ICM142 – Programming for Finance - Spring 2018

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Deliverables

This course is graded based on an individual Programming and Empirical Finance assignment.

You should prepare a report using your knowledge from the course. The report should contain up to 3000 words (the word limit does not include references and tables) and it must be submitted electronically. Exceeding the word limit may be penalised; where any words past the limit would not be reviewed. Please submit a single report file. The output from any software you use to perform your calculation should be presented in the report and not submitted as a separate file. Also, include your programming code in an Appendix.

The deadline for electronic submission of the assignment on Blackboard is **12pm, Friday 20th April 2018**. Extensions to the deadline will only be given in very exceptional circumstances. Any such request for an extension must be agreed by the ICMA Centre's Senior Tutor and must be accompanied by a completed extenuating circumstances form available from: http://www.reading.ac.uk/internal/exams/student/exa-circumstances.aspx. Late submissions will be penalised according to University policy: https://www.reading.ac.uk/web/files/qualitysupport/penaltiesforlatesubmission.pdf.

As part of the submission process for the assignment, you are required to upload an electronic version of your work to the Blackboard site. Reports must be submitted in one of the following formats: **Word or PDF** files. Follow the procedure below to submit your project, which must be submitted as **one** single file.

1. Go to http://www.bb.reading.ac.uk
2. Enter your login and password and click login.
3. Click on **Programming for Finance (2017/18)**
4. From the left-hand menu, go to **Assignments.**
5. Click on **View/ Complete** under **PFF Assignment**
6. You will see a box on the screen, as shown below:

First name	Your first name will automatically default through
Last name (Family name)	Your Last name will automatically default through
Submission Title	**Enter your submission title.**

   Please note that your title must include your full name followed by PFF_Project, e.g. FirstName_LastName_PFF_Project

7. Click the **browse** button and select the file for your assignment on your computer (Remember that this must be one file only).
8. Click the **submit** button.
   The beginning of your assignment work will be shown on screen. Please check at this stage that you are submitting the correct file, as you are only allowed to submit one file.
   Note: All the formatting of your assignment is temporarily removed by Turn-It-In from the version shown on screen, and any Greek symbols and diagrams will disappear. Your assignment appears as a simple text file. Click the yes, submit button.

9. You will see on the screen a submission confirmation. You will also receive an e-mail from Turn-It-In UK confirming the receipt of your submission. Please keep this safe. This e-mail is also your **proof** of submission.
10. Log off. Click **log out** at the top of the screen.

Please note that only authorised ICMA Centre staff will be able to view the Turn-It-In report.

Assignment

Answer all parts of the following question. Marks allocated to each part in square brackets.

Data source for Questions 2 through 5 needs to be the same, and has to be mentioned at the beginning of your report

1) Many people find it difficult to understand blockchain because it requires the coordination of many components for it to function, and it's hard to see the full picture until all the individual components are fully understood. In brief, please explain the following from a technological standpoint: What are the basics of interaction of cryptography and economics? What is your fundamental understanding of Bitcoin and blockchain technology? [10]

2) What were the key events for Cryptocurrencies from February 15, 2017 till February 15, 2018? Create a timeline with the key dates and the key events. What was the reaction in Bitcoin trading (BTC) on these dates? Did the BTC price go up or down? By how much? What was the mean return on key events dates? What was the median return? What was the standard deviation? Create a variable that takes the value 0 on days without key events and 1 on days with key events. Calculate the correlation between the key events variable and the behaviour of Bitcoin, Ethereum (ETH), Ripple (XRP) and Nasdaq. Perform a regression analysis between the previous variables and briefly comment on the results. [25]

3) Create a function called assess_portfolio() that takes as input a description of a cryptocurrency asset portfolio and computes important statistics about it. You are given the following inputs for analysing a portfolio:
    - A date range to select the historical data to use (specified by a start and end date). You should consider performance from close of the start date to close of the end date on a daily basis, if you choose intraday data then please use daily median price.
    - Symbols for each cryptocurrency asset (e.g., BTC, ETH, XRP, LTC).
    - Portfolio allocations for each asset at the beginning of the simulation (e.g., 0.2, 0.3, 0.4, 0.1) which should sum to 1.0.
    - Total starting value of the portfolio (e.g. $1,000,000)

    Your goal is to create a programme to compute the daily portfolio value over the given date range within a sample period from: February 15, 2016 to February 15, 2018, and then the following statistics for the overall portfolio:

    - Cumulative return
    - Average period return (if sampling frequency == 252 trading days then this is average daily return)
    - Standard deviation of daily returns

- Sharpe ratio of the overall portfolio, given daily risk-free rate (usually LIBOR), and yearly sampling frequency (usually 252, the number of trading days in a year)
- Moving historical volatility (i.e. moving historical standard deviation of the log returns)
- Ending value of the portfolio

Are these returns all positive? Or not? What is your explanation for what you observe?   [25]

4) Create an event study profile of a specific market event in the Cryptocurrency market, and compare its impact on two relatively liquid cryptocurrencies. The event is defined as when the daily median price / daily close price of the cryptocurrency is 15% lower than the previous day. Evaluate this event for the time period: February 15, 2016 to February 15, 2018. Create and describe your own trading strategy based on the findings, to include writing the code for your trading strategy and execution of the strategy with relevant output in plots.   [20]

5) Now that you've got your trading strategy at hand, it's a good idea to also backtest it and calculate its performance. However, when you're backtesting, it's a good idea to keep in mind that there are some pitfalls. For example, external events such as market regime shifts, which are regulatory changes or macroeconomic events. Also, liquidity constraints, could affect your backtesting heavily. Create your own 'market event' and experiment with it using your trading strategy developed in the previous question for a cryptocurrency portfolio. Consider answering these questions:

- Explain why the event chosen is a relevant 'market event'?
- Is it possible to make money using your event?
- If it is possible, what is your trading strategy? Think about details of entry (buy) and exit (sell), how many days would you hold?
- Is this a risky strategy?
- How much do you expect to make on each trade?
- How many times do you expect to be able to act on this opportunity each year?
- Is there some way to reduce the risk?   [20]

For questions 2, 3, 4 and 5, you will need to write code in Python 3.6 using Python functions, libraries and classes. You will need to respect the good programming practices such as commenting your code so that it is clear (to you and other programmers that might read it) as to what it attempts to execute.

Assessment Criteria

Your work will be assessed in terms of how well you have carried out the various parts of the assignment, in terms of: appropriate understanding of key concepts / principles discussed in class (programming code, functions, classes, commenting); correctness, clarity, completeness and relevance of your interpretations and commentaries.

The marks assigned to each part of the assignment are given in square brackets at the end of each part.