

Solution & Grading Key

Very Important (READ THIS):

All students with seven digit ID numbers must add "2" in front of their ID number to make it eight digit. For example:

ID # 6770177 should be made 26770177

You should put the eight-digit ID (26770177 in the above example) on both the exam and the bubble sheet.

Examination Cover Sheet

Print Name: ➔		ID Number: ➔	
COURSE FINANCE	NUMBER COMM 308	SECTIONS: (➔ Circle your section) CC, DD, G, H, I, J, K	
EXAMINATION Final Exam VERSION BLUE	DATE April 24, 2015	TIME 3 hours 19:00 to 22:00	# OF PAGES 18 Including this cover
INSTRUCTOR: (➔ Underline your instructor's name) Nada El Hassan June Riley Kaveh Moradi Dezfouli Monir Wahhab Ian Rakita Mohammad Sabr Rahul Ravi		DIVISION John Molson School of Business Concordia University	

INSTRUCTIONS: Please read these carefully

1. Please ensure you have 18 pages (including this cover page) in this exam.
2. For Part I of this exam (Multiple Choice Questions): All answers must be recorded **IN PENCIL** on the computer sheet. Only the computer sheet will be graded.
3. For Part II: Show your calculations to earn part marks. Write in the space provided. If you are using the back of the exam for answering any question, you should label it clearly
4. For Part II: All answers must be recorded **IN INK** within this exam.

MATERIALS ALLOWED:

1. You must submit a BLUE computer answer sheet.
2. You are allowed to bring one or more calculators (ENCS sticker not necessary)
3. You are allowed to bring one language dictionary (no finance/ mathematics/economics etc. dictionary)

SCORES (FOR INTERNAL USE ONLY)

Part I MCQ	Part II Numerical and Short Answer Questions				Total
	Question 1	Question 2	Question 3	Question 4	
	(Max: 70 Points)	(Max: 11 Points)	(Max: 5 Points)	(Max: 8 Points)	(Max: 6 Points)

Part I: Multiple Choice Questions (28 Questions, 70 Points Total):

- This part consists of 28 Multiple Choice Questions. Each question is worth 2.5 points.
- **Only answers on the computer answer sheet will be graded.**
- **Use a pencil to mark your answers on the Computer Sheet.**

1. John Doe Enterprises borrowed \$149,500 for two years from the bank. At the end of the two years, they repaid the loan with one payment of \$176,590. What was the quoted interest rate on the loan? Assume the interest rate is quoted as an APR compounded semi-annually.

A. 4.25%

B. 8.36%

☒ C. 8.50%

D. 8.68%

E. None of the above

$$\text{Effective Rate} = \frac{176590 - 149500}{149500} = 18.12\%$$

$$\text{ESR} = (1.0181204)^{\frac{1}{2}} - 1 = 4.25\%$$

$$\text{Ans} = 8.5\% \text{ APR Comp. S.A.}$$

2. An interest rate of 20% per year compounded quarterly can also be expressed as (rounded to 4 decimal places)

A. an effective quarterly rate of 5%.

B. 21.55% effective annual rate

C. 10% effective semiannual rate

☒ D. Both A and B

E. A, B, and C

$$\text{EQAR} = \frac{0.2}{4} = 5\%$$

$$\text{EAR} = 1.05^4 - 1 = 21.55\%$$

3. CCA recapture can arise if:

I. CCA asset class is terminated

II. Assets are sold for less than UCC of asset class

III. Assets are sold for more than UCC of asset class

A. I only.

B. II only

C. II and III only

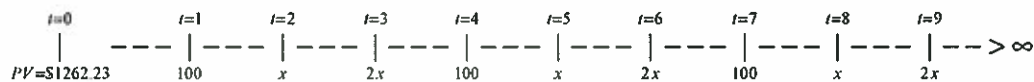
☒ D. I and III only

E. I, II, and III

4. In an efficient market, the announcement that a company earned profits last year that exceeded analysts' expectations should cause the stock price to

A. Rise gradually as investors learn of the news
 B. Be unchanged since no one can benefit abnormally
 C. Be unchanged since it was unexpected news
 D. React unpredictably up or down
 (E) Rise very quickly

5. The present value ($t = 0$) of the following cash flow stream is \$1,262.23 when discounted at 12 percent (EAR). What is the value of the missing cash flows (x)? Assume the pattern of payments continues in perpetuity.



A. \$48.35
 B. \$100.00
 (C) \$123.60
 D. \$300.00
 E. None of the above

$$\cancel{1262.23} = E_{3\text{year}} \text{ rate} = (1.12)^3 - 1 = 40.4928\%$$

$$1262.23 = \frac{100}{0.404928} \times 1.12^2 + \frac{x}{0.404928} \times 1.12 + \frac{2x}{0.404928}$$

$$x = \underline{\underline{123.60}}$$

6. Your quantitative research team at Technical Investment Strategies LLC reports that they identified a successful trading strategy. The team claims that superior returns could be achieved by purchasing Canadian stocks whose price has increased at a higher rate than the increase in the Toronto Stock Exchange S&P/TSX stock market index over the past six month. If true, the existence of such a trading strategy would be evidence...

A. against the stock market being strong form efficient.
 B. against the stock market being semi-strong form efficient.
 C. against the stock market being weak form efficient.
 D. Both (A) and (B)
 (E) All (A), (B) and (C)

7. Given the following information, which investment(s) would risk averse investors prefer if the risk free rate is 2 percent?

Investment	Cost Today	Value of Investment after one year:	
		Probability: 40%	Probability: 60%
I	\$18.00	\$36.00	\$8.00
II	\$14.00	\$12.00	\$16.00
III	\$15.00	\$30.00	\$5.50

$$\frac{19.2 - 12}{18} = 6.6\%$$

$$\frac{14.4 - 14}{14} = 2.86\%$$

$$\frac{15.3 - 15}{15} = 2\%$$

- A. I only
- B. II only
- C. III only
- ☒ D. I and II only
- E. I, II, and III
8. The effective annual required rate of return on the ordinary shares of Southeast Corporation is 18%. The shares' expected dividend yield for year one is 4%. The shares' annual dividends are expected to grow at a constant annual rate forever. Which of the following is a correct statement?

- A. The expected annual dividend growth rate is 4%.
- ☒ B. The expected annual dividend growth rate is 14%.
- C. The expected annual dividend growth rate is 22%.
- D. The shares' expected capital gains yield for year one is 18%.
- E. None of the above.

$$r = 18\% = \text{Div. yield} + \text{Cap. gain}$$

$$\text{Div. yield} = 4\%$$

$$\text{Capital gain} = \underline{\underline{14\%}}$$

9. Which bond's price would be the least sensitive to an unexpected change in the interest rate?
- A. A discount (or zero coupon) bond with 12 years to maturity
- B. A discount (or zero coupon) bond with 8 years to maturity
- ☒ C. A bond with 10% coupon rate and 8 years to maturity
- D. A bond with 5% coupon rate and 8 years to maturity
- E. A bond with 5% coupon rate and 10 years to maturity

10. A new project with a life of 10 years, costs \$210,000 and is expected to generate annual net cash inflows of \$x each year. The project has a payback period of 10 years. Which of the following statement/s is/are most correct: (Note: RRR stands for the required rate of return for the project)
- A. $NPV_A > 0$, and $PI_A > 1$
 - B. $IRR_A > RRR_A$, and discounted payback period will be less than 10 years
 - ☒ C. $PI_A \leq 1$, and $IRR_A \leq RRR_A$
 - D. Both A and B
 - E. Both B and C
11. For a given constant effective annual rate, the quoted rate _____ as the compounding frequency increases.
- A. Does not change.
 - B. Increases.
 - ☒ C. Decreases.
 - D. It depends on the effective rate.
 - E. It depends on frequency of payments.
12. A company has a market-to-book ratio that is greater than 1.0. If this company uses book value of equity to determine their WACC, they will derive a value that is _____ the market based WACC. Because _____
- A. Equivalent to; the ratio of debt to equity is the same whether book values or market values are used.
 - B. Greater than; the ratio of debt to equity will be greater than if the ratio was based on market values.
 - C. Greater than; the ratio of debt to equity will be less than if the ratio was based on market values.
 - ☒ D. Less than; the ratio of debt to equity will be greater than if the ratio was based on market values.
 - E. Less than; the ratio of debt to equity will be less than if the ratio was based on market values.

$$\frac{M}{B} > 1 \Rightarrow M > B$$

$$WACC = \frac{M}{V} K_E + \frac{D}{V} K_D (1 - T_c)$$

$$\frac{V}{M} = 1 + \frac{D}{M} < 1 + \frac{D}{B}$$

$$\Rightarrow \frac{V}{M} < \frac{V'}{B} \Rightarrow \frac{M}{V} > \frac{B}{V'}$$

Blue Version

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\therefore weight on equity will go down & debt weight will increase.
 \therefore new WACC will be lower.

13. Which of the following will help shareholders mitigate agency problems? Shareholders can:

- I. Elect directors
- II. Use their voting rights to push for governance changes
- III. Give managers option to buy stock at current price

A. I, and II

B. II, and III

C. I, and III

☒ D. I, II, and III

E. None of the above.

14. Which of the following statement/s is most correct?

A. when bonds of comparable risk have a yield to maturity of 5%, a \$1,000 face value bond with 25 years to maturity and a coupon rate of 6% (3% payable semi-annually) should sell at a discount.

B. a bond with a \$1,000 face value, 20 years to maturity, coupon rate of 6% (3% semi-annual coupon) and that sells for \$1,181.79 has a yield-to-maturity of 3.126%.

C. when the effective annual rate is 8%, a zero coupon \$1,000 face value bond that sells for \$250.25 must have 20 years (rounded to the nearest whole year to maturity).

D. all of the above are true.

☒ E. None of the above is true

15. The expected return of Security A is 12 percent with a standard deviation of 15 percent. The expected return of Security B is 9 percent with a standard deviation of 10 percent. Securities A and B have a correlation of 0.4. The market return is 11 percent with a standard deviation of 13 percent and the risk free rate is 4 percent. What is the Sharpe ratio of a portfolio if 35 percent of the portfolio is in Security A and the remainder in Security B?

A. 0.54

☒ B. 0.61

C. 0.86

D. 1.02

E. None of the above

$$r_A = 12\% \quad r_B = 9\% \quad \rho_{A,B} = 0.4$$

$$\sigma_A = 15\% \quad \sigma_B = 10\%$$

$$E(r_p) = 0.35 \times 0.12 + 0.65 \times 0.09 = 10.05\%$$

$$\sigma_p = \sqrt{0.35^2 \times 0.15^2 + 0.65^2 \times 0.1^2 + 2 \times 0.35 \times 0.65 \times 0.15 \times 0.1 \times 0.4}$$

$$= 0.093546$$

$$\frac{0.1005 - 0.04}{0.093546} = 0.6139$$

SR_A =

16. An investor would not enter a position in a _____ if she believes that the price of the underlying stock will fall in the near future.

A. short call option on an underlying stock
 B. long call option on an underlying stock
 C. long put contract on an underlying stock
 D. short put option on an underlying stock
 (E) Both B and D

17. Fun 'N Fast Games needs \$21 million to finance their latest venture. The company plans to fund this project by issuing new shares of common stock at a market price of \$46 a share. The direct costs are \$985,000, and the underwriting spread is 7.5%. How many shares of stock must Fun 'N Fast issue to fully fund their venture? (Round your answer to the nearest whole number).

A. 480,168
 B. 513,780
 (C) 516,686
 D. 519,307
 E. 521,033

$$(1 - 0.075) \times x \times 46 = 985,000 + 21,000,000$$

$$x = \underline{\underline{516686.25}}$$

18. RecRus Inc. has two separate divisions: DVD rental and sporting goods. The beta of the entire company is 1.25. The beta of the DVD rentals division is 0.8 and the beta of the sporting goods division is 1.5. The risk free rate is 4 percent and the market risk premium is 7.5 percent. Which of the following independent projects should the company undertake?

Project	Industry	CF ₀	Perpetual annual CF	PV ₀
I	Sporting goods	-\$150,000	+\$25,000	13934
II	Sporting goods	-\$200,000	+\$30,000	-3273
III	DVD rental	-\$50,000	+\$6,000	21,300 19,000
IV	DVD rental	-\$80,000	+\$7,500	35,177 -5000

A. Projects I and II
 (B) Projects I and III
 C. Projects II and IV
 D. Projects III and IV
 E. Projects I, II, III, and IV

$$r_{DVD} = 0.04 + 0.8 \times 0.075 = 0.1$$

$$r_{sg} = 0.04 + 1.5 \times 0.075 = 0.1525$$

$$PV_0(\text{Project I}) = -150,000 + \frac{25,000}{0.1525}$$

$$= \underline{\underline{13934}}$$

19. Trans Continental Corporation (TCC) has an effective annual WACC of 9.60%. It is financed with 40% debt and 60% equity. TCC's effective annual cost of equity is 12.80% and its corporate tax rate is 40%. The debt issued by TCC is 30-year bonds, paying coupons annually at a coupon rate of 8%. Each TCC bond has a face value of \$1,000. What is the value of each TCC bond?

A. \$1,076.74 $0.096 = 0.6 \times 0.128 + 0.4 \times 0.6 \times r_D$
 B. \$1,027.93 $\Rightarrow r_D = 8\%$
 C. \$1,017.67 $\therefore \text{Bonds are at par: } P_0 = \underline{\underline{\$1000}}$
☒ D. \$1,000.00
 E. It cannot be determined with the information given

20. If portfolio weights are positive: 1) Can the return on a portfolio ever be less than the smallest return on an individual security in the portfolio? 2) Can the variance of a portfolio ever be less than the smallest variance of an individual security in the portfolio?

A. 1) yes; 2) yes
 B. 1) yes; 2) no
☒ C. 1) no; 2) yes
 D. 1) no; 2) no
 E. 1) maybe; 2) no

21. Which of the following risk-adjusted performance measures, can be graphically interpreted using the Security Market Line (SML)?

I. Sharpe ratio
 II. Treynor ratio
 III. Standard deviation
 IV Beta

A. I only
☒ B. II only
 C. I and III only
 D. II and IV only
 E. None of the above

22. Crystal has created the following portfolio:

sold a call option – strike price \$15.00 and maturity 1yr

bought 3 puts – strike price \$18.00 and maturity 1yr

Suppose at expiration the stock price is \$17.00. What is the payoff of her strategy?
(Assume that each option is for the sale or purchase of one share of the stock).

A. -\$1.

☒ B. \$1.

C. \$2.

D. \$3.

E. \$5.

$$\text{payoff} = -2 + 3 \times 1 = \underline{\underline{\$1}}$$

23. Suppose the Far North Airlines has two mutually exclusive projects: Setting up a hub in Far East, and Setting up a hub in Far West. Project East has an IRR of 12 percent and project West has an IRR of 15 percent. The crossover rate is 9 percent. The project's appropriate discount rate is 8 percent. Far North should _____.

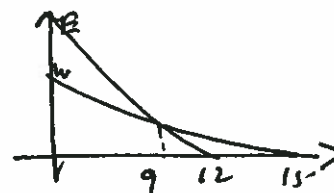
☒ A. Accept project East, and reject project West

B. Accept project West, and reject project East

C. Accept both projects.

D. Reject both project.

E. Insufficient information. It will depend on the cash flows from the two projects.



24. A firm has recently purchased Class 10 equipment for \$100,000 with a CCA rate of 30%. What is the amount of depreciation that the firm can claim as a tax-deductible expense in the second year?

A. \$30,000

B. \$15,000

C. \$21,000

☒ D. \$25,500

E. None of the above

	UCCB	CCA	UCC E
1	100,000	15,000	85,000
2	85,000	25,500	

25. Given no change in required returns, the price of a stock whose dividend grows at a constant rate of $g\%$ will: (Assume the required rate of return for the stock is $k\%$ EAR)

- A. Increase over time at a rate of $k\%$.
- B. Decrease over time at a rate of $k\%$.
- ☒ C. Increase over time at a rate of $g\%$.
- D. Decrease over time at a rate of $g\%$.
- E. None of the above.

26. A firm issued 30-year \$1,000 par value bonds ten years ago at par. At that time, the yield to maturity for such bonds was 9%. Today these bonds are selling for \$1,100. The coupon is paid annually. What is the yield to maturity (rounded to two decimal places) for these bonds today?

☒ A. 10.06%

☒ B. 9.00%

C. 8.99%

☒ D. 7.98%

☒ E. Not enough information

$$1100 = \frac{90}{r} \times \left[1 - \frac{1}{(1+r)^{20}} \right] + \frac{1000}{(1+r)^{20}}$$

Bond trading at premium \Rightarrow yield $= r < 9\%$.

27. Choose the best alternative. Which one of the following statements regarding amortized loans is false?

- A. Amortized loans all have a balloon payment at the end of the loan term.
- B. Amortized loan payments consist of interest only.
- C. An amortized loan requires only one lump sum payment at the end of the loan term.
- D. B and C are false.
- ☒ E. A, B, and C are false.

28. A type of underwriting where the firm receives the agreed-upon amount and the underwriter assumes all of the risk is called a _____ underwriting.

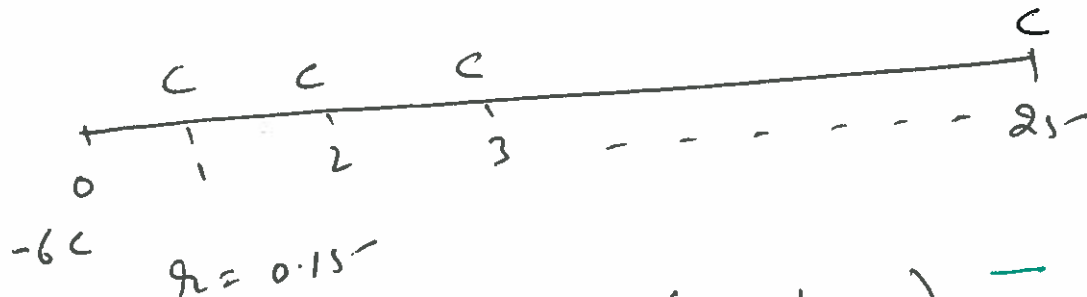
- A. Guaranteed
- B. Green Shoe
- ☒ C. Firm commitment
- D. Red herring
- E. Best efforts

Part II: Problems (30 Points Total)

- Answer on this document, in the space provided. Use the back of the sheet if you need additional space. Label it clearly. Any work on the back of the sheet, which is not labeled clearly, will not be graded.
- Show all your work. Unsupported statements or numbers will not receive any credit.

Q1. (11 Points) Application of TVM: This question has two unrelated parts. Information from part (a) should not be used in part (b)

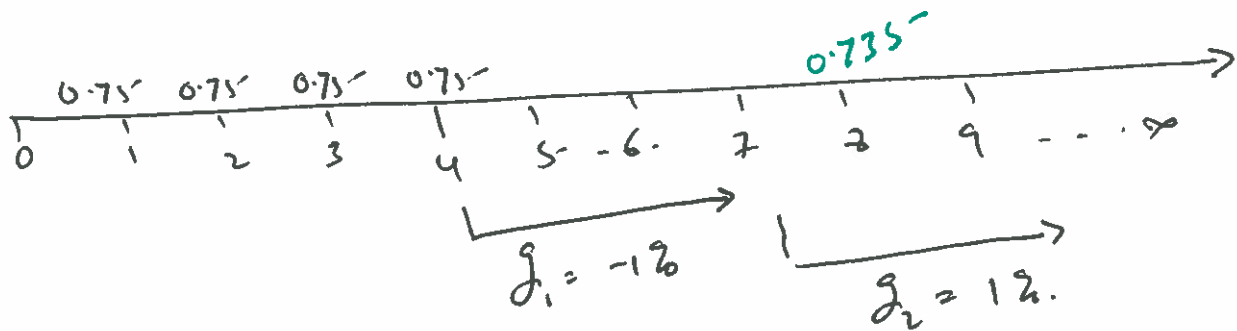
Q1 (Part a) (3 Points): The cash inflows stream of an investment project is a 25-year annuity paying C dollars at the end of every year starting one year from today (first payment at $t=1$). The project requires an initial investment of $6C$. The required rate of return of this project is 15%. Should you invest in this project?


$$\begin{aligned} \text{NPV} &= -6C + \frac{C}{0.15} \times \left(1 - \frac{1}{1.15^{25}} \right) \\ &= -6C + 6.46C > 0 \end{aligned}$$

\therefore invest in the project.

— 1 point- Annuity
— 1 point- for NPV
— 1 point- decision.

Q1 (Part b) (8 Points): Carbon Energy Corporation will pay a dividend of \$0.75 per share at the end of year one. They intend to keep paying \$0.75 annual dividends until 4 years from now. At that time they anticipate undertaking a major exploration initiative which will cause the dividends following year four to decline at 1% per year until the dividend paid at the end of year seven is made. Subsequent dividends are then expected to grow at 1% per year indefinitely. On the basis of these projections calculate the current trading price of Carbon stock assuming that investors expect a return from Carbon stock of 16% per year compounded quarterly.



$QR = 0.16\%$ APR Comp. quarterly

$\Rightarrow EAR = 4\%$

$EAR = 1.04^4 - 1 = 16.985856\%$ — 1 pt.

$D_7 = 0.75 \times 0.99^3 \times 1.01 = 0.735001493$ — 1 pt.

$$P_0 = \frac{0.75}{0.16985856} \times \left[1 - \frac{1}{1.16985856^4} \right] + \frac{0.75}{0.17935856} \times \left[1 - \left(\frac{0.99}{1.16985856} \right)^4 \right]$$

$$\times \frac{1}{1.16985856^3} + \frac{0.735001493}{0.15935856} \times \frac{1}{(1.16985856)^7}$$

$P_0 = 1.657 + 1.2687 + 1.5345 -$
 (2 pt) (2 pt) (2 pt)

Blue Version = \$4.46

Q2. (5 Points):

It is given that assets A and B are priced in the market by the CAPM, with the following data:

Stock	Expected Return	Beta
A	25%	1.5
B	-10%	-1

*Expected returns are based on CAPM

Assets C and D are priced in the market by the dividend growth model, with the following data:

Stock	Expected Return	Beta
C	28.6%	2
D	16.8%	0.75

**Expected returns are based on the dividend growth model

Assume that the correct asset-pricing model is the CAPM. Based on the above data, show that Asset C and D are Overpriced/Underpriced/correctly priced.

$$0.25 = r_f + 1.5 \times (r_m - r_f)$$

$$\frac{-0.1}{+} = \frac{r_f}{-} + \frac{1}{+} (r_m - r_f)$$

$$0.35 = 2.5 (r_m - r_f) \Rightarrow (r_m - r_f) = 0.14 \rightarrow \text{1 pt}$$

$$\therefore \underline{r_f} = -0.1 + 0.14 = \underline{4\%} \rightarrow \text{1 pt}$$

$$\text{CAPM} \Rightarrow r_c = 0.04 + 2 \times 0.14 = 0.32 > 28.6\% \rightarrow \text{1 pt}$$

\therefore Asset C is overpriced.

$$r_d = 0.04 + 0.75 \times 0.14 = 14.5\% < 16.8\% \rightarrow \text{1 pt}$$

\therefore Asset D is underpriced.

Blue Version

0.5x2
= 1 pt.
for decisions

Q3. (8 Points)

Kingsmill Industrial Systems Company (KISC) is trying to decide between two different conveyor belt systems. System A costs \$360,000, has a four-year life, and requires \$135,000 in pre-tax annual operating costs. System B costs \$430,000, has a six-year life, and requires \$98,000 in pre-tax annual operating costs. Both systems are to be depreciated at 30% per year (class 10) and will have no salvage value. Whichever project is chosen, it will be replaced with the same choice when it wears out. If the tax rate is 34% and the discount rate is 12%, which project should the firm choose?

text book
Ch. 10, 841

$$\text{Operating Cost}_A = \$135,000 \times (1 - 0.34) = \$89,100 \leftarrow \text{1 pt.}$$

$$\text{PVCCATS}_A = \$82,744.90 \leftarrow \text{1 pt.}$$

$$\text{PV}(\text{Cost}_A) = -360,000 - \frac{89,100}{0.12} \times \left(1 - \frac{1}{1.12^4}\right) + 82,744.90$$

$$= -547,332.93 \leftarrow \text{1 pt.}$$

$$\text{Operating Cost}_B = \$98,000 \times (1 - 0.34) = 64,680 \leftarrow \text{1 pt.}$$

$$\text{PVCCATS}_B = \$98,834.13 \leftarrow \text{1 pt.}$$

$$\text{PV}(\text{Cost}_B) = -430,000 - \frac{64,680}{0.12} \times \left(1 - \frac{1}{1.12^6}\right) + 98,834.13$$

$$= -597,091.64 \leftarrow \text{1 pt.}$$

$$\text{EAC}_A = \frac{547,332.93 \times 0.12}{\left(1 - \frac{1}{1.12^4}\right)} = \$130,331.93 \leftarrow \text{1 pt.}$$

$$\text{EAC}_B = \frac{597,091.64 \times 0.12}{1 - \frac{1}{1.12^6}} = \$145,223.04 \leftarrow \text{1 pt.}$$

Blue Version

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Choose B

Q4. (6 Points) **Option portfolio payoff:** Suppose that the price of a share of stock in XYZ Corporation is currently trading at \$30 per share. Consider buying the following two options on one share of XYZ:

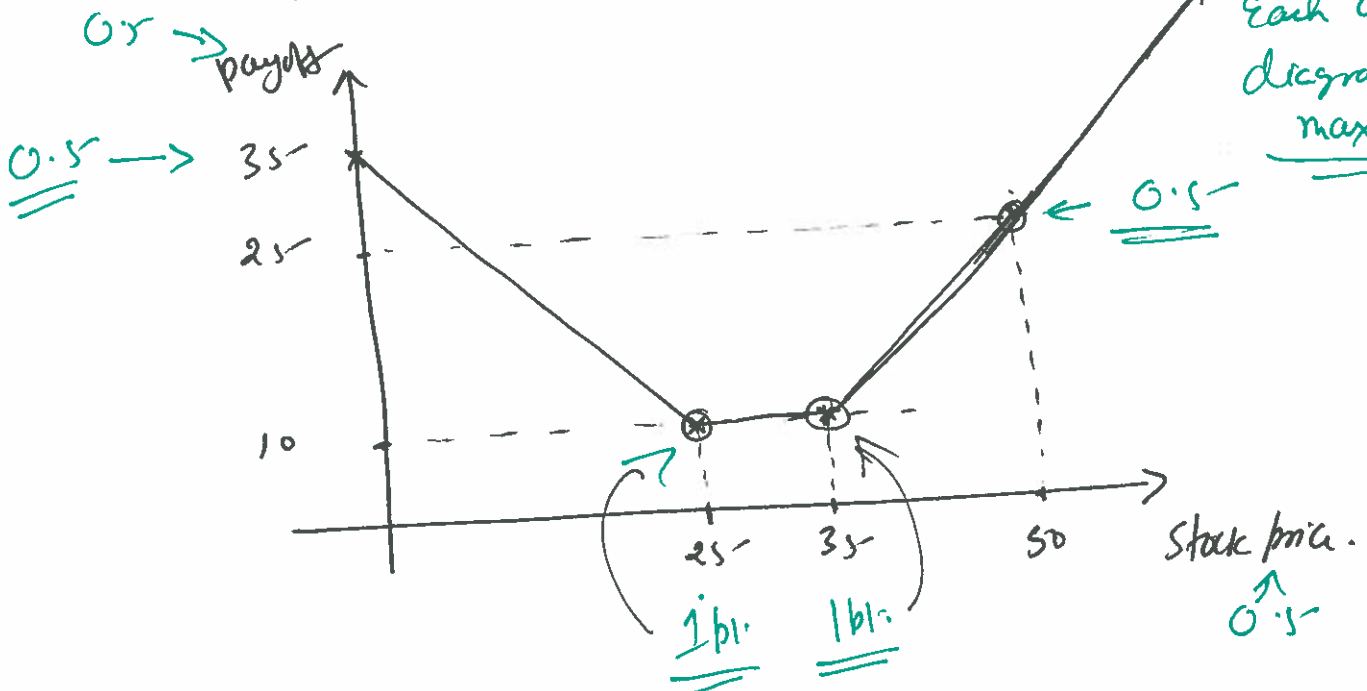
- A Call option with strike price \$25
- A Put option with strike price \$35

i. (4 Points) Draw a payoff diagram of this portfolio

Note: Clearly label both axes and the location of each important point on the diagram (Points of intersections, points where the graph changes direction, etc.).

	0	25	35	50
C_{25}	0	0	10	25
P_{35}	35	10	0	0
	35	10	10	25

if only C_{25}
 $\& P_{35}$ presented
 but not the portfolio
 — award 1 pt for
 Each correct
 diagram.
max = 2 pt



ii. (2 Point) What is the holder of this portfolio betting on? What is the minimum cost of this portfolio?

he is betting on the price rising above \$35 or falling below \$25 \Rightarrow volatility high. \rightarrow 1 pt.

Formula Sheet

$$PV \times (1 + r)^t = FV_t \quad [5.3]$$

$$PV_0 = \frac{FV_t}{(1 + r)^t}$$

$$\text{Annuity present value} = \frac{C}{r} \times (1 - \text{Present value factor}) = \frac{C}{r} \times \left\{ 1 - \frac{1}{(1 + r)^t} \right\} \quad [6.1]$$

$$\text{Annuity FV factor} = (\text{Future value factor} - 1) / r = \left(\frac{(1 + r)^t - 1}{r} \right) \quad [6.2]$$

$$\text{Annuity due value} = \text{Ordinary annuity value} \times (1 + r) \quad [6.3]$$

$$\begin{aligned} \text{Perpetuity present value} \times \text{Rate} &= \text{Cash flow} \\ PV \times r &= C \end{aligned} \quad [6.4]$$

$$\text{Annuity present value factor} = \frac{1}{r} \times (1 - \text{Present value factor}) \quad [6.5]$$

$$PV = \frac{C}{r - g} \quad [6.6]$$

$$PV = \frac{C}{r - g} \left[1 - \left(\frac{1 + g}{1 + r} \right)^t \right] \quad [6.7]$$

$$EAR = \left(1 + \frac{QR}{m} \right)^m - 1 \quad [6.8]$$

$$EAR = e^q - 1 \quad [6.9]$$

$$1 + R = (1 + r) \times (1 + h) \quad [7.2]$$

$$R \approx r + h \quad [7.4]$$

$$r = (D_1/P_0) + g \quad [8.5]$$

$$\text{PV tax shield on CCA} = \frac{[ldT^c]}{d + k} \times \frac{[1 + .5k]}{1 + k} - \frac{S_n d T^c}{d + k} \times \frac{1}{(1 + k)^n} \quad [10.5]$$

$$\text{Total dollar return} = \text{Dividend income} + \text{Capital gain (or loss)} \quad [12.1]$$

$$\text{Var}(R) = \left(\frac{1}{(T - 1)} \right) \times \left[(R_1 - \bar{R})^2 + \dots + (R_T - \bar{R})^2 \right] \quad [12.3]$$

$$\text{Geometric average return} = [(1 + R_1) \times (1 + R_2) \times \dots \times (1 + R_T)]^{1/T} - 1 \quad [12.4]$$

$$\text{Risk premium} = \text{Expected return} - \text{Risk-free rate} = E(R_U) - R_f \quad [13.1]$$

$$E(R) = \sum_j R_j \times P_j \quad [13.2]$$

$$\sigma^2 = \sum_j [R_j - E(R)]^2 \times P_j \quad [13.3]$$

$$\sigma = \sqrt{\sigma^2}$$

$$E(R_p) = x_1 \times E(R_1) + x_2 \times E(R_2) + \dots + x_n \times E(R_n) \quad [13.4]$$

$$\text{Covariance of returns: } COV_{L,U} = \sum_{i=1}^n \text{Prob}_i (r_{L,i} - E(r_L))(r_{U,i} - E(r_U))$$

$$\sigma_p^2 = x_L^2 \sigma_L^2 + x_U^2 \sigma_U^2 + 2x_L x_U \text{CORR}_{L,U} \sigma_L \sigma_U \quad [13.5]$$

$$\sigma_p = \sqrt{\sigma_p^2}$$

$$\text{Covariance}_{L,U} = \text{CORR}_{L,U} \sigma_L \sigma_U \quad [13.6]$$

$$\text{Total return} = \text{Expected return} + \text{Unexpected return} \rightarrow R = E(R) + U$$

$$\text{Announcement} = \text{Expected part} + \text{Surprise} \quad [13.7]$$

$$R = E(R) + \text{Systematic portion} + \text{Unsystematic portion} \quad [13.8]$$

$$\text{Total risk} = \text{Systematic risk} + \text{Unsystematic risk} \quad [13.9]$$

$$E(R_i) = R_f + [E(R_M) - R_f] \times \beta_i \quad [13.10]$$

$$\beta_2 = \frac{\text{COV}(R_2, R_M)}{\sigma^2(R_M)} \quad [13A.4]$$

$$R_E = R_f + \beta_E \times [R_M - R_f] \quad [14.2]$$

$$WACC = \left(\frac{E}{V}\right) \times R_E + \left(\frac{P}{V}\right) \times R_P + \left(\frac{D_m}{V}\right) \times R_D \times (1 - T_C) \quad [14.6]$$

$$C_1 = 0 \text{ if } (S_1 - E) \leq 0 \quad [25.1]$$

$$C_1 = S_1 - E \text{ if } (S_1 - E) > 0 \quad [25.2]$$

$$C_0 \geq 0 \text{ if } S_0 - E < 0 \quad [25.4]$$

$$C_0 \geq S_0 - E \text{ if } S_0 - E \geq 0$$