



**HERBERT CHITEPO SCHOOL OF LAW & BUSINESS
SCIENCES**

DEPARTMENT OF ECONOMICS & FINANCE

FINAL EXAMINATION

BACHELOR OF COMMERCE PART 4 SEMESTER 1

**COURSES FINANCIAL MODELLING AND RISK
MODELLING & ACTUARIAL SCIENCE**

CODES HBF4110/HRMI4110

DATE 2024

DURATION 3 HOURS

GREAT ZIMBABWE UNIVERSITY
RECEIVED

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INSTRUCTION TO CANDIDATES

EXAMINATIONS OFFICE

- 1. THE PAPER COMPRISES 5 QUESTIONS**
- 2. YOU ARE REQUIRED TO ANSWER QUESTION 1 AND ANY OTHER THREE QUESTIONS**
- 3. BEGIN THE ANSWER TO EACH QUESTION ON A FRESH WORKBOOK SHEET**
- 4. USE MICROSOFT EXCEL TO ANSWER ALL QUESTIONS**
- 5. FINANCIAL AND NON-PROGRAMMABLE SCIENTIFIC CALCULATORS ARE ALLOWED IN THE EXAMINATION.**
- 6. CANDIDATES WILL OBTAIN CREDIT FOR SHOWING ALL WORKINGS**

QUESTION 1

[40 MARKS]

Compulsory

1.1 Suppose you are valuing an investment that promises \$2,500 per year at the end of this and the next four years. The bank pays an annual interest rate of 15 percent on a five-year deposit. Calculate the investment amount needed to achieve this cash flow. Use the following Microsoft Excel functions:

- 1.1.1 Summing Cells [2 Marks]
- 1.1.2 NPV [2 Marks]
- 1.1.3 PV [2 Marks]

1.2 Compute the 1-Day and 5-Day VaRs for the two-stock portfolio given below. [14 Marks]

Parameters	Stock 1	Stock 2
Annual Volatility	13%	22%
Share Price	\$4.50	\$9.50
Shares Owned	75,000	50,000
Days Per Year	365	
Confidence Level	95%	
Covariance	0.45	
Time Horizon (Days)	5	

1.3 Suppose that there are four risky assets that have the following expected returns and variance-covariance matrix:

	A	B	C	D	E	F
1	A FOUR-ASSET PORTFOLIO PROBLEM					
2	Variance-covariance, S					Mean returns E(r)
3	0.10	0.01	0.03	0.05		6%
4	0.01	0.30	0.06	-0.04		8%
5	0.03	0.06	0.40	0.02		10%
6	0.05	-0.04	0.02	0.50		15%

Consider two portfolios of risky assets:

	A	B	C	D	E
8 Portfolio x		0.2	0.3	0.4	0.1
9 Portfolio y		0.2	0.1	0.1	0.6

Show that portfolios *x* and *y* are neither on the envelope nor efficient.

[20 Marks]

QUESTION 2**[20 MARKS]**

2.1 The Exam Packet contains monthly data for stock prices of Kellogg and IBM for the period 2019 to 2023.

2.1.1 Calculate the statistics—mean, variance, standard deviation, covariance, correlation—for the portfolio invested 30% in Kellogg. [10 Marks]

2.1.2 Create a chart of the mean and standard deviation of combinations of the portfolio. [5 Marks]

Add the individual asset returns to the chart—are the two assets on the efficient frontier? [5 Marks]

3**[20 MARKS]**

A company is considering the purchase of an asset whose cost is \$1,200,000. The asset was purchased with \$300,000 of the company's equity and with \$900,000 of debt. The interest rate on the debt is 12%. The company will lease the asset out for \$115,000 per year, payable at the end of each year. The lease term is 15 years. The asset will be depreciated over a period of 8 years, using standard IRS depreciation schedule. The depreciation schedule for such asset is:

Year	1	2	3	4	5	6	7	8
Depreciation	14.28%	24.49%	17.49%	12.50%	8.92%	8.92%	8.92%	4.48%

Calculate the asset's IRR and indicate whether the firm should buy the asset or not.

[20 Marks]

QUESTION 4**[20 MARKS]**

4.1 You are given the following data relating to a small mining company:

- Growth rate 10%
- Discount rate 15%
- Cost \$5,000
- Year 1 cash flow \$1,000

4.1.1 Compute the mining company's NPV and IRR. [6 Marks]

4.1.2 Do a sensitivity analysis on the NPV of the project, varying the discount rates from 0%, 3%, 6%, ..., 21% and varying the growth rates from 0%, 3%, ..., 12%, and hide the formula cell. [6 Marks]

4.2 Solve the following equation ($AX = Y$) using matrices, where: [8 Marks]

QUESTION 2**[20 MARKS]**

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2.1.2 Create a chart of the mean and standard deviation of combinations of the portfolio. [5 Marks]

2.1.3 Add the individual asset returns to the chart—are the two assets on the efficient frontier? [5 Marks]

QUESTION 3**[20 MARKS]**

A leasing company is considering the purchase of an asset whose cost is \$1,200,000. The asset will be purchased with \$300,000 of the company's equity and with \$900,000 of debt. The interest on the debt is 12%. The company will lease the asset out for \$115,000 per year, payable at the end of each year. The lease term is 15 years. The asset will be depreciated over a period of 8 years, using standard IRS depreciation schedule. The depreciation schedule for such asset is:

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4.2 Solve the following equation ($AX = Y$) using matrices, where: [8 Marks]

$$A = \begin{bmatrix} 13 & -8 & -3 \\ -8 & 10 & -1 \\ -3 & -1 & 11 \end{bmatrix}, Y = \begin{bmatrix} 20 \\ -5 \\ 0 \end{bmatrix}, X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

QUESTION 5

[20 MARKS]

The firm whose financials are illustrated below wishes to maintain cash balances of 80 over the next 5 years. It also desires to issue neither additional stock nor make any changes in its current level of debt. Model this situation. [20 Marks]

	A	B	C	D	E	F	G
1	SUSTAINABLE DIVIDENDS--Template						
2	Sales growth	10%					
3	Current assets/Sales	15%					
4	Current liabilities/Sales	8%					
5	Net fixed assets/Sales	77%					
6	Costs of goods sold/Sales	50%					
7	Depreciation rate	10%					
8	Interest rate on debt	10.00%					
9	Interest paid on cash & marketable securities	8.00%					
10	Tax rate	40%					
11							
12	Year	0	1	2	3	4	5
13	Income statement						
14	Sales	1,000					
15	Costs of goods sold	(500)					
16	Interest payments on debt	(32)					
17	Interest earned on cash & marketable securities	8					
18	Depreciation	(100)					
19	Profit before tax	374					
20	Taxes	(150)					
21	Profit after tax	225					
22	Dividends	(90)					
23	Retained earnings	135					
24							
25	Balance sheet						
26	Cash and marketable securities	90	80	80	80	80	80
27	Current assets	160					
28	Fixed assets						
29	At cost	1,070					
30	Depreciation	(300)					
31	Net fixed assets	770					
32	Total assets	1,000					
33							
34	Current liabilities	80					
35	Debt	320	320	320	320	320	320
36	Stock	450	450	450	450	450	450
37	Accumulated retained earnings	150					
38	Total liabilities and equity	1,000					

[END OF EXAMINATION]