Exam: Finansiell Risk, MVE 220/MSA400
Thursday, May 31 2018, 8:30-12:30
Jour: Ivar Simonsson ankn 5325

Allowed material: List of Formulas, Chalmers allowed calculator.

Problems 1-4: Multiple choice, only hand in table with answers
Only one correct answer. Correct answer gives 5 points, no answer ("don't know") gives 0 points and wrong answer gives -1 point (more than one answer automatically gives -1 point).

Uppgift	a	b	c	d	e	f (Don't know)	Points
1	☐	☐	☐	☐	☐	☐	
2	☐	☐	☐	☐	☐	☐	
3	☐	☐	☐	☐	☐	☐	
4	☐	☐	☐	☐	☐	☐	

Problems 5-10: Hand in full solutions

1 Consider the following statements:

1 The efficient market hypothesis (EMH) states that at any given time, stock prices fully reflect all available information.

2 Weak market efficiency means that share prices only reflect publicly available information, e.g. annual reports and company announcements.

3 Strong market efficiency implies that it is not possible to make abnormal gains through investment based on so called "insider information".

4 There is widespread consensus about the form of the efficiency of the stock market

Which of the following is true?

(a) ☐ Statements 1 and 2 are wrong, the others are correct

(b) ☐ Statements 2 and 3 are wrong, the others are correct

(c) ☐ Statements 1 and 4 are wrong, the others are correct

(d) ☐ Statements 3 and 4 are wrong, the others are correct

(e) ☐ None of the above

(f) ☐ Don't know.

2 Consider the following statements:

1 In a Bonus-Malus insurance system, the cost of an insurance contract depends on the past behavior of the policyholder.

2 Markov chains can be used as help with setting premiums in Bonus-Malus systems

3 In 1961, a Belgium insurance company introduced the possibility to buy a no-claim discount policy. As a result, the company gained new costumers and attracted more good drivers.

4 In 1971 a Belgian ministerial decree introduced an "official" bonus-malus system with 18 classes that had to be applied by all companies

Which of the following is true?

(a) ☐ All the statements are correct

(b) ☐ 1 is wrong; the others are correct

(c) ☐ 2 is wrong; the others are correct

(d) ☐ 3 is wrong: the others are correct

(e) ☐ None of the above

(f) ☐ Don't know.

3 Consider the following statements:

1 The Basel III accord is a law that all countries must follow.

2 Basel III specifies limits for ratios of quantities like regulatory capital and risk weighted assets.

3 The regulatory capital is the maximum amount of capital a bank is allowed to hold.

4 The new more strict requirements in the Basel III accord may make it more difficult for new actors in the bank and hence lead to reduced competition in an already oligopolistic industry.

Which of the following is true?

(a) ☐ 1, 2 are correct; the others are wrong

(b) ☐ 2 and 3 are correct; the others are wrong

(c) ☐ 2 and 4 are correct; the others are wrong

(d) ☐ 1 and 3 are correct; the others are wrong

(e) ☐ None of the above

(f) ☐ Don't know

4 Consider the following statements:

1 Through the work of Taleb we have now learnt to act so that black swans will not occur in the future.

2 Antifragile things benefit from shocks.

3 Trading curbs (= temporary restricions put on program trading when dramatic price movements or volatility occur) had been put in place the year before the black monday, October 19, 1987. But they were not effective.

4 It is within extremistan (= situations where one measure can in fact change the total) that we find Black Swans.

Which of the following is true?

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

(b) ☐ Statements 1, 2 are correct; the others are wrong

(c) ☐ Statements 1, and 4 are correct; the others are wrong

(d) ☐ Statements 2 and 4 are correct; the others are wrong

(e) ☐ None of the above

(f) ☐ Don't know.

5 Suppose you have observed a sample $x_1, x_2, \ldots, x_n$ from a GP distribution with shape parameter $\gamma = 0$ and scale parameter σ.

a) Find the maximum likelihood estimator $\hat{\sigma}$ of σ. (3p)

b) Use observed information to find an estimate of the variance of $\hat{\sigma}$. (3p)

6 Suppose monthly maxima are independent and indentically distributed and follow a Gumbel distribution (i.e. a Generalized Extreme Value distribution with shape parameter $\gamma = 0$).

a) Find the probability that yearly maxima exceeds the level u. (3p)

b) Find the p-th quantile of the distribution of yearly maxima. (3p)

7 When a PoT model was fitted to the 46 excesses of the level $u = 0.9$ million SEK for the windstorm loss data of the Swedish insurance group LFAB during 1982-1993 the estimates of the parameter in the GP distribution of the excesses were $\hat{\sigma} = 3.87$ and $\hat{\gamma} = 0.70$.

a) Find an estimate of the probability that the maximum loss in one year exceeds the reinsurance level 850 million SEK. (3p)

b) Estimate the median of the conditional distribution of the loss in one windstorm, given that the loss exceeds 850 millon SEK (5p)

8 Consider a static credit portfolio with m obligors which we model as mixed binomial model inspired by the Merton framework. The individual one-year default probability is $\bar{p}$, the individual loss is ℓ and the default correlation is ρ. Use the LPA-formula to derive an analytical expression for the one-year $\mathrm{VaR}_\alpha(L)$ in the mixed binomial Merton model. (6p)

9 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 $\mathrm{VaR}_{95\%}(L) = 118.5$ million SEK and $\mathrm{VaR}_{99\%}(L) = 260.7$ 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. (8p)

10 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 $\mu = -2.6371$ and $\sigma = 1.2399$. Each loan has notional 1 million SEK and the individual loss is $\ell = 60\%$. Use the LPA-formula to compute the probability that within one year, the total portfolio credit loss will be more than 40 million SEK but less than 110 million SEK. (6p)