Initial Plan: Explainable machine learning for exploiting technical and fundamental indicators in stock trading

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Project Description

Two of the most commonly employed tools for predicting the stock market and selecting stocks are technical analysis and fundamental analysis. Where technical analysis is a more short-term method that often utilises daily prices and trading volume to make predictions, fundamental analysis is a more long-term method that focusses on the intrinsic value of a company, using financial statements and more broad economic indicators. Research into these financial indicators has shown that the most effective method of predicting the stock market is a combination of these two tools[1].

The use of machine learning in forecasting the stock market has been researched extensively, including research into machine learning in the use of fundamental analysis and machine learning in the use of technical analysis. However, the research into a hybridisation of these techniques using machine learning is surprisingly somewhat limited. This project aims to fill this gap by producing an explainable machine learning model for fundamental and technical analysis and evaluating its effectiveness.

Aims and Objectives

Aim: Produce and evaluate an explainable machine learning algorithm for predicting the stock market that combines both fundamental and technical analysis techniques.

Objectives:

1) Perform background reading into machine learning in stock market prediction, including:

- Collecting research to be used in Literature Review
- Identifying machine learning models for fundamental and technical analysis to be used for hybridised method
- Finding sources of stock market data to be used in the testing and evaluation of hybridised technique
- Identifying evaluation models for the efficiency of a technique in forecasting the stock market.

2)Effectively implement the hybridised model

3) Evaluate hybridised model – involves using the evaluation model and data identified in the background reading, and comparing the hybridised model to technical and fundamental machine learning techniques on their own.

4) Write the dissertation – perform a writeup of everything covered up to this point

Potential Risks:

This project requires a lot of background reading, as can be seen by the list of topics that need researched. Therefore, there is the risk that I spend too much time on the initial background reading, which would be a problem as there is a large technical component to this project that I need to allocate a significant amount of time to. In addition, the topic of finding techniques for fundamental and technical analysis could potentially cause problems for me, as the techniques must be free to access, capable of integrating with each other and be able to produce an output that it is interpretable to a human being, meaning that the amount of techniques that can be used could potentially be limited and hard to find. To mitigate this, the work plan allows more time for background reading and research than I would normally allocate, due to the volume of information that needs gathered.

One potential risk is that my experience implementing machine learning algorithms is very minimal, meaning that the implementation could possibly prove more difficult than expected, leading to delays. Another potential risk to the implementation stage is the difficulty of integrating the fundamental and technical techniques. This is because the techniques will most likely work on completely different sets of data, and could potentially even require different programs and technologies to one another, making integration more difficult than anticipated. To mitigate this, I will create a strict work plan that allocates a significant amount of time to the implementation stage, ensuring that enough time is allocated.

The evaluation could potentially show that the hybridised model is more effective than the fundamental or technical analysis models on their own, which would essentially mean that the implementation of the integrated model has failed. Therefore, I will ensure that the algorithms for fundamental and technical analysis are compatible, and I will dedicate a significant amount of time to testing in the implementation stage, to ensure that the model is working.

As the write-up stage will be the last stage of a challenging project that has a lot of risks associated with it, it is possible that there is not as much time as anticipated to perform the writeup. This could potentially lead to a poorly written writeup if there is not enough time to write to a good quality. Therefore, I have given myself a “flexi-week” in the work plan before the writeup, which ensures that if there any leftover tasks or significant delays they do not eat into the write-up period.

Feasablitity:

- Accessing stock market data: It may be hard to find existing stock market data that is free to access in order to test and evaluate the integrated model
- Technology: As this project is centered around machine learning, special machinery may be required to train the model, e.g. GPUs. If this is the case, it is important that this is identified as early as possible, as this technology is in short supply and it would therefore be critical that the technology is reserved as early as possible
- Accessing Algorithms: There may be some licensing issues in accessing the algorithms/programs that are used for fundamental and technical analysis.

Therefore, it is important that all programs used are open source, or else the correct permissions are gathered before use.

Ethical Considerations:

- One potential ethical consideration is in the privacy of any financial data gathered for the project i.e. stock prices, financial statements etc. It is crucial to obtain this data in the right way and follow any related data protection laws.
- Another potential ethical consideration is in the obtaining of existing programs/algorithms to produce the hybridised method. It is crucial that these algorithms/programs are properly referenced to ensure that it does not look like they are being passed off as my own work. The correct permissions will be required also before use.

Work Plan:

Task Name	Estimated Start Date	Estimated End Date	Milestones
Write Initial Plan	20/01/25	02/02/25	➢ Have initial plan completed and submitted by estimated end date
Background Reading	02/02/25	24/02/25	➢ Gather at least 50 references to be used in literature review/background and throughout the paper ➢ Identify at least 1 machine learning algorithm for both fundamental and technical analysis that are open source and eligible to be integrated with each other ➢ Identify an evaluation model to evaluate the implemented model ➢ Find a source of data to be used for testing and evaluation of the combined model
Implementation	24/02/25	24/03/25	➢ Produce a working explainable machine learning model for forecasting the stock market that takes in stock market data, uses machine learning techniques in fundamental and technical analysis and produces a prediction of stock market performance
Evaluation	24/03/25	14/04/25	➢ Produce quantitative data on the effectiveness of the integrated model ➢ Compare integrated model with existing models that use machine learning with fundamental and technical analysis alone ➢ Display data in readable graph formats

Flexi-Week	14/04/25	21/04/25	➢ ((Flexible week to perform any leftover tasks))
Writing	21/04/25	08/05/25	➢ Write up the final report ➢ Ensure report is submitted before deadline

References:

1) (Bettman, J. Sault, S. Schultz, L. 2009. *Fundamental and technical analysis: substitutes or complements?*)