University of Hong Kong

Final Year Project

Investment Strategy Development in Technology Stocks

Project Plan

Prepared by

Zhang Qingxu

Department of Computer Science

Supervised by

Dr. S.M. Yiu

Department of Computer Science

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Abstract

Technology is one of the driving force of economic growth. Investing in the right technology companies stocks not only yields considerable returns but also boosts business growth which can improve social welfare as a whole. Typical investment methods include traditional equity research and quantitative trading. The former has a focus on in-depth fundamental analysis, but it costs a lot of human resources. The latter is efficient and scalable but focuses on statistical speculation instead of value investment. Taking both investor's interest and social good into consideration, this project will blend in-depth fundamental analysis and quantitative techniques to achieve efficient value investment. For the implementation, both qualitative and quantitative data will be collected and processed. Python is the primary developing language with pandas as the quantitative tool. Different machine learning techniques will be practiced and evaluated through back-testing. A quantitative investing strategy model with respect to business ethics and trends in the technology sector will be delivered in the end. The project website is i.cs.hku.hk/fyp/2019/fyp19054.

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1 Introduction

Technology evolves at a rapid speed and has changed people's day-to-day life in many aspects. Technology is an active driver of global economic development. According to Fortune 500, technology firms possess a dominant position in the world's top companies [1]. Historical data has proven high returns from long-term investment in successful tech firms such as Microsoft and Tencent. In the initial stage, tech firms require capital input to achieve their long-term growth goal, and equity financing is one of the primary sources [2]. Through identifying and investing in promising tech stocks, investors can not only gain good returns but also have a positive impact on society. However, it's not easy to invest in the right tech stocks. First, the variability and uncertainty of technology lead to the difficulties in tech stocks valuation. Second, the business models in the technology sector vary from traditional ones [3]. Third, statistical arbitrage used in quantitative trading may result in some adverse effects on the market so that some capital is not helping the business to grow [4]. Therefore, it is of significance to design and develop quantitative investment strategies which achieve efficient value investment in the technology sector.

2 Background

2.1 Quantitative trading overview

Quantitative trading is composed of trading strategies based on quantitative analysis, which rely on mathematics and statistical probabilities to identify market inefficiency and investment opportunities [5]. Unlike traditional trading, which is supported by traders' expertise or preferences, quantitative trading imports considerable data into the quantitative model and generates trading decisions (See Fig. 1). The input data can be historical stock prices, information related to fundamental factors that underpins the business, market news, and so on. The quantitative model often incorporates three modules, stock selection, trading timing, and risk management. Sometimes traders include the result of the model as part of their research and perform transactions manually. Some traders also allow the model to execute the trade automatically without human intervention. In this case, it is also named algorithmic trading [6]. If the algorithmic trading transacts a large number of orders in fractions of a second and profits from beating the market in terms of speed, it can be categorized as high-frequency trading (HFT) [7].
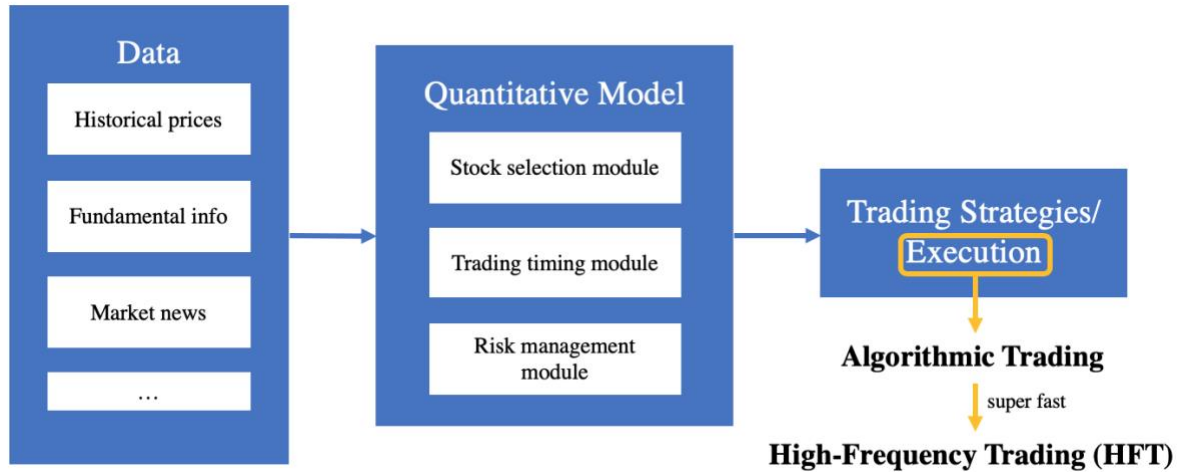
Fig. 1. Quantitative Trading Diagram

2.2 Comparisons between traditional equity research and quantitative trading

Traditional equity valuation often involves fundamental analysis. It is a method of measuring a security's intrinsic value by examining related macro factors such as economic status and micro factor such as the competitiveness of a company [8]. In particular, capturing tech trends is essential in terms of tech stocks valuation [9]. Traditional equity research is more about qualitative analysis than quantitative analysis, and such work is demanding. Equity researchers are typically required to input massive time and energy into their study, which guarantees the depth of the deliverables but lacks efficiency. Their work has a focus on value investment that involves picking undervalued stocks and targets at long-term returns.

As mentioned before, quantitative trading makes use of mathematics, statistics, and computational power to generate investment strategies. With computers, the analyzing process is efficient as well as scalable. However, most of the quantitative trading strategies take advantage of probability with regards to historical patterns. Thus, such speculations are only applicable to the short-term or medium-term investment [4,5].

Traditional	Quantitative
Qualitative analysis	Quantitative analysis
Depth	Wedth/Scalability
Value investment	Speculation
Long term	Short-to-medium term

Table 1. Comparisons between traditional equity research and quantitative trading

3 Objective

Key idea – efficient value investment

This project develops investment strategies in the technology stocks market to achieve efficient value investment by combining in-depth fundamental research with quantitative techniques. On one hand, it takes advantage of machine learning and other quantitative methodologies to efficiently generate monetary returns for the investors. On the other hand, It identifies the undervalued yet promising stocks and contributes to social good through helping capital to flow to the business that exactly needs it.

Scope of technology stocks

This project focuses on technology company stocks in listed in the Hong Kong Stock Exchange (HKEX), National Association of Securities Dealers Automated Quotations (NASDAQ), Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE). The wide coverage of tech stocks is to contrast tech firms in different stages of company life cycle.

4 Methodology

As shown in Fig. 2, this project starts with data processing with regards to business and financial metrics. In the strategy evaluation phase, different machine learning algorithms will be investigated and tested with the data processed before. The first quantitative model will be developed. After back-testing and modification, the finalized quantitative model will be delivered.

Data source

- Quantitative data (e.g. historical stock price) from Yahoo Finance, Bloomberg, etc.
- Qualitative data (e.g. market news) from major social media platforms

Programming language

- Python

Quantitative tools

- pandas (Python library) – data analyst toolkit [10, 11]

Data visualization

- Matplotlib/Bokeh/pandas/Seaborn (Python library) [10, 11]

Machine Learning

A range of machine learning techniques (e.g. LSTM[12], random forest[10, 11]) will be evaluated and the final algorithms used is to be determined [13].
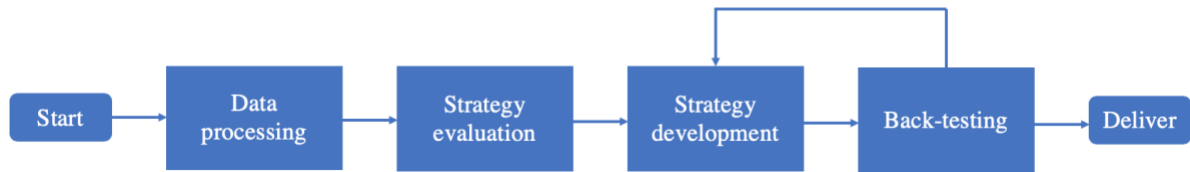
Fig. 2. Project Work Flow

5 Schedule and Milestones

Time	Tasks & **Milestones**
September, 2019	• Ideation and literature review • Project website • Detailed project plan
October, 2019	• Data collection, cleansing and normalization • **Database Construction** • Python package practice
November - December, 2019	• **Evaluation of current investing strategies** • **1st quantitative model prototype development**
January - February, 2020	• Back-testing • Modification of the model • First presentation • Detailed interim report
March - April, 2020	• **Finalized quantitative investing model** • Final report • Final presentation

6 Conclusion and Comments

The detailed plan serves as a guide and explains the intuition for the project. The performance of technology stocks has been drawing a lot of attention. As the business models of tech firms differ from traditional ones, the valuation of tech firms comes with particular patterns as well as uncertainty. Qualitative research and quantitative trading have been widely used in the financial field. Since both of the methods have their own limitations, this project aims to achieve efficient value investment through a combination of qualitative analysis and advanced computational methods. As the writer is doing a second major in Business Design

and Innovation (first major: Computing and Data Analytics), some variables from business analytics will be refined and included in the final quantitative model. Hopefully, this project could generate some positive effects.

The project website is i.cs.hku.hk/fyp/2019/fyp19054.

7 References

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