MTH4114
Computing and Data Analysis with Excel

Duration: 2 hours

Apart from this page, you are not permitted to read the contents of this question paper until instructed to do so by an invigilator.

You should attempt ALL questions. Marks available are shown next to the questions.

Calculators are not permitted in this examination. The unauthorised use of a calculator constitutes an examination offence.

Complete all rough work in the answer book and cross through any work that is not to be assessed.

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Exam papers must not be removed from the examination room.

Examiners: Dr S. Sarfo And Dr S. del Bano Rollin

Turn Over

NOTE:
For this exam, there are **5 marks** available for presentation and proper organisation of work.

Question 1. [25 marks]
Use the worksheet labelled **Question 1**

You are given a data file named data.txt (on QMplus) which contains the historical weekly closing adjusted prices for four different shares over a 10-week period. The file is an ASCII text file, and each line contains five fields, separated by commas and tab space. The first field is the date, given in the format dd/mm/yyyy, and the remaining fields contain the prices for the four shares. We show here the first three lines of the file:

```
02/07/2017,262.89447,207.152863,344.5,201.170151
09/07/2017,255.315704,207.50119,325,207.273743
16/07/2017,259.548004,204.067734,328.5,210.882217
```

Download this data file from QMplus, and import the content into an Excel spreadsheet. (You may need to process the data, so that Excel correctly recognises the first field as a valid date.)

(a) Create a single line graph to compare the price trend (price vs date) of all four companies over the time period.   **[5]**

(b) Adjust the properties of your graph to display:

   (i) a suitable chart or graph title.   **[1]**

   (ii) date values (instead of number series) on the horizontal axes.   **[2]**

  (iii) title to the axes.   **[2]**

  (iv) the legend should have the name of the right company.   **[2]**

(c) Calculate the return on each share price.   **[4]**

(d) Calculate the mean return over the 10 weeks for each company.   **[2]**

(e) Calculate the excess return of each return value over the mean return.   **[2]**

(f) Use the excess returns in (e) above and the return values in (c) above to generate a variance-covariance matrix.   **[5]**

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Question 2. [24 marks]
Use the worksheet labelled **Question 2**.

The data range A5:G15 contains seven columns of attributes of watches in stock for sale in a supermarket.

(a) Convert the data range **A5:G15** to a table and give your table a suitable name. **[4]**

(b) Concatenate the content of column B (**Product)** and column C (**Date)** in column G to give the **Detailed description**. The first (in cell G6) is done for you. **[4]**

(c) Write a formula (a VLOOKUP FUNCTION) in cell B24 to take in the product code and return or yield the detailed description of the product. **[4]**

(d) Write another formula (a VLOOKUP FUNCTION) in cell C24 to take in the product code and return or yield the price of the product. **[4]**

(e) Autofill your formulas in B24 and C24 down to B26 and C26. **[3]**

(f) Adjust the formula to display blank (instead of **#N/A**) in columns B and C if the product code entered is wrong. **[5]**

Question 3. [24 marks]
Use the worksheet labelled **Question 3**

(a) On the worksheet labelled **Question 3** is the Summary Output of a linear regression between the share price returns of Orion plc (a FTSE 100 company) and returns on the FTSE 100 index.

    (i) In cell C21, write down the correlation coefficient for the regression.   **[3]**

    (ii) In cell C23, write down the linear equation between the returns on the share prices and returns on the FTSE 100 index.   **[3]**

(b) Consider the function
$$f(x) = x^3 - x - 1$$

    (i) Generate 11 points for the interval $-5 \leqslant x \leqslant 5$ and a chart showing a plot of this function.   **[8]**

    (ii) Create a table with values of $f(x)$ and $f'(x)$ and using one or more appropriate initial values x_0, implement the Newton-Raphson method in Excel by to determine all the (real) roots of f to 4 decimal places.   **[10]**

    Hint: The Newton–Raphson formula is:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}.$$

Question 4. [22 marks]
Use the worksheet labelled **Question 4**

(a) Use MS Excel to solve the following simultaneous equations.

(i)
$$\left.\begin{array}{rcr} 4x + 9y = & 8 \\ 8x + 6z = & -1 \\ 6y + 6z = & -1 \end{array}\right\}$$

[**8**]

(b) Use MS Excel to implement the trapezium rule with four ordinates (three strips) to find an appropriate value to 3 decimal places for each of:

(i)
$$\int_{1.5}^{6} x^2 \sqrt{x^2 - 1}\, \mathrm{d}x.$$

[**7**]

(ii)
$$\int_{0}^{2} 6^x \, \mathrm{d}x.$$

[**7**]

End of Paper.