



FINAL EXAM (01.02.2019) – 1:30 hours

Name/Nome: _____ Number/Número: _____

PLEASE READ THE FOLLOWING INFORMATION BEFORE SOLVING THE EXAM:

- 1) The exam has a version in English and a version in Portuguese (at the end).
- 2) You are allowed to keep your pens, pencils and a calculator with you.
- 3) The structure of the exam is the following:
 - In Group I each question (1 to 6) is multiple choice;
 - Groups II to IV require explaining all the steps in your solutions.
- 4) Grading:
 - Each correct multiple-choice answer is worth 1.5 points (each incorrect multiple-choice answer does not penalize the student);
 - Group I is worth 9.0 points;
 - Group II is worth 3.0 points;
 - Group III is worth 1.5 points;
 - Group IV is worth 3.0 points;
 - Group V is worth 3.5 points.
- 5) Multiple choice questions must be answered by drawing a circle around the letter that, in your opinion, corresponds to the correct solution.
- 6) You are not allowed to un-staple the exam.

GOOD LUCK!

Group I (9.0 points)

Answer each question by drawing a circle around the letter that, in your opinion, corresponds to the correct solution.

1. Which of the following statements does seem plausible in a strong efficient market?
 - I) On average, professional investment managers make superior returns
 - II) In a year, approximately 50% of portfolio managers underperform the market
 - III) On average, managers who trade based on inside information do not outperform the market
 - a) I only
 - b) II only
 - c) I and III only
 - d) II and III only**

2. The social media firm The Circle will issue one-year coupon bonds at par with a face value of €55 million. The coupon rate is 6% and the company's tax rate is 20%. What is the present value of the interest tax shield?
 - a) € 0.66 million
 - b) € 0.62 million**
 - c) € 11 million
 - d) € 0.12 million

3. The Circle is considering investing in the Kingdom of United People. For this purpose, the company is assessing how taxation will impact the investment, having gathered the following data: Corporate Tax Rate (t_c) = 20%; General Personal Tax Rate (t_p) = 15%; Personal Tax Rate on Equity Income (t_{pe}) = 28%; and Personal Tax Rate on Interest Income (t_{pi}) = 18%. What is the relative tax advantage of debt?
 - a) 0.30
 - b) 1.10
 - c) 1.42**
 - d) 0.70

4. Short selling the stock and selling the put option on the stock provides the same payoff as:
 - a) selling the call and selling the present value of the exercise price in T-bills.**
 - b) buying the call and buying the present value of the exercise price in T-bills.
 - c) writing (selling) a call option and buying a put option on the stock.
 - d) buying a call option and writing (selling) a put option on the stock.

5. The Circle's stock is currently traded at €15. In each quarter, its price can increase by 25% or decrease by 20%. It is also known that the quarterly risk-free interest rate is 4%. Under these circumstances, what is the current value of a call option with an exercise price of €17 and expiration in six months. Use the two-stage binomial method.
 - a) € 1.69**
 - b) € 6.44
 - c) € 3.30
 - d) € 1.76

6. The Circle developed an innovative technology to profile their users such that ads could be better fitted to each one. The implementation of this technology costs €70 million. This amount will remain constant in the years to come. If implemented, sales will increase by €10.5 million per year, in perpetuity. The respective costs will increase by €6.6 million per year, also in perpetuity. Assume that the cost of capital and the risk-free rate are both 4% per year. However, this innovative technology incorporates some degree of risk. Actually, in one year, sales will be either €15 million or €8 million with equal probability. Calculate the expected NPV (in millions) of the project if it is postponed by one year. (Ignore taxes)
 - a) € 27.50
 - b) € 50.48
 - c) € 67.31**
 - d) € 39.81

Group II (3.0 points)

The Olissipo Watches, Ltd is a manufacturer of top level watches with headquarters in Lisbon. The company's business is mature in the classical life cycle of a firm. The Olissipo Watches top managers asked the business consultants to study the best payout policy for the company.

- a) (0.5 points) What does mean an "ex-dividend stock" for a buyer?

Stocks are bought without the dividend. The buyer is not entitled to receive it.

- b) (0.5 points) Assume perfect and rational financial markets, there are no taxes, there is no new public information, and you are a member of the business consultant team. What is your advice to the top managers? Explain.

Assuming MM are right, payout is a residual to other financial policies. The company should make investment and financing decisions, and then pay out whatever cash is left over. If no investment opportunities is available, the company should distribute any remaining cash flows. Decisions about how much to pay out change over the life cycle of the firm.

It does not matter. Shareholders can sell the shares if they have a preference for dividends.

- c) (2.0 points) The Olissipo Watches has 1.250.000 shares outstanding and the following market-value balance sheet (€ millions):

Surplus cash	3	30	Equity
Net working capital	6	0	Debt
Other operational assets	21		
Total	30	30	Total

- i. If Olissipo Watches pays out a dividend of € 2.8 million what is the new price per share?

Old price per share €24.00 (€30,000,000 ÷ 1,250,000 sh)

Dividend €2,800,000

New Equity €27,200,000

New price per share €21.76 (€27,200,000 ÷ 1,250,000 sh)

- ii. If Olissipo Watches buys back shares worthing € 2.8 million, how many shares will be bought and what will be the new price per share?

Old price per share	€24.00	
Amount to buyback	€2,800,000	
Shares to buyback	116,667	(€2,800,000 ÷ €24.00)
New Equity	€27,200,000	
New price per share	€24.00	(€27,200,000 ÷ 1,133,333 sh)

Group III (1.5 points)

What is the present value of interest tax shields generated by the three debt issues, considering that the marginal corporate tax rate (Tc) is 25%?

- a) (0.5 points) A 10,000 € perpetuity at 6%;

$$PV(ITS) = 10,000 \times 0.25 = 2,500 \text{ €}$$

- b) (0.5 points) A 10,000 € 1-year loan at 6%;

$$PV(ITS) = \frac{10,000 \times 0.06 \times 0.25}{(1 + 0.06)^1} = 141.51 \text{ €}$$

- c) (0.5 points) A 10-year loan of 10,000€ at 6%. Assume no principal is repaid until maturity.

$$PV(ITS) = \frac{10,000 \times 0.06 \times 0.25}{0.06} \times \left[1 - \frac{1}{(1 + 0.06)^{10}} \right] = 1,104.01 \text{ €}$$

Group IV (3.0 points)

REHTONA, SA is implementing a project whose all equity financing NPV amounts to € 20 million. However, the management team is going to issue € 130 million of debt. The corresponding flotation costs will amount to € 800,000. The flotation costs can be amortized over the project's 4 year life. The debt will be issued at 5% interest, with principal repaid in a lump sum at the end of the fourth year. If the firm's tax rate is 30%, calculate the project's APV.

Flotation Costs	800,000	
Life span	4 years	
Annual depreciation	200,000	
Annual Flot. Tax Shield	60,000	$(800,000 \times 0.30 \div 4)$
PV(Flotation Costs)	587,243	$(800,000 - 60,000 \times \alpha)$
Debt	130,000,000	
Tax Shield	1,950,000	$(130,000,000 \times 0.05 \times 0.30)$
PV(Interest Tax Shield)	6,914,603	$(1,950,000 \times \alpha)$

$$\alpha = \frac{1}{0.05} \times \left[1 - \frac{1}{(1 + 0.05)^4} \right]$$

$$\text{APV} = \text{NPV all equity financed} + \text{PV(Interest Tax Shield)} - \text{PV(Floating Costs)}$$

$$\text{APV} = 20,000,000 + 6,914,603 - 587,243 = 26,327,361$$

Group V (3.5 points)

The Britada Plains, SA is planning to expand its business over the next sixteen months. The Britada Plains needs to fund its plan. However, under present market trends it is not clear if this project should go ahead or not. Olive oil experts say that there is an average risk of 15% per year for this type of business. The market value of the new business is € 20 million. The risk-free interest rate is 1.35% a year.

- a) (0.5 points) Suppose that the Britada Plains has the possibility to buy a sixteen-month option on a property with all the required facilities with an exercise price of € 22 million, to be exercised in 16 months. What is the value of this option?

Strike price	22,000,000
Market value	20,000,000
Time to exercise	1.33 years
Risk-free return per year	1.35%
Volatility	15.00%

d1	-0.36044
d2	-0.53365
N(d1)	0.35926
N(d2)	0.29679

Value of a B-S European Call option is: € 771,429

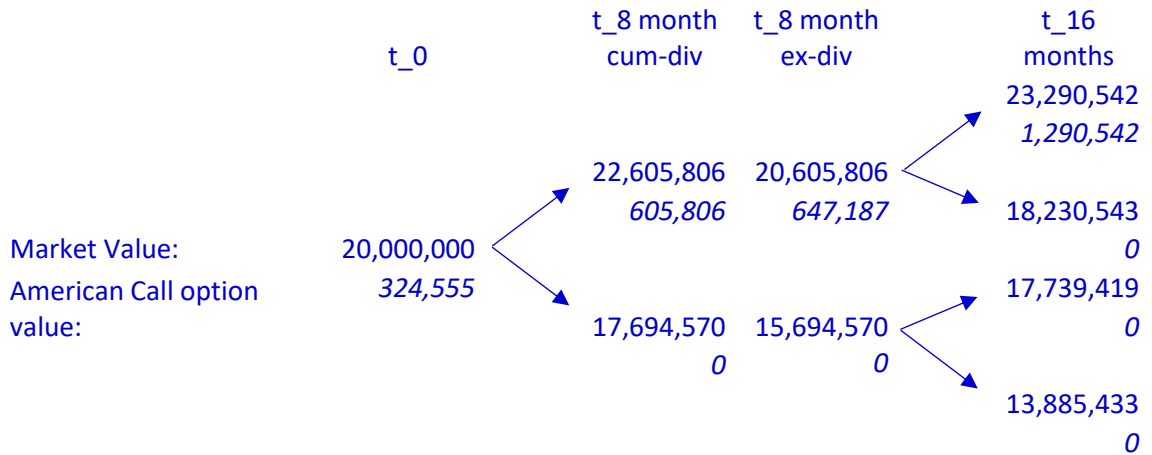
Black-Scholes assumes a continuum of prices until exercise. Binomial works with just two possible prices.

- b) (2.5 points) Suppose that the Britada Plains has the possibility to buy a sixteen-month option on a property with all the required facilities with an exercise price of € 22 million, to be exercised in 8 months or in 16 months. If the option is not exercised in 8 months, the owners will sell the property production to the local olive oil producers' Association for an amount of € 2 million. What is the value of this option?

Strike price	22,000,000
Risk-free return per year	1.35%
Time to exercise	0.67 years
Volatility per year	15.00%
Risk-free return per period til exercise	0.90%
Dividend lost from non-exercise	2,000,000

Upside return ($u = e^{(\sigma * \text{SQRT}(\text{time}))}$)	1.1303	return =	13.03%
Downside return ($d = 1 / u$)	0.8847	return =	-11.53%

Probability Up (P) = 50.60%
 Probability Down (1-P) = 49.40%



Value of an American Call option is: € 324,555

- c) (0.5 points) Assume now a lower amount of money for which the property owners will be able to sell the production to the local olive oil producers' Association (i.e. less than € 2 million). Would it increase or decrease the value of the option in question b)? Explain.

Increases b).

Reducing the value lost (through a "dividend") until exercise increases the value of the underlying asset. Consequently, the value of the call option.