## 

Bachelor of Computing with Honours in Internet Technology

FINAL YEAR PROJECT

Initial Report

Topic: An Intelligent Index Tracking System

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## Section 1. Problem Definition

### A. Introduction (How the Problem was Found)

Financial services, one of the most important sectors for Hong Kong to earn their income, at the same time, many Hong Kong citizens also make their alternative income through the stock market, which build a very active stock trading activities and vibrant banking activities. (Census and Statistics Department, Hong Kong Special Administrative Region, May 2019)

Nowadays, there are many ways to investment related to index such as Exchange Traded Funds (ETF). ETF is one of the most well-known invest methods, this fund is using index tracking to make profits from the market by average investment profits. ETF is a fund without agent’s judgment but traded by fixed index. The purpose of ETF is using the lowest cost to track the overall market return.

However, we found out that ETF is unfriendly to newcomers who wants to start investing, as there are too many stocks among the world. The most common way to evaluate the performance of stocks in each industry or region is that, number of representative companies will be extracted to be a fractional stock.

### B. Project Aim (The Problem)

The project aims at providing a convenient trading system for newcomers to learn quick and use a lower cost to earn the profit from index. To start with, the current situation in the stock market will be introduced. As mentioned above, to evaluate the performance of stocks, fractional stock is chosen, they form the index to show an overview of performance. In the market, some indexes are famous such as Hang Seng Index(HSI), Standard & Poor’s 500, they use at least 500 fractional stocks to calculate the index.

It causes a problem that, for the newcomers, it is difficult for them to understand the operation of the stock market, as there are too many fractional stocks to look at. Some newcomers may seek help from trading agents, who is in charge of managing the stocks for their customers and provide suitable advice by their analysis on the market. However, most of the agents charge for the wage by each transaction, which leads to another problem, the cost will be extremely high if the client chooses to invest in multiple markets at the same time, if newcomers want to learn quick in the stock market by understanding numerous market, it is extremely difficult for them to invest in the market.

### C. Project Objectives

The proposed objectives are:

* Collect data from the stock markets
* Data Analysis to help investors
* Design and develop an integrated platform for investors
* Evaluate new application against current method

### D. Value Propositions

The newcomers, investors, who are struggling to invest in the market, or have difficulties in focusing multiple stock market, are our potential users. We provide a web-based application which is composed of a data analysis system and an integrated platform. The newcomers can enter the stock market at a lower difficulty and familmize with the stock market. It can shorten the time for them to explore in this sector. As for the investors who have invested in multiple stock market in different regions, they can make good use to manage their stock with the data recorded by the system, which can help them investing in the market well.

Besides data analysis from the stock market, system may provide financial news analysis, which is depending on the news from financial markets, prediction may be made by the system, and provide suggestions to investors. It can help the newcomers and investors to predict the flow of the stock, which may different by just comparing the data in the market. It can increase the accuracy of the prediction of the stock market.

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## Section 2. Background or Literature Review

### A. Problem Analysis

For the newcomers, they want to participate in the stock market by using ETF, but there are two problems with using ETF. It is investing index by fund manager need high cost and it is difficult to let newcomers to learn investment.

Due to the cost of ETF, the cost is including handling fee, transaction tax, fund manager fees, custodial fees, index authorization fee, listing fee and the cost of adjusting the investment.[[2]](https://djinfo.cathaysec.com.tw/school/ET920000.htm) Also, some of the ETF is include a lot of fractional stock, some of those fees are charged by each stock trading. In addition, ETF investment mostly use traditional indexing to index tracking, it means the fund is including all the fractional stock of the index. Investors need to have large principle to invest on all fractional stock. Otherwise, the index performance cannot fully represent to the profits of ETF. For being high accuracy, the cost will also become higher. Therefore, the newcomers are difficult to afford such high cost for investment.

In addition, for those investors do not want to spend time to manage their investment ETF may be a good choice for them to get in the investment market. However, some of the investors want to learn how to invest in stocks by themselves through index tracking. In situation, ETF is not suitable for them, because they cannot learn anything by using fund manager.

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### B. Supporting Technologies

After the research, there are no any software are exactly index tracking software provide for the newcomers. Even, a normal index tracking software, it does not provide for the public to download. The main reason of no exact index tracking software is most of the investor was invested through fund manager than themselves. Since accounted by the fund manager will be more convenient and save time. However, it is unable to let newcomers learn any investment knowledge from investing index.

Some of the similar software was found is portfolio tracking[[3]](https://programmingforfinance.com/2018/02/tracking-a-portfolio-with-python/), it is tracking the stock portfolio. The function of this software is input the self-chosen stock portfolio, the software will be tracking the performance of the stocks on daily or the past. Also, the software will rebalance the rate of the stock invested for make average invest profits, the daily report also will generate automatically to report the return and performance of the stocks. In addition, it can generate the chart to display the risk and return of the stocks. Most data of this software comes from an API call ‘Quandl’, this API will provide the stock symbols, the historical data benchmark symbol and set the data starting date.Yahoo finance also provide much data to calculate the index.[[4]](https://finance.yahoo.com/) Due to the rebalance function, the rate of the stocks is set by user, but the rate may not be the most effective to get the profits. Also, the function of rebalance is only reset the rate to become the original rate which set by the user. Therefore, I think it can be change by using AI to calculate the most effective rate for the stock for get more profits. Also, the software only displays the proportion of the risk and return of the stock. It has not having a risk assessment to the user to find out how high risk the user can be afforded. So that, the software should be provide a risk assessment to the user to let them know about the risk level they can the affordable.

### C. Review of Existing or Related Solutions

For the previous system, it has some is suitable for us to be the reference. The API ‘Quandl’ is a good resource to get the historical data for free, it provides the current price, opening price, closing price of the stock between the period. It also provides a different type of chart for us to build for the user to easily compare the return and risk.Such as Correlation Heatmap, Violin Chart and Risk-Return Plot etc. But there is something that can be improved, such as the function of rebalance should not be only reset the rate of the stocks, it should use AI to calculate the most effective rate to get the profits from the index.

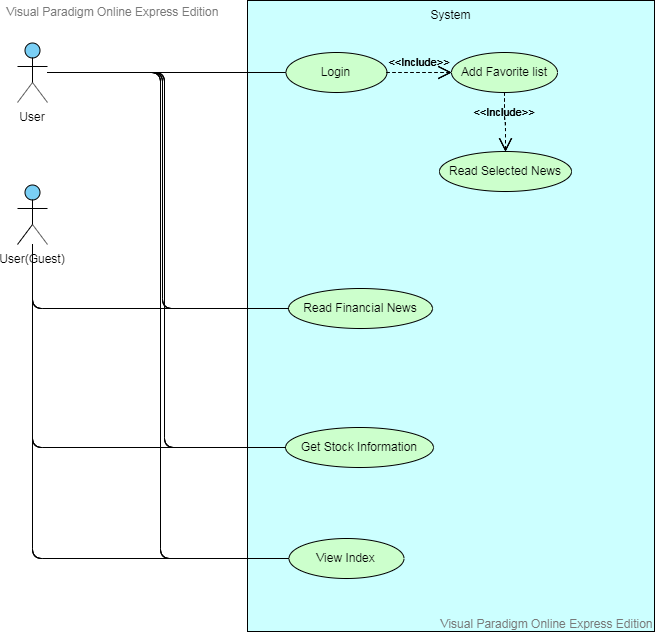
Due to the previous are not suitable for our purpose and there is some function can be improving, so that we must develop a new system which target to index. Make the different between original index and the virtual index of our system to be minimized. At the same time, the user can be user the lowest cost to track the overall market return, thus increasing user passives incomes.

## Section 3. Preliminary Methodology

### A. Overview of Methodologies (Short)

In this final year project, we are going to make a system which can help newcomer or beginner assimilate into financial market. User can use less time to learn about the market. Traditionally, if people want to be a stock investor, they always need to pay amounts of “tuition fee”. They need to learn from failure, which means losing money. Using our system, they can easily monitor the stock and the news about those stocks. The system will send a message to notify user if a news mention it.

Also, our system has an index tracking function. User can easy to get all the data they need to analyze the market trend.The main different with other similar index is that our index going to having less constituent companies to represent the market perform. That means users can get almost the same effect by using less trading fee.



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### B. Requirements, Supporting Technologies, and Technical Gap

The functional requirement as below:

* Index tracking correctly with original index
* Similar change between original index and minimized fractional stock index
* Generate chart to report the return and risk of index
* Risk assessment of user

The main difficulty in this project is that we need to make sure all our data must be updated. In the financial market, people get more information in real time, will have superiority to gain more. We are concerned about the network speed, server speed, program performance .etc. To upgrade network speed and server speed, all we need is to upgrade the hardware. However, we are focused on technical way in this case.

In this project, we are going to improve our program to push up the efficiency. So, we will use better performance’s language. For example, we are going to use PHP7 for client side but not Python. According to the article [[5]](https://stackify.com/php-vs-python-which-should-you-choose-in-2019/) , slow database queries bog down every programming language. And PHP team has done a lot on this. Using local variable rather than global variable is another possible way to increase the speed of programs.

### C. Higher Level System Design

Our system completely functional by having those features we just mentioned. In fact, there are also lots of ways to improve our system.

One way is adding AI prediction for user. The AI prediction system main purpose is to analyze the market trend form finance news.[[6]](https://www.forbes.com/sites/forbesagencycouncil/2018/08/01/do-you-know-the-difference-between-data-analytics-and-ai-machine-learning/#2a24cf565878) The AI are going to read the keywords such as “well”, and those keywords will have a weight. Also according the news company, there are also credibility weight. The system will calculate the point from those weight. The other basis of prediction is the record of the stock. For example, the history of maximum or minimum. It would help to predict if the stock continue rising or falling.

Because of the user may not professional in trading, our system will be a character like personal account executive. According to user's risk assessment, system can give user investment advice. User can easily choose the stock which is suitable for him/her.

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## References

1. Census & Statistics Department, Hong Kong Special Administrative Region. Hong Kong monthly digest of statistics, Hong Kong monthly digest of statistics (May 2019). Hong Kong.
2. Related Fee of ETF  
   (<https://djinfo.cathaysec.com.tw/school/ET920000.htm>)
3. Stock Portfolio in Python

(<https://programmingforfinance.com/2018/02/tracking-a-portfolio-with-python/>)

1. Yahoo Finance (<https://finance.yahoo.com/>)
2. PHP vs Python: Which Should You Choose in 2019? ERIC BOERSMA MAY 25, 2019 DEVELOPER TIPS, TRICKS & RESOURCES (<https://stackify.com/php-vs-python-which-should-you-choose-in-2019/>)
3. Do You Know The Difference Between Data Analytics And AI Machine Learning? (<https://www.forbes.com/sites/forbesagencycouncil/2018/08/01/do-you-know-the-difference-between-data-analytics-and-ai-machine-learning/#2a24cf565878>)

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### Appendix A. Project Plan

|  |  |
| --- | --- |
| Date | Task |
| 05/09/2019 | Identify the project theme |
| 11/09/2019 | Discuss current situation and problems |
| 11/09/2019 | Research about current solutions and technologies |
| 20/09/2019 | Start coding the system |
| 03/10/2019 | First presentation & Review presentation |
| 24/10/2019 | Initial Report Submission |
| 10/2019 | Progress Rate Review |
| 11/2019 | Second presentation |
| 12/2019 | Complete basic function of system |
| 01/2020 | Interim Report Submission |
| 03/2020 | Mock Presentation & Review |
| 05/2020 | Final presentation & Submission of Final Report |

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### Appendix B. (Group Project Only) Team Members' Roles and Responsibility

The following table outlines the roles of every team member in this project.

|  |  |  |
| --- | --- | --- |
| Roles | Member(s) | Remarks |
| Team Coordinator | Fung Wai Yin |  |
| Secretary | Fung Wai Yin |  |
| System Analyst & Designer | Fung Wai Yin | Python |
| Application Layout & UI Designer | Pun Cheuk Kwan | PHP |
| Function Designer & Manager | All members |  |
| Programmer | All members |  |
| Tester and Evaluator | All members |  |
| Database Expert | Yung Chun To Samuel | apache |
| Cloud Server Expert | Yung Chun To Samuel |  |

The following table outlines the task responsibility of every team member in this project.

|  |  |  |
| --- | --- | --- |
| Tasks | Responsible Member(s) | Target Date |
| Technology Test: Python get stock data | Fung Wai Yin | Oct 2019 |
| Technology Test: Python generate chart | Fung Wai Yin | Oct 2019 |
| Technology Test: Algorithm for lowest difference between original index and virtual index | Fung Wai Yin | Nov 2019 |
| Technology Test: Use AI to calculate the best rate of stock allocation | Fung Wai Yin | Dec 2019 |
| Web Application: Design Layout and UI | Pun Cheuk Kwan | Nov 2019 |
| Web Application: User Account | Pun Cheuk Kwan | Nov 2019 |
| Web Application: Risk assessment | Pun Cheuk Kwan | Dec 2019 |
| Server: Account and User Data Management | Yung Chun To Samuel | Oct 2019 |
| Server: Database Management | Yung Chun To Samuel | Nov 2019 |
| Database Setup and Maintenance | Yung Chun To Samuel | Nov 2019 |
| Cloud Server Setup and Maintenance | Yung Chun To Samuel | Nov 2019 |
| Questionnaire Design | Fung Wai Yin | Jan 2020 |
| User Experience Review | All members | Jan 2020 |

Oscar = FUNG Wai Yin

Keith = PUN Cheuk Kwan

Samuel = YUNG Chun To Samuel

### Appendix C. (Group Project Only) Team Meeting Minutes

Meeting 1

|  |  |  |
| --- | --- | --- |
| Date: 13/09/2019 | Time: 11:00am | Place: 9/F, Block A, OUHK |
| Attendee:   1. All members | | |
| Discussion:   * The details of the topic of final year project | | |
| Conclusions:   * Topic defined | | |

Meeting 2

|  |  |  |
| --- | --- | --- |
| Date: 20/09/2019 | Time: 11:30am | Place: 9/F, Block A, OUHK |
| Attendee:   1. Fung Wai Yin 2. Pun Cheuk Kwan | | |
| Discussion:   * Research result , facing problem and schedule of the programming | | |
| Conclusions:   * Decide to spend 6 hour per week | | |

Meeting 3

|  |  |  |
| --- | --- | --- |
| Date: 04/10/2019 | Time: 11:00am | Place: 9/F, Block A, OUHK |
| Attendee:   1. All members | | |
| Discussion:   * Show the progress rate of the program | | |
| Conclusions:   * Need to speed up | | |