

A - Academic year 2022/2023
2nd Map45 test - 12th June 2023
18:00 (Lisbon Time)
Duration: 45 minutes

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Important notes

1. The correct answers should be written ONLY IN the TABLE below, with a full circle, NOT along the pages.
2. Use a pencil for your answers in the TABLE and only in the end, fill it with a pen.
3. Do not separate the set of sheets of this handout, they should be delivered all.
4. The test is to be done without consultation. Any cheating will cancel the test.
5. Each multiple-choice question is worth **0.8** values; each wrong answer discounts **0.15** values on the exam grade; an unanswered question will have **0**. Answering several options is a wrong answer.
6. Only basic or scientific calculators (without text storage) are allowed but you have a formula summary at the end of this assignment.

OBLIGATORY ANSWERS TABLE

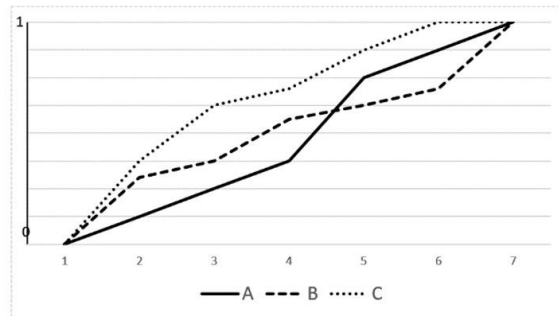
Questions	Answers: fill with a circle				
1	a	b	c	d	e
2	a	b	c	d	e
3	a	b	c	d	e
4	a	b	c	d	e
5	a	b	c	d	e
6	a	b	c	d	e
7	a	b	c	d	e
8	a	b	c	d	e
9	a	b	c	d	e
10	a	b	c	d	e
11	a	b	c	d	e
12	a	b	c	d	e
13	a	b	c	d	e
14	a	b	c	d	e
15	a	b	c	d	e
16	a	b	c	d	e
17	a	b	c	d	e
18	a	b	c	d	e
19	a	b	c	d	e
20	a	b	c	d	e
21	a	b	c	d	e
22	a	b	c	d	e
23	a	b	c	d	e
24	a	b	c	d	e
25	a	b	c	d	e

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1. Cumulative probability distributions obtained with Monte Carlo simulation for three possible alternative strategies (A, B and C) to be chosen by a company are presented in the figure below. Which of the following statements is correct:

- a) The A strategy has first order dominance over strategy C
- b) The B strategy has first order dominance over strategy C
- c) The A strategy has second order dominance over strategy B
- d) The C strategy has no first order dominance over strategy A
- e) All answers are correct



2. A Monte Carlo simulation generating x random numbers, can model a Gauss distribution with μ mean and σ standard deviation, by one of which equations? (Where N is the Gauss function, Inverse N is the inverse of the Normal, z are the standardized Gauss random values, u are uniform random values):

- a) $x = N(u, \mu, \sigma)$
- b) $x = N \text{ inverse}(z, \mu, \sigma)$
- c) $x = N(z, \mu, \sigma)$
- d) $x = N(u/2, \mu, \sigma)$
- e) $x = N \text{ inverse}(u, \mu, \sigma)$

3. The symmetry of a distribution can be measured using the value of:

- a) Standard Deviation
- b) Mean
- c) Kurtosis
- d) Skewness
- e) No one of the others

4. Each Tesla share is presently valued at \$800. Assuming an exercise price of \$600, a share's quarter volatility of 20% and a yearly risk-free interest rate of 5%, calculate the value of a Call option at three months maturity.

- a) Between \$200 and \$205
- b) Between \$205 and \$210
- c) Between \$210 and \$215
- d) Between \$215 and \$220
- e) No one of the others

5. The Starbucks share price is \$18 while a Starbucks Put Option with a maturity of 3 months is valued at \$3 with an exercise price of \$16. The risk-free interest rate is 5% per semester. How much would

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you be willing to pay for a Call Option on Starbucks shares with the same maturity and exercise price? Assume European options.

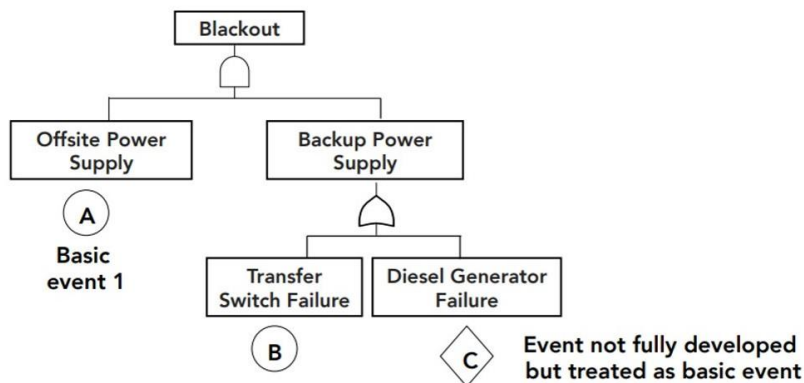
- a) Between 4.6 and 4.8
 - b) Between 4.8 and 5.0
 - c) Between 5.0 and 5.2
 - d) Between 5.2 and 5.4**
 - e) No one of the others
6. The current Nickel price is \$2300 per ton and the Future price one year from now is \$2000. Assuming a 5% six-month free interest rate, the net convenience yield is:
- a) -18%
 - b) +18%
 - c) -23%
 - d) +23%**
 - e) No one of the others
7. The Steel Oil company who builds oil rigs for oil drilling wants to fix the price of 1000 tons of steel to be used in next year's production. It buys one-year futures contracts at a price of \$1,500 per ton. Suppose the steel price increases to \$2,000 in one year. How much Steel Oil will pay or receive for the steel futures contract at maturity?
- a) Pays \$500,000
 - b) Receives \$500,000**
 - c) Receives \$2,500,000
 - d) Pays \$2,500,000
 - e) No one of the others
8. A company issued a one-year bond, which pays 5% interest for each semester. The bond has a face value of \$1000. The market value of the bond today is \$900. What is the bond buyer's return at the end of one year (YTM), if the company will not default?
- a) 23.5%
 - b) 29.4%
 - c) 37.5%
 - d) 42.5%
 - e) No one of the others**
9. A company issued a two-year bond, which pays 5% interest for each semester. The bond has a face value of \$1000. What is the market value of the bond today, if bond buyer's return (YTM) is 10%, assuming the company will not default?
- a) \$900
 - b) \$1000**

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- c) \$1368
- d) \$1409
- e) No answer is correct.

10. For the following Fault Tree Analysis, which will be the minimal “cut-set”?



- a) {B,A}, {B,C}
- b) {A,B}, {A,C}**
- c) {C,A}, {C,B}
- d) {A}, {C,B}
- e) No one of the others

11. The Ford share price is \$15 while a Ford Put Option with a maturity of 3 months is valued at \$3 with an exercise price of \$17. The risk-free interest rate is 1% per year. How much would you be willing to pay for a Call Option on Ford shares with the same maturity and exercise price? Assume European options.

- a) Between 0 and 0.9
- b) Between 1 and 1.9**
- c) Between 2 and 2.9
- d) Between 3 and 3.9
- e) No one of the others

12. Which expression is correct for the value of a Put Option?

- a) Put option = $\min[0; (\text{strike price, market price})] - \text{premium}$
- b) Put option = $\max[0; (\text{strike price, market price})] - \text{premium}$**
- c) Put option = $\max[0; (\text{strike price, market price})] + \text{premium}$
- d) Put option = $\min[0; (\text{strike price, market price})] + \text{premium}$
- e) No one is correct

13. The @Risk function used to model scenarios, like for example evaluating the Net Profit for different prices scenarios is:

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- f) @riskbernoulli
 - g) @riskbinomial
 - h) @risksimtable**
 - i) @riskcompound
 - j) @riskdiscrete
14. Before a corrective action, your equipment had an occurrence rank of 5, a severity rank of 6 and a likelihood rank of 7. After the corrective action, your equipment now has an occurrence rank of 3, a severity rank of 5 and a likelihood rank of 6. Which is the reduction in your Risk Priority number?
- a) 18%
 - b) 21%
 - c) 57%**
 - d) 87%
 - e) No one of the others
15. You have bought a Call option on an Apple share for \$50, with a strike price of \$160. If at maturity the share is worth \$180, how much will you gain or lose, net?
- a) Lose \$50
 - b) Lose \$30**
 - c) Lose \$20
 - d) Win \$20
 - e) No answer is correct.
16. The live cattle futures price for one year contract is \$3 per Kg and the spot price is \$2.5 per Kg. The yearly Convenience Yield is -10%, the interest rate is 3% per year. Calculate the storage costs in \$/Kg.
- a) 0.145 \$/Kg
 - b) 0.175 \$/Kg**
 - c) 0.225 \$/Kg
 - d) 0.345 \$/Kg
 - e) No one of the others
17. If the Net Convenience Yield for a commodity is negative, this means that:
- a) There is a market trend to consume the product in the future.
 - b) There is a market trend to consume the product now.**
 - c) The storage costs are smaller than the convenience yield.
 - d) The free interest rate is quite small.
 - e) No answer is correct.

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18. Meta company has issued one-year bonds with 5% coupons and with a nominal value of \$1000. Suppose, however, that there is a 30% chance that Meta will default after one year, and in that case the bond holders will receive 25% the bonds nominal value. The interest rate on one-year risk-free bonds is 3%. How much would it cost you to insure the bonds of Meta company against default?
- a) 124
 - b) 186
 - c) 240
 - d) 320
 - e) No one of the answers
19. If the stocks volatility increase, the respective:
- a) Call price increases and the Put prices increases.
 - b) Call price increases and the Put prices decreases.
 - c) Call price decreases and the Put prices increases.
 - d) Call price decreases and the Put prices decreases.
 - e) No one is correct.
20. A call option is out of the money (OTM) if the:
- a) market price is above the strike price.
 - b) market price is below the strike price.
 - c) market price is equal to the strike price.
 - d) call option has a larger value than the put option.
 - e) call option has a smaller value than the put option.
21. Which equation reflects the Put-Call parity?
- a) Put Price = Call price - Present Value of the Exercise price – Stock price
 - b) Put Price = Call price + Present Value of the Exercise price – Stock price
 - c) Put Price = Call price - Present Value of the Exercise price + Stock price
 - d) Put Price = Call price + Present Value of the Exercise price + Stock price
 - e) No one is correct
22. Which sentence is correct? Implied volatility:
- a) is an estimate of the asset future variability.
 - b) can be calculated if we have all the other variables in the B&S formula.
 - c) considers all the information used by market participants.
 - d) can be more accurate than historical volatility.
 - e) All answers are correct.

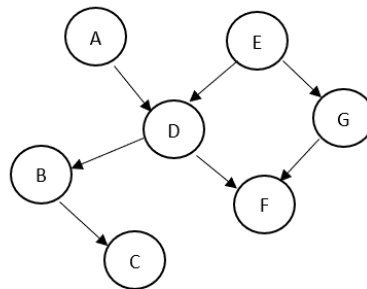
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23. What is the price of a 3 months Put option, knowing that the value of a Call option of identical maturity is \$1.72, the share Price is \$36 and the strike price is \$40, assuming an interest rate of 10% yearly.

- a) Between \$4.0 and \$4.3
- b) Between \$4.3 and \$4.6
- c) Between \$4.6 and \$4.9
- d) Between \$4.9 and \$5.2
- e) No answer is correct.

24. Which nodes are conditionally dependent on A (or d-connected) knowing the state of D and knowing nothing about the remaining nodes?



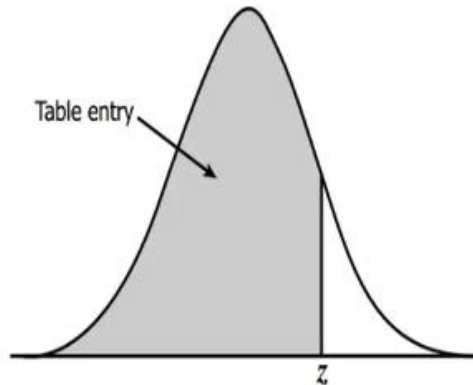
- a) D, E, F, G
- b) A, D, B, C
- c) A, D, B, C, F
- d) E, G, F
- e) All the nodes are d-connected with A

25. The White Stone Company Debt has a one-year maturity and the promised payment to White Stone creditors is \$1,200. The market value of the Assets is \$1,500 and the standard deviation of Asset value is 30% per year. The risk-free Interest rate is 5%. Calculate the value of White Stone Debt.

- a) Between \$1100-\$1110
- b) Between \$1110-1120\$
- c) Between \$1120-1130\$
- d) Between \$1130-1140\$
- e) No answer is correct.

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Find values on the right of the mean in this z-table. Table entries for z represent the area under the bell curve to the left of z. Positive scores in the Z-table correspond to the values which are greater than the mean.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

Black-Scholes Option Pricing Model:

$$O_C = [N(d_1) \times P] - [N(d_2) \times PV(EX)]$$

$$d_1 = \frac{\ln\left(\frac{P}{EX}\right) + \left(r + \frac{v^2}{2}\right)t}{v\sqrt{t}} \quad d_2 = d_1 - v\sqrt{t}$$

$$\text{Put price} = O_C + PV(EX) - P$$

$$F_t = S_0(1+r_f - y)^t \quad F_t = S_0(1+r_f + SC - CY)^t$$