Comparing different Combinations of Fundamental and Technical indicators in stock price forecasting

Juncheng Chen

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PRIFYSGOL

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Initial Plan

Supervisor: Yuhua Li

Moderator: Yipeng Qin

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1. Project Description

Predicting how the stock market will change has always been one of the most difficult things. There are so many factors in this prediction behavior - including physical or psychological factors, rational or irrational behavior factors and so on. All these factors together make the stock price fluctuate violently and it is difficult to predict accurately [1]. In recent years, machine learning has made good progress in stock forecasting and becomes increasingly popular and successful when it can predict financial time series data with high accuracy.

Technical analysis and fundamental analysis are two commonly employed investment tools for making trading decisions and predicting stock prices [2]. Surveys have shown that, applying machine learning to stock price forecasting by combining two kinds of indicators together contributes to achieve better forecasting performance [3]. However, there is still an important but difficult problem existing -there are so many indicators involved in the technical and fundamental analysis. While each of them possibly has a big impact on predicting future returns, it is exante unclear which indicators should be used, and how to combine them to improve trading performance. Existing literature has used machine learning for combining different technical indicators or fundamental ratios but much less is explored to combine both methods.

Therefore, this project aims to compare performance of combining different fundamental and technical indicators together based on machine learning method. In order to complete the project, the company datasets responding different indicators can be retrieved from Quandy package [4] and Yahoo financial website [5]. The project will also implement different machine learning models such as Neural Network (NN) and Support Vector Machine (SVM) to compare forecasting performance. These algorithms will be implemented by using programming language Python and some popular machine learning libraries such as 'sklearn' [6]. If time allows, the project probably considers about some questions such as when MLcombined strategy works and for what types of stocks it works better.

2. Project Aims and Objectives

With the 12 weeks limitation, I have split my aims and objects into main and desirables. Main aims and objectives are the minimum to which must be achieved to complete the project. Desirables are those additional options I would like to complete if there is enough time.

2.1 Main Aims and Objectives

This project main aim is to use different combinations of technical and fundamental indicators as inputs, compare their performance and then determine the combined indicators that performs best in predicting stock price. Furthermore, a comparison of machine learning algorithms will be performed. Appropriate algorithm selection will significantly increase performance of stock prediction.

- Research machine learning models:
 - Research similar financial timeseries analysis project and papers, and study machine learning model such as Neural Network (NN) and Support Vector Machine (SVM)
 - Research python libraries available to help with implementing algorithms such as 'sklearn' [6] or TensorFlow platform [7]
 - Research available python data visualization libraries such as Matplotlib
 - Research suitable ways to compare model performance such as Root Mean Square Error (RSME)
- Research financial terminology
 - Learn about various financial stock terminology such as stock market, trading volume and moving average
 - Research different fundamental and technical indicators and understand their meaning
- Collect and store datasets
 - Collect financial timeseries data from Quandl [4] package or Yahoo Finance website [5]
 - Pre-process dataset in a format enable machine learning model to interpret
- Implement machine learning models, compare stock price prediction
 - performance and visualize the data
 - Develop a comprehensive comparison for stock prediction performance among different combination of fundamental and technical indicators with a suitable visualization of the results
 - o Compare different machine learning models about stock price forecasting
 - Find the most effective indicator combination with most optimal machine learning model
- Evaluate Result
 - Evaluate critically the performance of models
 - Minimize the error value of the analysis

• Use scientific assessment methods to ensure the objectivity of results

2.2 Desirables

- Compare performance of models using combined indicators in different industries:
 - Research industry designation and retrieve corresponding index price data from the MSCI website [8]
 - \circ ~ Find the most effective indicator combination for each industry
- Use other non-standard loss-minimization machine learning algorithms to forecast stock price such as evolutionary genetic algorithm [9] and compare model performance

3. Ethical Considerations

Most financial timeseries data used in this project are from yahoo finance website [5] and QuandI package [4] and they are open to everyone so there is no need for ethical approval.

4. Work Plan

4.1 Deliverables

Deliverables for this project include initial plan (7st February) and final report which must be submitted at the end of the semester. For the deadline on the 13th May, I must submit a final project including report, graphs, source codes and relevant supporting materials.

4.2 Supervisor Meetings

My supervisor Yuhua decided to arrange a weekly meeting with me on Wednesday. This is to keep track of where I am with the development and I can get guidance and support from my supervisor in time.

4.3 Millstones

- Week 1: 31/01/22 06/02/22
 - Gaining some background knowledge of machine learning model and financial stock terminology
 - o Meeting with supervisor and discuss the initial plan
 - Read some referenced papers and gain some basic ideas of project
 - Deliverables: Initial plan
- Week 2: 07/02/22 13/02/22
 - Continue to research on machine learning models
 - o Research on fundamental and technical indicators
 - o Read articles about how to process financial timeseries data
 - o Download and install relevant software and libraries
- Week 3: 14/02/22 20/02/22
 - Learn more about complicated deep learning through blogs and online course
 - Search determined fundamental and technical indicators data, collect and store them
 - o Try to pre-process financial data in specified format
- Week 4: 21/02/22 27/02/22
 - Use financial timeseries data to predict stock price by using simple strategies such as moving average in order to lay a good foundation for the future machine learning model
 - Find a suitable way to visualize the result of prediction performance

- Week 5: 28/02/22 06/03/22
 - Try to integrate a chosen machine learning model to financial timeseries data with combined technical indicators and financial indicators
 - Visualize the result of model performance
- Week 6: 07/03/22 13/03/22
 - Use different combination of fundamental and technical indicators to predict stock price and evaluate which combination gives the best performance
 - Visualize the result of model performance
- Week 7: 14/03/22 20/03/22
 - Implement different machine learning model and compare their performance of stock prediction
 - Visualize the result of model performance
- Week 8: 21/03/22 27/03/22
 - Explore different way to visualize and analyze the result
 - Implement different visualization methodology and analysis methods to analyze the performance of each model
 - o Test the result and minimize the experimental errors
- Week 9: 28/03/22 03/04/22
 - Continue to evaluate and refine the experiments
 - o Continue uncompleted analysis and records all evaluation graphs or tables
 - If time allows, compare model performance in different industries or implement other algorithms

Easter break

- Week 10: 25/04/22 01/05/22
 - Write up initial draft framework of final report
 - o Refine codes and add appropriate comments for increasing readability
- Week 11: 02/05/22 08/05/22
 - Continue to write up the final report
 - Proof reading the final report to meeting the requirement
- Week 12: 09/05/22 13/05/22
 - o Continue to proof reading and check each section with the marking criteria
 - Deliverables: Final report, source code, supporting materials

Reference

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