WORLDQUANT UNIVERSITY

Group Work Project

MScFE 560

Data Feeds and Technology

Revision Date: 09/07/2019

Overview

This document describes the requirements for the three Group Work Project assignments which must be submitted at the end of week 3, 5, and 7 respectively. Within a week of each submission, your group will receive feedback from the WQU Instructional Team, enabling you to use the feedback to revise your assignment ahead of the second and third submissions. You will use the Group Work Forum to communicate with your peers throughout the course.

Please make use of the **LIRN Library** located on the left pane of your screen as the primary resource for your research.

Your research should favor authoritative, scholarly sources, and you must cite all sources where relevant. The task is not to reproduce the research of others, but instead to develop your own systematic narrative that addresses the research topic and is informed by the research of others. Not only are you required to cite accurate and relevant facts, but you must also present your own clear logic when linking and contextualizing these facts.

Visit the **Student Resource Center (SRC)** where you can find resources on **how to conduct research**, how to use different sources of information, how to **cite references to** a**void plagiarism**, and how to use the **MLA citation style.**

Group Work Project Objectives

Submission 1: Develop a C# application that allows you to add property information to an Excel worksheet and apply statistical methods to that information

Submission 2: Compare and contrast the key concepts of different blockchain technologies including Bitcoin, Ethereum, Hyperledger, and Corda

Submission 3: Explore the key concepts of smart contracts. and their applications to financial engineering

Submission 1: Using C# and Excel to Track Property Prices

For this submission, you will explore the use of C# and Excel to keep track of the pricing of various properties. You are required to implement various useful statistical calculations which will allow you to gain further insight into the overall trends of the property market.

You are provided with skeleton code which includes an already implemented command line interface, which functions according to the menu presented when the application is run:

```
Select an option (1, 2, 3, 4, 5) or enter 'x' to quit...
1: Add Property
2: Calculate Mean
3: Calculate Variance
4: Calculate Minimum
5: Calculate Maximum
```

Figure 1: Common line interface

For this submission, complete the following tasks:

1. **Set up the worksheet when the application is launched for the first time -** The main method already calls a method "SetUp"; therefore, you simply have to implement this method, which should create a new Excel workbook titled "property_pricing.xlsx"

2. **Implement the adding of property information to the sheet -** The property information headers are as follows:
    a. Size (in square feet)
    b. Suburb
    c. City
    d. Market value

    The command line interface already calls a method "AddPropertyToWorksheet", so you will simply have to implement this method.

    Note: It will be useful here to make use of a counter, which can be stored to the right of the last header, so that you have an easy reference to know how many rows of data are stored in the sheet. This will be useful for the statistical calculations, and to know where each row should be inserted when adding new rows. The counter would be a number stored in a known cell.

3. **Implement statistical methods -**. In the skeleton code you find the following four statistical methods already declared:
    a. Mean market value
    b. Variance in market value
    c. Minimum market value
    d. Maximum market value

    Your task is to update these methods to perform the correct work based on the data from the sheet. These methods are already called in the command line interface, so you only need to implement the method.

Submission 2: Key Concepts in Blockchain Technologies

The purpose of this submission is to explore different blockchain platforms in order to understand the solutions available in the market today and, more importantly, to solidify your understanding of the key concepts of blockchains.

As a starting point to compare different blockchain technologies, use Module 5: Cryptocurrencies course notes as well as the notes below on settlement finality.

Settlement Finality: Payments Perspective

Much of the interest around blockchain, particularly Bitcoin, is its potential role as a payments system. As such, it is worth considering the concept of settlement finality for each of these technologies.

At a high-level, settlement finality refers to the concept of a payment being irrevocable – i.e. once a payment is made, and settled, it cannot be reversed. Interestingly, this is particularly important in the prevention of bank runs. Let's consider a more relevant example around what settlement finality is by looking at Bitcoin.

Bitcoin uses a proof-of-work consensus algorithm, which relies on miners sorting transactions into blocks, and timestamping them. However, should 51% of the network choose to, it is possible to go back and re-mine the chain. As such, Bitcoin has a probabilistic settlement. Essentially, it is always theoretically possible that a payment can be reversed. (Of course, this possibility decreases significantly with chain length and the number of miners.)

See the following reference: https://www.mangoresearch.co/settlement-finality-pow-pos-blockchain/ for a more detailed explanation.

For this submission, your task is to describe and compare the key concepts of different blockchain technologies:

1. Bitcoin
2. Ethereum
3. Hyperledger
4. Corda

For each of the technologies above, discuss the following:

1. **Scalability** – i.e. the ability for the system to process transactions
2. **Consensus protocol** – i.e. how the network reaches a state of consensus or how the integrity of the ledger is maintained.
3. **Privacy** – i.e. the degree to which users and transactions are private.
4. **Degree of decentralization** – i.e. whether there are central points of failure or authority.
5. **Settlement finality** – i.e. whether transactions are truly final and irrevocable.

Write a report of 1-2 pages for each of the points above.

Submission 3: Key Features of Smart Contracts

The purpose of this submission is to explore smart contracts in order to understand their current and future relevance to financial engineering as well as to demonstrate your understanding of the key concepts in smart contracts.

Smart contracts and the blockchain platforms on which they run represent a distinct departure from traditional trading solutions as the ones introduced in the Financial Markets course. Your task is to compare smart contracts to those traditional trading solutions. In your report include the following:

1. Describe smart contracts.
2. Explain how smart contracts function and achieve this functionality (in the Ethereum network).
3. List and explain the advantages of using smart contracts as compared to traditional trading solutions.
4. List and explain the disadvantages of using smart contracts as compared to traditional trading solutions.
5. Identify and describe one appropriate use-case for smart contracts.