

Appendix E

Table of Contents

Table of Contents	1
Meeting and discussion with client and students	1
Summary:	1
Agenda:	1
Recommendations:	3
Mr. Vorlow:	3
Students:	3

Meeting and discussion with client and students

Summary:

On the 5th of December, a meeting was organised in which the client Mr. Vorlow and his IB Economics students were gathered to try out the program and discuss any issues. Initially, I explained to them all the functionalities of the program, and how it is intended to be used, and then I allowed them to use it and discuss what aspects they liked and disliked about it.

Overall, the clients really liked the program and were impressed by its functionalities. Mr. Vorlow found it very helpful and interesting, however he did have some recommendations to be made in the future, which are mentioned later on.

Here are the comments and discussions made by the various stakeholders about the program.

Agenda:

Date Meeting: 5-12-2019

Present: Mr. Vorlow, 15 Economics students

Criterion 1.1: "The product will model a perfectly efficient market."

Comments: Mr. Vorlow was satisfied with the underlying "economic theory and assumptions" in the stochastic moving average algorithm used in order to simulate future stock prices.

Criterion 1.2: " The product will model market volatility"

Comments: Students were impressed by the generation of the graphs of the stock price time series and how “realistic” they looked. Mr. Vorlow concurred and was pleased with the attempt at “simulating geometric brownian motion” which “captured the essence of random shocks”, thereby accurately illustrating the above erratic behaviour.

Criterion 2.1: “The product will enable the use to buy shares”

Comments: The students once logged in to the main menu interface, they found it “intuitive and easy to find the area where they would be able to buy shares”; no difficulties were reported.

Criterion 2.2: “The product will enable the use to sell shares”

Comments: Similar outcome as described in comments in Criterion 2.1. The students once logged in to the main menu interface, they found it “intuitive and easy to find the area where they would be able to sell shares”; no difficulties were encountered.

Criterion 2.3: “The product will enable the user to short shares”

Comments: According to Mr. Vorlow, this was the “only shortcoming” of the program as it was not included in the prototype. He stated that it “did not affect much” and did not “detract much at all from the overall functionality of the program”. He was “very pleased with the effort”.

Criterion 3: “The product will model change in the value of the portfolio”

Comments: The portfolio would successfully update, thereby capturing the real-time aspect of trading in the stock market. Mr. Vorlow expressed that he was impressed by the fact that each time a user loaded their portfolio, they could see whether the value of their stock increased or decreased by means of a tick that would either be a ‘+’, a ‘0’, or a ‘-’. However, the program would only be able to update daily, as that was the interval of stock values available from the JSON file where they were retrieved from.

Criterion 4: “Multiple portfolios - each for a user - will be stored in a database once initialised and their values tracked in real time”

Comments: Mr. Vorlow was satisfied that “multiple users could log in to a single computer (one at a time)”. That is the product could successfully support multiple users. The community options also worked whereby one could view the portfolios of all the users on one device. The values of the portfolios updated successfully, albeit they were only able to update daily.

Criterion 5: “The Product will use historical data from companies stored in a database format to make predictions for their future price using monte carlo/stochastic methods.”

Comments: Instead of a database, the data used was taken from a JSON file made available by the Alpha Vantage API. When Mr. Vorlow was told that, he stated that “the difference was immaterial” and that the “functionality of the program was unchanged.” He even claimed that “it was better” as “it was more efficient, skipping the time it would take loading it from an online source and then processing it, rather than directly”. The stochastic

methods used generated graphs as expected (see comments to Criteria 1.2, 7, 9) and the monte carlo simulation was entailed iterating the above projection and producing a distribution of stock prices, which “worked perfectly” (see comments to Criterion 8).

Criterion 6: “The product will display historical data of companies on a graph.”

Comments: Mr. Vorlow was pleased with the ability of the program to display historical time series for many companies and was satisfied with the shape of the resulting graph (see comments to Criterion 1.2). Also, he was impressed by the additional functionality of being able to zoom in and select a portion of the graph to focus on.

Criterion 7: “ The product will give projections of future price movements of a company’s stock as line graphs using simple statistical procedures incorporating ‘drifts’ and ‘shocks’.”

Comments: Mr. Vorlow was impressed by the algorithm used in the generation of future stock prices. The change in price was determined by the sum of two components. The deterministic one and the random one. The former is proportional to the moving average of the prices thus far in the projection and the random one is proportional to the standard deviation of the stock prices thus far and a random number from a gaussian distribution. He commented that “the algorithm worked flawlessly” and all the “economic and financial assumptions were sound” as they gave a ‘roughness’ and behaviour as one would expect.

Criterion 8: “ The product will produce and display a distribution (approximating a lognormal distribution) given the historical data.”

Comments: The students expressed interest in this feature and by direct observation of some operating it, I frequently saw students changing the number of intervals of stock prices (bins) and the number of projections (number of stock values), thereby affecting the shape of the model

Criterion 9: “The product will use statistical methods and models. More specifically, random walks and Geometric Brownian Motion.”

Comments: The students were intrigued by the generation of projected stock price time series and frequently asked “how it was implemented”. They also reported that it seemed to “match the previous trend of the historical data” which was also displayed on the same graph.

Criterion 10: “The product will include social media posts, more specifically, tweets generated from a simple query using an API.”

Comments: The students were quite impressed by the above social media tool and frequently used it, not hesitating to express how they began to see its “importance in observing trends regarding the direction of the stock market”, which could help them “make better informed decisions”. Mr. Vorlow commented that maybe the feed “could be made more colourful”.

Recommendations:

From the feedback received from the students and Mr. Vorlow, I wrote down the main recommendations. Here is a summary of what they proposed as extensions of the program for a potential future iteration of the software development cycle.

Mr. Vorlow:

1. He said it would be nice it would be possible to implement “a way of influencing the value of the stock price given on the volume of stocks bought or sold by the users”. For instance, if someone bought “50 Microsoft shares”, this could exert an “upward pressure on its stock’s price due to an increase in demand” and would manifest as a positive shock for a “certain period of time such as a week perhaps”.
2. Mr. Vorlow also expressed that monitoring the value of the stock prices in “finer time intervals such as every hour or even every 15 minutes” would constitute an improvement to the current system. However, the feasibility of the above is questionable due to the API constraints placed on me as the options for a free API providing many functionalities were limited.

Students:

3. The students mentioned that it would be nice for the program to have an extension in order to “display a list of students’ portfolios between different machines”, not just locally on one machine. This would require the product to be “accessible as a website”.
4. There were also some suggestions regarding the implementation of a “ranking tool” that would display user’s portfolios in order of highest to lowest according to some metric such as the “total value of all stocks owned” by the users.