

FINAL EXAMINATION

Programme Name	:	BA (HONOURS) ACCOUNTING & FINANCE 3+0 IN COLLABORATION WITH UNIVERSITY OF PLYMOUTH
Course Code & Name	:	MAL2006 QUANTITATIVE FINANCIAL MODELLING
Duration	:	3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Please read the instructions given in the question paper **CAREFULLY**.
2. The question paper consists of **FIVE (5)** questions.
3. Answer **ALL** questions in the question paper.
4. Answers to the questions are to be written into the examination booklet.
5. Electronic dictionaries, lecture notes, files or any unauthorised materials except writing equipment are strictly prohibited.

This question paper must be submitted along with all used and/or unused rough papers and/ or graph papers (if any). Candidates are **NOT ALLOWED** to take any examination paper(s) used or unused out of the examination hall.

WARNING:

The Examination Board of Peninsula College Georgetown regards cheating as a very serious offence and will not hesitate to mete out the appropriate punitive actions according to the severity of the offence committed, and in the accordance with the clauses stipulated in the Students' Handbook, up to and including expulsion from Peninsula College Georgetown.

(This booklet contains 7 printed pages including this page)

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ALLOWED TO DO SO

Answer **ALL** questions on the separate sheet provided.

[100 marks]

1. In a recent survey, 10,000 investors were carefully chosen to provide insights into their perspectives on financial market investments. Specifically, participants were presented with a question that inquired about their perceptions of market performance, with the following choices: cryptocurrency market, equity market, and commodity market. The survey responses have been summarized and are presented below:

Investment	Observed frequency
Cryptocurrency market	2623
Equity market	3315
Commodity market	4062

According to an expert's forecast, it was anticipated that 30% of investors would opt for the cryptocurrency market, 30% would favour the equity market, and the remaining 40% would select the commodity market.

- a) Utilizing the data presented in the table above, conduct a formal statistical test to assess whether there is substantial evidence to challenge the expert's perspective. You should state the hypotheses that you are testing, show your calculations and write a full conclusion to your test in your solution. (12 marks)
- b) What would be the impact on the results if 300 of the participants who initially chose the Equity market switched to the cryptocurrency market? Briefly explain the difference in results. (8 marks)
- Total: [20 marks]
2. In a research study focused on lifestyle changes, an analyst examines the daily activity levels of individuals who have recently incorporated a new fitness routine. The analyst selects a sample of twelve participants and records their daily step counts for the past month, as shown in the table below:

Participant	Daily Step Count
1	2091
2	2199
3	2077
4	2065
5	1935
6	2159
7	2024
8	2091
9	2247
10	2242
11	2291
12	1943

- a) Calculate the sample mean and standard deviation for the daily step count in the provided dataset. (5 marks)
- b) Share brief comments on potential concerns related to the design of this study, including any implications for the accuracy of the results. (3 marks)

- c) The fitness program claims that, on average, participants have their daily step count by at least 2000 steps. Test this claim using the given data and the statistics from part (a). Clearly state the null and alternative hypotheses, compute the relevant test statistic, and present your conclusions. (10 marks)
- d) Describe the key assumption underlying the test conducted in part (c). (2 marks)
Total: [20 marks]
- 3 a) Suppose RM1,000 is invested at an annual interest rate 6%. Calculate the compound amount after 10 years if the interest is compounded:
- i) Annually (2 marks)
- ii) Semiannually (2 marks)
- iii) Quarterly (2 marks)
- iv) Monthly (2 marks)
- b) Bank Rakyat offers a monthly mortgage interest rate of 0.6%. Calculate the corresponding annual percentage rate (APR). (2 marks)
- c) James decided to purchase a used car and made a down payment of RM2,000. He then committed to monthly payments of RM300 for a duration of 4 years, with an annual interest rate of 12%, compounded monthly, applied to the remaining balance
- i) What was the initial cost of the used car? (8 marks)
- ii) Calculate the portion of James's total car payments that was allocated to interest charges (2 marks)
Total: [20 marks]
4. a) An analyst has collected data on four stocks, including their Beta values and estimated returns

Stock	Beta	Estimated Return
Zeta	1.4	17.00%
Eta	1.2	15.60%
Theta	0.8	13.60%
Kappa	-0.7	3.50%

Given a risk-free rate of 6% and a market risk premium of 8%, identify which stock is the least likely to be recommended by the analyst based on their characteristics. (10 marks)

- b) Which of the following possible portfolios cannot lie on the efficient frontier?

Portfolio	Expected Return	Standard Deviation
WealthGuard	9%	7%
Capital Masterworks	11%	7%
Investment Pinnacle	18%	16%
Asset Ascendancy	18%	12%

(3 marks)

- c) Based on the provided correlation matrix, which of the following two stock portfolios would a risk-averse investor be least inclined to prefer, and what is the rationale for this choice, assuming all other factors are equal?

Stock	A	B	C
A	+1		
B	--0.23	+1	
C	+0.75	--0.24	+1
D	+0.92	--0.45	+0.63

Portfolios:

Portfolio 1: Stocks A and D

Portfolio 2: Stocks B and C

Portfolio 3: Stocks B and D

(4 marks)

- d) An analyst assembles the following data regarding the returns of two commodities

	Commodity A	Commodity B
E(R)	0.048	0.092
σ^2	0.0064	0.0081

Given that the covariance between the returns of Commodity A and Commodity B is 0.0032, calculate the correlation (ρ) between their returns, denoted as $\rho_{a,b}$.

(3 marks)

Total: [20 marks]

5. a) An investor allocates 55% of her capital into a high-risk asset with an anticipated 11% return and an expected standard deviation of 7%, while the remaining 35% is invested in a risk-free asset with a fixed 5% return. Calculate the expected return and portfolio standard deviation. (3 marks)
- b) Abu Sdn Bhd is presently trading at RM12 per share, and it is projected to issue a dividend of RM 2 per share with an estimated share price of RM 14 in one year. The company has a beta of 1.5. The expected market return is 14%, and the risk-free rate is 5%. Determine the forecasted and expected return for Abu Sdn Bhd's shares, and assess whether it represents a favorable investment. (4 marks)

- c) Calculate the expected return for Lambda Sdn Bhd based on the information provided below:

Economy	Probability %	Return %
Bull	35	19.7
Normal	55	9.8
Bear	10	-13.2

(3 marks)

- d) If the expected market return is 17% and the risk-free return is 9%, compute the beta for Lambda Sdn Bhd (2 marks)
- e) As new assets are incorporated into a portfolio, the total risk, as measured by standard deviation, decreases at a diminishing rate.' Explain whether this statement is true or false, providing reasoning for your response. (2 marks)
- f) Discuss whether it is true or false that incorporating a high-risk commodity into a low-risk cryptocurrency portfolio can lead to a reduction in overall risk. (2 marks)
- g) Discuss whether it is true or false that diversification has the potential to reduce both systematic and unsystematic risk. (2 marks)
- h) Discuss whether it is true or false that when two assets exhibit a correlation of -1, the variance of returns for a portfolio containing these two assets can be reduced to zero. (2 marks)

Total: [20 marks]

- END OF QUESTIONS -

APPENDIX A: FORMULAE SHEET

The sample mean is given by: $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$.

The sample standard deviation is given by: $s = \sqrt{\frac{\sum_{i=1}^n x_i^2 - n\bar{x}^2}{(n-1)}}$

The test statistic formula for the one-sample t -test is given by: $t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$

The test statistic formula for the chi-squared goodness-of-fit test is given by:

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

where the abbreviations O and E stand for the observed and expected frequencies respectively and the summation is over all of the categories.

The annual Percentage Rate is given by: $r_{APR} = (1 + i)^n - 1$

The future value of an annuity is given by: $A = R \left[\frac{(1+i)^n - 1}{i} \right]$

The present value of an annuity is given by: $P = R \left[\frac{1 - (1+i)^{-n}}{i} \right]$

APPENDIX B: CHI-SQUARE TABLE

Critical values of the Chi-square distribution with d degrees of freedom

d	Probability of exceeding the critical value						
	0.05	0.01	0.001	d	0.05	0.01	0.001
1	3.841	6.635	10.828	11	19.675	24.725	31.264
2	5.991	9.210	13.816	12	21.026	26.217	32.910
3	7.815	11.345	16.266	13	22.362	27.688	34.528
4	9.488	13.277	18.467	14	23.685	29.141	36.123
5	11.070	15.086	20.515	15	24.996	30.578	37.697
6	12.592	16.812	22.458	16	26.296	32.000	39.252
7	14.067	18.475	24.322	17	27.587	33.409	40.790
8	15.507	20.090	26.125	18	28.869	34.805	42.312
9	16.919	21.666	27.877	19	30.144	36.191	43.820
10	18.307	23.209	29.588	20	31.410	37.566	45.315

APPENDIX C: STUDENT T-DISTRIBUTION TABLE

Degrees of freedom (ν)	Amount of area in one tail (α)							
	0.0005	0.001	0.005	0.010	0.025	0.050	0.100	0.200
1	636.6192	318.3088	63.65674	31.82052	12.70620	6.313752	3.077684	1.376382
2	31.59905	22.32712	9.924843	6.964557	4.302653	2.919986	1.885618	1.060660
3	12.92398	10.21453	5.840909	4.540703	3.182446	2.353363	1.637744	0.978472
4	8.610302	7.173182	4.604095	3.746947	2.776445	2.131847	1.533206	0.940965
5	6.868827	5.893430	4.032143	3.364930	2.570582	2.015048	1.475884	0.919544
6	5.958816	5.207626	3.707428	3.142668	2.446912	1.943180	1.439756	0.905703
7	5.407883	4.785290	3.499483	2.997952	2.364624	1.894579	1.414924	0.896030
8	5.041305	4.500791	3.355387	2.896459	2.306004	1.859548	1.396815	0.888890
9	4.780913	4.296806	3.249836	2.821438	2.262157	1.833113	1.383029	0.883404
10	4.586894	4.143700	3.169273	2.763769	2.228139	1.812461	1.372184	0.879058
11	4.436979	4.024701	3.105807	2.718079	2.200985	1.795885	1.363430	0.875530
12	4.317791	3.929633	3.054540	2.680998	2.178813	1.782288	1.356217	0.872609
13	4.220832	3.851982	3.012276	2.650309	2.160369	1.770933	1.350171	0.870152
14	4.140454	3.787390	2.976843	2.624494	2.144787	1.761310	1.345030	0.868055
15	4.072765	3.732834	2.946713	2.602480	2.131450	1.753050	1.340606	0.866245
16	4.014996	3.686155	2.920782	2.583487	2.119905	1.745884	1.336757	0.864667
17	3.965126	3.645767	2.898231	2.566934	2.109816	1.739607	1.333379	0.863279