# HERBET CHITEPO SCHOOL OF LAW AND BUSINESS SCIENCES

## DEPARTMENT OF ECONOMICS AND FINANCE

## MAIN EXAMINATION

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|---|---|
| **BACHELOR OF COMMERCE** | **PART 1 SEMESTER 2** |
| **COURSE** | **QUANTITATIVE ANALYSIS FOR BUSINESS/FINANCIAL ENGINEERING STATISTICS** |
| **CODE** | **HBF126/ HFE121** |
| **DATE** | **2024** |
| **DURATION** | **3 HOURS** |



**INSTRUCTIONS TO CANDIDATES**

1. **THE PAPER COMPRISES 5 QUESTIONS.**
2. **YOU ARE REQUIRED TO ANSWER ALL QUESTIONS.**
3. **BEGIN THE ANSWER TO EACH QUESTION ON A FRESH PAGE OF THE ANSWER BOOKLET.**
4. **NON-PROGRAMMABLE FINANCIAL OR SCIENTIFIC CALCULATORS ARE ALLOWED INTO THE EXAMINATION.**
5. **CANDIDATES WILL OBTAIN CREDIT FOR SHOWING ALL WORKINGS.**

**Question 1**

Investment analysts generally believe that the price of fixed-rate bonds is inversely related to the prime interest rate for loans; that is, bonds perform well when loan interest rates are down and perform poorly when interest rates are up.

| Bond rate % | Prime interest rate % |
|---|---|
| 5 | 16 |
| 12 | 6 |
| 9 | 8 |
| 15 | 4 |
| 7 | 7 |

1.1 Draw a scatter plot and comment on the pattern observed. [7 marks]

1.2 Determine the least squares regression equation that can be obtained from the above data. [8 marks]

1.3 Interpret the coefficients a and b. [5 marks]

**(20 marks)**

**Question 2**

Use the following time-series data to answer the questions.

| Period | Time Series |
|---|---|
| 1 | 48 |
| 2 | 41 |
| 3 | 37 |
| 4 | 34 |
| 5 | 36 |
| 6 | 31 |
| 7 | 43 |
| 8 | 52 |
| 9 | 60 |
| 10 | 48 |
| 11 | 41 |
| 12 | 30 |

2.1 Develop forecasts for periods 5 to 12 using a 3-period MA. [10 marks]

2.2 Explain the four main components of time series data. [15 marks]

**(25 marks)**

**Question 3**

Financial analysts like to use the standard deviation as a measure of risk for a stock. The greater the deviation in a stock price over time, the riskier it is to invest in the stock. However, the average prices of some stocks are considerably higher than the average prices of others, allowing for the potential of a greater standard deviation of price. For example, a standard deviation of $5.00 on a $10.00 stock is considerably different from a $5.00 standard deviation on a $40.00 stock. In this situation, a coefficient of variation might provide insight into risk. Suppose Stock X costs an average of $13.21 per share and has shown a standard deviation of $5.28 for the past 30 days. Suppose Stock Y costs an average of $2.52 per share and has shown a standard deviation of $0.50 for the past 30 days.

3.1 Use the coefficient of variation to determine the variability for each stock. [8 marks]

3.2 Based on the coefficient of variation, which is the riskier stock. [2 marks]

**(10 marks)**

**Question 4**

Compare and contrast the Laspeyres index and the Paasche index. [20 marks]

**(20 marks)**

**Question 5**

5.1 Distinguish between probability and non-probability sampling techniques, giving examples of each. (15 marks)

5.2 For a study that consists of personal interviews with participants (rather than mail or phone surveys), explain why simple random sampling might be less practical than some other sampling methods. (10 marks)

**(25 marks)**

**FORMULAE**

Mean for:

i) Ungrouped data $= \frac{\varepsilon x}{n}$

ii) Grouped data $= \frac{\varepsilon fx}{n}$ or $\frac{\varepsilon fx}{\varepsilon f}$

Mode for grouped data $= L_m + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2}\right) C$

Median for grouped data $= L_m + \left(\frac{\frac{n}{2} - F}{fm}\right) C$

Standard deviation for ungrouped data $= \sqrt{\frac{\varepsilon\left(x - \bar{x}\right)^2}{n-1}}$

Standard deviation for grouped data $= \sqrt{\frac{\varepsilon f\left(x - \bar{x}\right)^2}{n-1}}$

Coefficient of variation $= \frac{SD}{x} x100$

Regression equation $Y = a+bx$

Parameters i) b $= \frac{n\varepsilon xy - \varepsilon x \varepsilon y}{n\varepsilon x^2 - (\varepsilon x)^2}$

ii) a $= \bar{y} - b\bar{x}$

Correlation coefficient (r) $= \frac{n\varepsilon xy - \varepsilon x \varepsilon y}{\sqrt{n\varepsilon x^2 - (\varepsilon x)^2}.\sqrt{n\varepsilon y^2 - (\varepsilon y)^2}}$

Coefficient of Determinant $= r^2$

Spearman Rank Correlation coefficient –Rho = $1-\frac{6\varepsilon D2}{N(n^{2-1})}$

Simple Price index $= \frac{Pn}{Po} x100$

Simple Aggregate price index $= \frac{\varepsilon P_n}{\varepsilon P_o} x100$

Indices: Laspyre quantity index $= \frac{\varepsilon P_o Q_n}{\varepsilon P_n Q_o} x100$

Pasche quantity $= \frac{\varepsilon P_n Q_n}{\varepsilon P_n Q_o} x100$

Fischer Index $= \sqrt{L_q x P_q}$

Probability: i) Poison Distribution $= \frac{\frac{x}{1}.e^{-1}}{x!}$

ii) Combinations $= \frac{n!}{r!(n-r)!}$

Interval estimate for population mean σ known: $\bar{x} \pm z\alpha_{/2} \frac{\sigma}{\sqrt{n}}$

| Value of $z\alpha_{/2}$ for the most commonly used confidence intervals | | | |
|---|---|---|---|
| Confidence level | $\alpha$ | $\alpha_{/2}$ | $z\alpha_{/2}$ |
| 90% | 0.1 | 0.05 | 1.645 |
| 95% | 0.05 | 0.025 | 1.960 |

| | | | |
|---|---|---|---|
| 99% | 0.01 | 0.005 | 2.576 |
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