the expected return of each asset in the portfolio and about the covariance between each pair of assets in the portfolio.

4 Another problem with Markowitz's portfolio theory is that systematic risk is not handled. Systematic risk is the type of risk that affects most, if not all, assets in a portfolio. For example, inflation, interest rates, unemployment levels, exchange rates, or Gross National Product level are all contributors of systematic risk.

5 To construct good Markovitz portfolios, one tries to find assets which are as highly correlated as possible.

Which of the following is true?

(a) ☐ 1, 2, are correct; 3,4,5 are wrong

(b) ☐ 1, 3, 4, are correct; 2, 5 are wrong

(c) ☐ 1, 3, are correct; 2, 4, 5 are wrong

(d) ☐ 2, 3, 5 are correct; 1, 4 are wrong

(e) ☐ None of the above

(f) ☐ Don't know

4 Consider the following statements:

1 *Arbitrage* means that stock prices to a large extent are arbitrary.

2 APT is short for Arbitrage Pricing Theory

3 Marov chains can be used to model business cycles

4 Harry Markopolos reported Bernard Madoff to the SEC, but still no action was taken by the SEC.

5 The founder of Bitcoin, Satoshi Nakamoto has become a well-known celebrity in Japan.

Which of the following is true?

(a) ☐ 1, 2 are correct; 3,4,5 are wrong

(b) ☐ 3, 4 are correct; 1, 2, 5 are wrong

(c) ☐ 1, 3, 4 are correct; 2,5 is wrong

(d) ☐ 2, 3 are correct; 1, 4, 5 are wrong

(e) ☐ None of the above

(f) ☐ Don't know

5 Muhammad Yunus is thought of as one of main creators of microcredit. Together with Grameen Bank, Yunus was awarded the Nobel Peace Prize in 2006 "for their efforts to create economic and social development from below". Consider the following statements:

1 Yunnus was a poor man when he started the microloans

2 Yunnus started by lending US $27 of his own money to 42 persons.

3 Grameen bank started encouraging beggars to bring something with them to sell when they went from door to door begging so that they could stop asking for money, and instead sell goods in order to support themselves and their families. The program ended up with having 100 000 beggars. After five years, 82% of the people in the program had stopped begging completely.

4 Yunnus always asked for collateral before giving out loans.

5 A reasons that regular banks in developing countries often do not lend money to poor people is that they are afraid they won't get their money back.

Which of the following is true?

(a) ☐ 1, 2, 4 are correct; 3, 5 are wrong

(b) ☐ 3, 4 are correct; 1, 2, 5 are wrong

(c) ☐ 1, 4 are correct; 2, 3, 5 is wrong

(d) ☐ 2, 3 are correct; 1, 4, 5 are wrong

(e) ☐ None of the above

(f) ☐ Don't know

6 Suppose 5-day maximum losses (= - returns) expressed in percent have a GEV distribution function with location parameter $\mu = 1.27$, scale parameter $\sigma = 0.79$ and shape parameter $\gamma = 0.14$. Then the losses themselves also have a GEV distribution function, and the parameters of this GEV distribution are

(a) ☐ $\mu = 0.0127$, $\sigma = 0.79$, and $\gamma = 0.14$

(b) ☐ $\mu = 0.0127$, $\sigma = 0.0079$, and $\gamma = 0.14$

(c) ☐ $\mu = 0.0127$, $\sigma = 0.0079$, and $\gamma = 0.0014$

(d) ☐ $\mu = 1.27$, $\sigma = 0.0079$, and $\gamma = 0.14$

(e) ☐ None of the above

(f) ☐ Don't know

7 Suppose that 5-day maximum losses are mutually independent and have a GEV distribution function with location parameter μ, scale parameter σ, and shape parameter γ. Then 20-day maximum losses also have a GEV distribution and, writing $\tilde{\mu}$, $\tilde{\sigma}$, $\tilde{\gamma}$ for the location, scale, and shape parameter for this distribution, it holds that

(a) ☐ $\tilde{\mu} = \mu$, $\tilde{\sigma} = 4^{\gamma}\sigma$, $\tilde{\gamma} = \gamma$

(b) ☐ $\tilde{\mu} = \mu + (1 - 4^{-\gamma})\frac{4^{\gamma}}{\sigma}$, $\tilde{\sigma} = 4^{\gamma}\sigma$, $\tilde{\gamma} = \gamma$

(c) ☐ $\tilde{\mu} = \mu + (1 + 4^{-\gamma})\frac{4^{\gamma}}{\sigma}$, $\tilde{\sigma} = 4^{\gamma}\sigma$, $\tilde{\gamma} = \gamma$

(d) ☐ $\tilde{\mu} = \mu + (1 - 4^{-\gamma})\frac{4^{\gamma}}{\sigma}$, $\tilde{\sigma} = 4^{-\gamma}\sigma$, $\tilde{\gamma} = \gamma$

(e) ☐ None of the above

(f) ☐ Don't know

8 Consider the following statements:

1 The delta method can be used to construct confidence intervals for VaR

2 Profile likelihood can be used to construct confidence intervals for VaR

3 If losses have a normal distribution then the 99% VaR is the same as a 99% one-sided confidence interval for the mean in the normal distribution

4 Likelihood ratio tests can be used to test the hypothesis that $\gamma = 0$ in a GP distribution

5 To use the delta method to construct confidence interval for VaR in the block maxima method on must have estimates of all parameters and the entire covariance matrix for the parameters in the GEV distribution.

Four of these statements are correct, and one is wrong. Which one is it?

(a) ☐ Statement 1 is wrong

(b) ☐ Statement 2 is wrong

(c) ☐ Statement 3 is wrong

(d) ☐ Statement 4 is wrong

(e) ☐ Statement 5 is wrong

(f) ☐ Don't know

9 Suppose that, as in problem 6, the 5-day maximum loss (= - returns) has a GEV distribution function with location parameter $\mu = 1.27$, scale parameter $\sigma = 0.79$ and shape parameter $\gamma = 0.14$, and that additionally the extremal index is $\theta = 0.73$. The one-day VaR can be computed from this, and is approximately

(a) ☐ 2.73

(b) ☐ 3.29

(c) ☐ 4.38

(d) ☐ 5.03

(e) ☐ None of the above

(f) ☐ Don't know

10 In a peaks over thresholds analysis to compute VaR one used the threshold $u = 1.7$ chosen such that 5% of the losses were above u and fitted a GP distribution to the excesses over the thresholds. The estimated parameters were $\sigma = 0.8$ and $\gamma = 0.1$.

The estimated 99% VaR then is

(a) ☐ 2.23

(b) ☐ 3.09

(c) ☐ 4.87

(d) ☐ 6.38

(e) ☐ None of the above

(f) ☐ Don't know

11 Consider a static credit portfolio with $m = 1000$ obligors which we model as a mixed binomial model with a logit-normal mixing distribution (for one year, say) with parameters $\mu = -3.371$ and $\sigma = 1.122$. Each loan has notional 1 million SEK and the individual loss is $\ell = 60\%$. Use the LPA-approximation formula to compute the probability that within one year, the total portfolio credit loss will be more than 30 million SEK but less than 100 million SEK.

This probability is

(a) ☐ 9.7%

(b) ☐ 18.3%

(c) ☐ 29.4%

(d) ☐ 36.8%

(e) ☐ None of the above

(f) ☐ Don't know

12 Consider a static credit portfolio with $m = 1000$ obligors which we model as mixed binomial model inspired by the Merton framework (for one year, say) and where each loan have notional 1 million SEK and the individual loss is $\ell = 60\%$. We know that the one-year LPA-VaR formula produces the values $\mathrm{VaR}_{95\%}(L) = 147.4$ million SEK and $\mathrm{VaR}_{99\%}(L) = 293.2$ million SEK. Given this, what is the one-year $\mathrm{VaR}_\alpha(L)$ for $\alpha = 99.9\%$ that is obtained from the LPA-VaR formula.

(a) ☐ 371 million SEK

(b) ☐ 418 million SEK

(c) ☐ 457 million SEK

(d) ☐ 503 million SEK

(e) ☐ None of the above

(f) ☐ Don't know

13 Consider two static credit portfolio models both with m obligors which we model as mixed beta binomial models for one year. The first model, Model 1, has parameters $a = 1$ and $b = 9$. The second model, Model 2, has parameters $a = 10$ and $b = 90$. Below, we let $\mathbb{P}[X_i = 1]$ denote the default probability and $\text{Corr}(X_i, X_j)$ denotes the default correlation for $i \neq j$ where $X_i = 1$ if obligor i defaults within one year and $X_i = 0$ otherwise.

Which of the following is true?

(a) ☐ Model 1 has lower default correlation than Model 2 and both models have the same default probabilities.

(b) ☐ Model 1 has higher default correlation than Model 2 and both models have the same default probabilities.

(c) ☐ Model 1 has lower default probability than Model 2 and both models have the same default correlations.

(d) ☐ Model 1 has higher default probability than Model 2 and both models have the same default correlations.

(e) ☐ None of the above

(f) ☐ Don't know

14 For any mixed binomial model we will below let Z be the random variable representing the background variable affecting all obligors in the portfolio where $X_i = 1$ if obligor i defaults within one year and $X_i = 0$ otherwise. Furthermore, we let $\text{Corr}(X_i, X_j)$ denote the correlation between X_i and X_j for $i \neq j$.

1 In the mixed binomial model inspired by the Merton framework the parameter ρ is always the same as the pairwise default correlation $\text{Corr}(X_i, X_j)$ for $i \neq j$.

2 In a mixed binomial model with a logit-normal mixing distribution, there exists no closed-form expressions (using elementary functions) for $\mathbb{P}[X_i = 1]$ in terms of the parameters μ and σ.

3 There exists mixed binomial models where $\mathbb{P}[X_i = 1 \mid Z]$ is a random variable with nonzero variance and where $\text{Corr}(X_i, X_j) = 0$.

4 In a mixed binomial model with $F(x) = \mathbb{P}[Z \leq x]$ it will always hold that $\text{VaR}_\alpha(L) \approx \ell \cdot m \cdot F^{\leftarrow}(\alpha)$ when m is large.

Which of the following is true?

(a) ☐ All the statements are wrong

(b) ☐ 1, 2, are correct; 3, 4 are wrong

(c) ☐ 2, 4 are correct; 1, 3 are wrong

(d) ☐ 2 is correct; 1,3 4 are wrong

(e) ☐ None of the above

(f) ☐ Don't know.

15 Consider a static credit portfolio with $m = 1000$ obligors which we model as mixed binomial model with two states $Z \in \{1, 2\}$ where $\mathbb{P}[Z = 1] = 70\%$ and $p(Z) = \mathbb{P}[X_i = 1 \,|\, Z]$ with $p(1) = 3\%$ and $p(2) = 12\%$. Compute the default probability $\bar{p} = \mathbb{P}[X_i = 1]$ and the default correlation $\rho_X = \mathrm{Corr}(X_i, X_j)$.

(a) ☐ $\bar{p} = 5.7\%$ and $\rho_X = 3.2\%$

(b) ☐ $\bar{p} = 5.7\%$ and $\rho_X = 12.8\%$

(c) ☐ $\bar{p} = 8.5\%$ and $\rho_X = 5.9\%$

(d) ☐ $\bar{p} = 8.5\%$ and $\rho_X = 23.1\%$

(e) ☐ None of the above

(f) ☐ Don't know