Application Of Thai Mutual Funds' Performance Prediction

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Academic Year 2020

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Title: Application Of Thai Mutual Funds
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Approved for Submission

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Date 10 / 06 / 2021

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Acknowledgments

The success of the Application of Thai Mutual Fund Performance Prediction reflects the efforts and support of people and organizations, to all of whom we are thankful. This project will not be successful without the help of many people in so many ways.

We want to express my sincere gratitude to our advisor, Assist.Prof.Dr.Chaiwat Nuthong continually and convincingly conveyed a spirit of adventure regarding research and excitement regarding teaching and suggestion. Without his guidance and persistent help, this project will not be possible.

Finally, we would like to show gratitude to our friends and all who contribute in one way or the other in the course of this project. We also appreciate a chance to have collaborated with other groups as well.

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Abstract

This work presents an application of mutual fund prediction and recommendation. The project is to create a web application that helps users start a mutual fund, even a beginner, and provide the best way to get an optimum return from a mutual fund. Mutual fund prediction determines the future movement of the fund value. The accurate prediction will lead to more profit investors can make. Although the prediction offers a chance for a good return, a lack of accurate knowledge and detailed information would lead to an inevitable loss in investment. Experience is also significant in investment. The features for application are divided into two main parts: fund recommendations and fund simulator. With the two features, users can get recommended mutual funds based on what funds they have invested through the fund simulator so that they have a chance to optimize their trading strategies without putting their own money at risk.

The mutual fund market's complexity can incredibly make many investors not confident enough to stay away from investing. The web application's project purpose will have a guideline for new investors to give new experience with a workable understanding of the mutual fund market and investment. With a unique feature called Wallet Account, beginner investors are allowed to practice trading mutual funds without risking real money and becoming familiar with how the real fund market moves. Fund recommendation shows how much they will lose or gain based on the prediction. Users can put the amount of money in their wallet account to see whether the investment strategy is on the right path. With this system, it will be a useful website for users who are interested in mutual funds investment.

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Chapter 1
Introduction

1.1 Motivation

The investment process requires knowledge, time, skill, and the ability to take a risk since returns are not guaranteed. Investors prefer to earn high rates of return from selected mutual funds. However, most beginner investors struggle not to know how to start investing in a mutual fund. Some rely on prediction without enough information about mutual funds or experience. The lack of basic knowledge results in low returns and high risk. That is why we come up with the idea of our unique features that allow investors to determine how profitable to invest in mutual funds.

The prediction is the act of trying to determine the future value of the selected mutual funds. Investors want to know whether the mutual fund will rise or fall over a certain period. The application developed in this project helps predict which Thai mutual fund gives the highest return profit in three months and six months periods based on the amount of money invested by users.

However, the prediction feature might not help in clarifying some confusions regarding mutual funds. Users have to understand the risk they are taking with their investment. It is for this reason why our project also encourages beginner investors to back-test their investment plan, as it raises the profits they take from mutual funds. We hope the project helps investors get the most effective choice of choosing a mutual fund and find a good mutual fund relevant to their needs.

1.2 Objective

This application's main objective is to help any users who are interested in investment gain the return from the selected mutual funds. The Mutual Fund Prediction Application must have the following features :

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- The system allows users to access information on Thai Mutual Funds with fund recommendation.
- The system provides users an experience to keep track of profit and loss of current mutual funds by having their wallet without risking any real money.

1.3 Scope Of Work

- The prediction value of a mutual fund is shown in percentage. It helps predict the chance of getting profit from the fund that investor buy and hold for the next three months.
- Users are able to access fundamental data of Thai Mutual Fund in the last three years.
- The system is validated using the control logic sent by Machine Learning Algorithms for Thai Mutual Funds Performance Prediction as information.

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Chapter 2
Literature Review

This chapter is a survey of research papers that are related to the Thai Mutual Funds Prediction Application. Section 2.1 gives the overviews of work based on a website similar to this project.

2.1 Related Work

2.1.1 FINNOMENA Appication

Finnomena is an investment knowledge platform that aims to help inexperienced investors create portfolios and make investment potential decisions by providing the knowledge needed in investment and helping personal financial planning tools. Finnomena provides three primary services for Thai investors: Necessary information in investment to evaluate the choice of choosing funds, Investment Advisory, and Fund Supermart.

For the tech stack part, the first use case is that the system shows the information of Thai Mutual Funds, including price, fee, and diagram for chart updates to reflect the market price, as shown in Figure 2.1. Investors can make sound decisions about investing in the market through the Hybrid Robo-Advisor platform, an investment trading hub, as shown in Figure 2.2. The last use case is a mutual fund distributor responsible for buying and selling units of mutual funds by investors, as shown in Figure 2.3.

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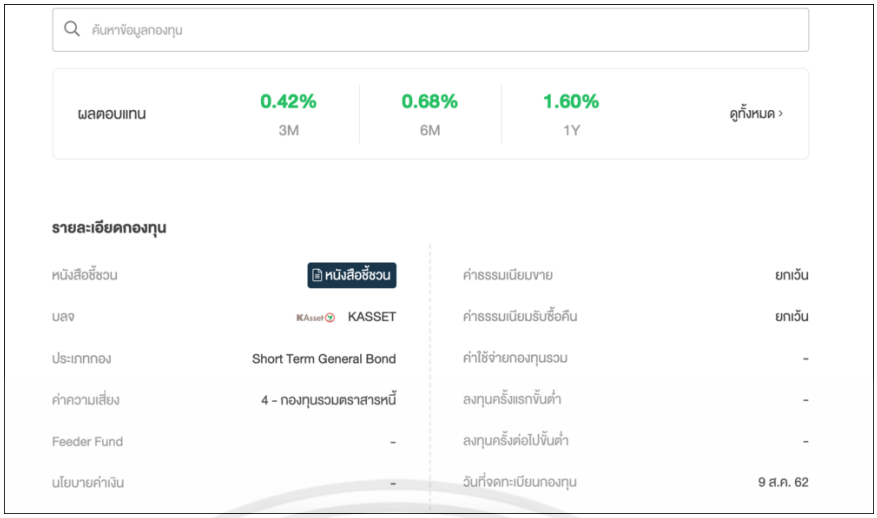

Figure 2.1: Information of a Mutual Fund

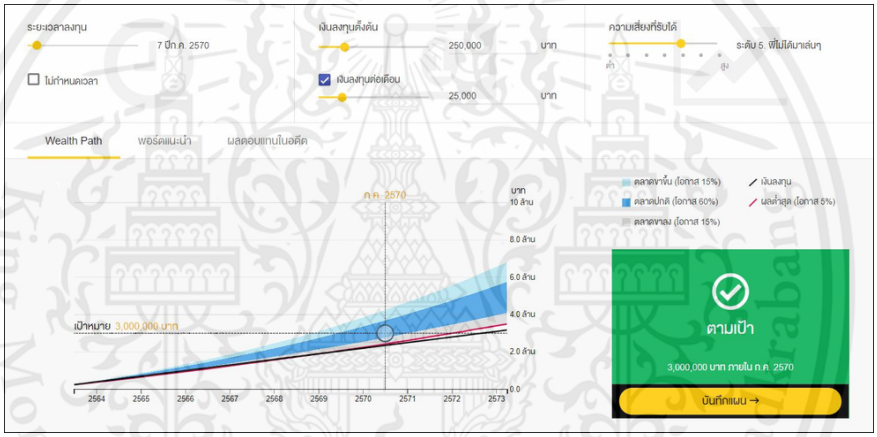

Figure 2.2: Investment portfolio managed by FINNOMENA Robo-advisor

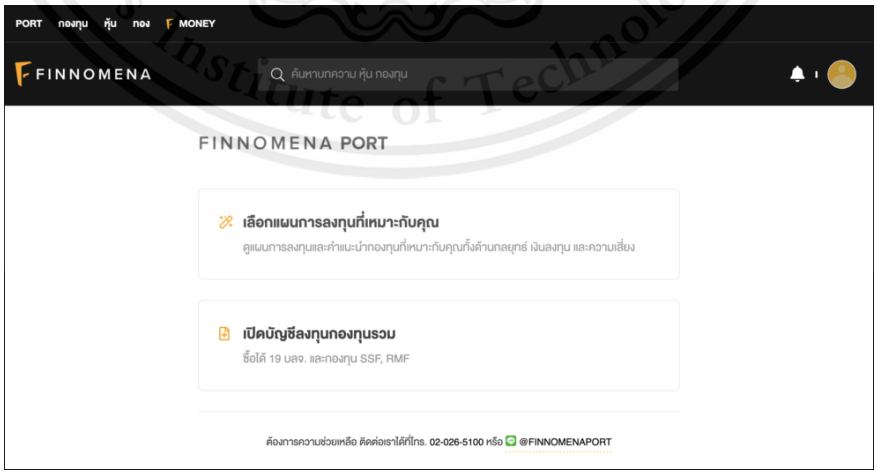

Figure 2.3: FINNOMENA Port

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Figure 2.4 shows the High-Level Architecture of Finnomena. Requests are sent in application/API Gateway in order to make route requests against the services. All stateless Services are more comfortable to create in Google Kubernetes Engine[1] for auto-scaling when it comes to a large number of users. Stateful Services are also deployed to Google Compute Engines (VM)[2].

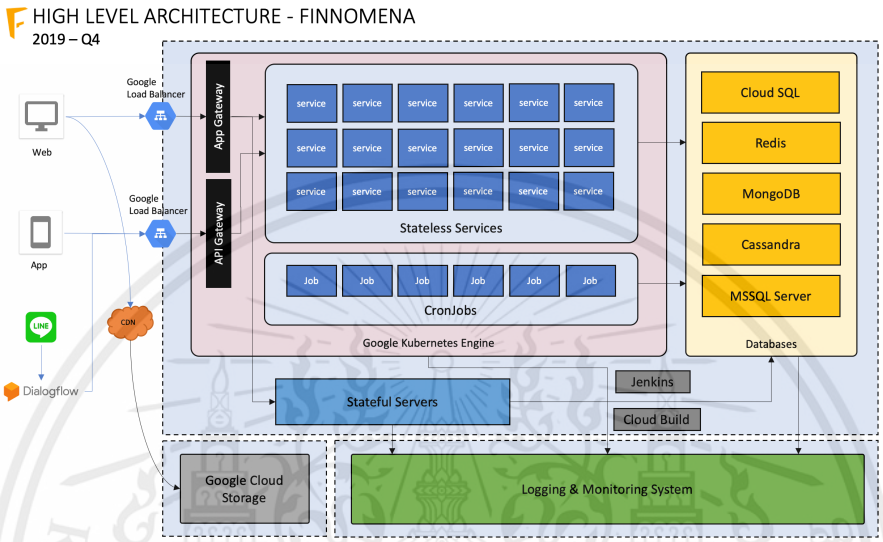

Figure 2.4: High Level Architecture of FINNOMENA

2.1.2 Jitta

Jitta analyzes stock fundamentals and fair values that come with the solution that helps investors achieve optimum returns through useful features. The advantage of the Jitta application is smart to stock analysis. Jitta works on algorithms on complex financial numbers and represents them as the two main factors when investing, as shown in Figure 2.5. The first factor is the Jitta Score, which gives a score out of ten based on business quality. Another factor is the Jitta Line, which is the fair price of a company. The lower the price hits below the Jitta Line, the more margin of safety to invest. This feature is called Jitta Ranking.

Jitta's algorithms help investors, especially beginners, understand potential investment in a better, easier way by using unique long-term investment solutions: Jitta.com and Jitta Wealth.

[1] An environment for deploying and managing containerized applications managed by Google.
[2] A Google Cloud platform that allows users to launch virtual machines on demand.

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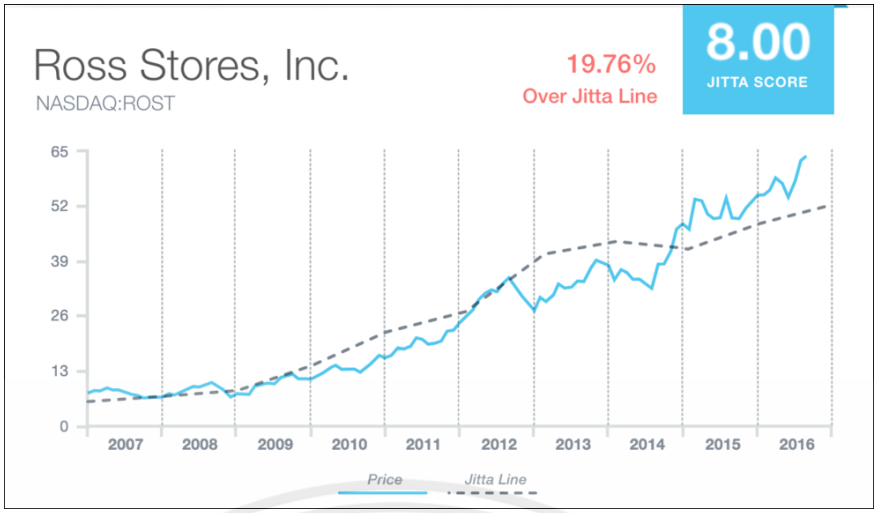

Figure 2.5: Jitta Ranking consisting of Jitta Score and Jitta Line

Figure 2.6 shows how Jitta.com represents the information to investors. Jitta.com boils down complex financial data into simple, practical stock insights even beginner investors can apply. For investors who like numbers, Jitta provides ten years and ten quarters of financial data to help investment decisions. Such data is available free of charge to every Jitta user.

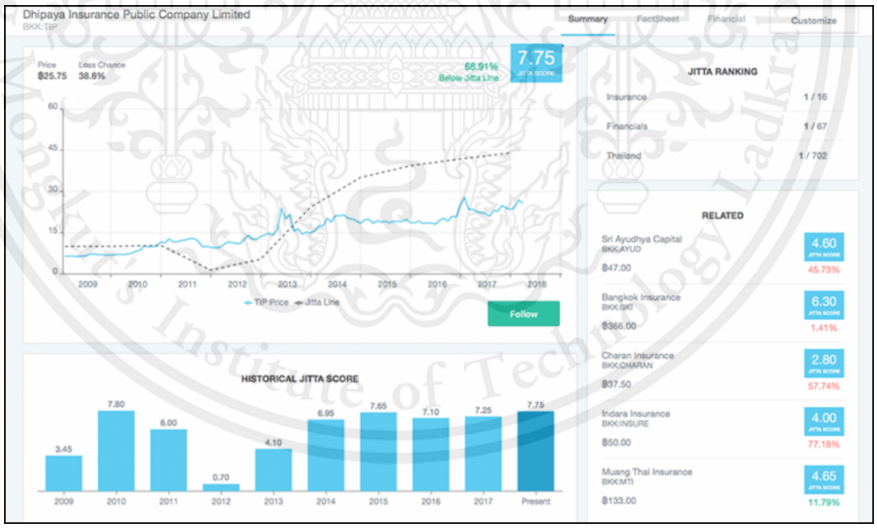

Figure 2.6: Jitta.com

Jitta Wealth, as shown in Figure 2.7, provides a private fund service. It is suitable for passive investors who desire higher-than-market returns but lacking the time or the expertise to invest themselves. Through the service, the automated investing tool manages investors' portfolios according to the Jitta Way approach—buying top 30 stocks

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on Jitta Ranking and rebalancing the portfolio once a year—to ensure the best possible long-term returns.

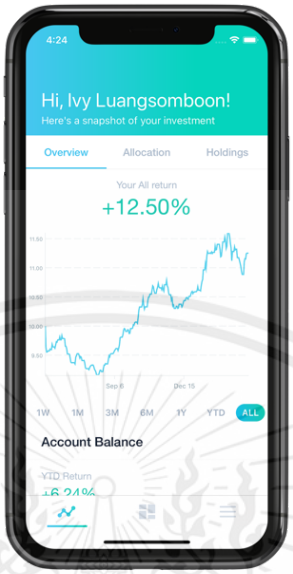

Figure 2.7: Jitta Wealth

2.1.3 Morningstar

Morningstar offers services that provide investors the information and tools they need to analyze funds, stock, and general market data. Figure 2.8 shows the predictive performance of the mutual fund given by Morningstar based on past performance. Investors can use a fund screener tool to find funds that meet the search criteria, as shown in Figure 2.9.

For architecture, Morningstar Direct uses distributed 4-tier architecture for high performance, high scalability, and high availability. It is developed using object-oriented techniques. Each class has its functionality while communicating with other components through public interfaces and open standards (XML and HTTP). This helps reduce component reuse and reduces maintenance costs. Figure 2.10 shows the network architecture of Morningstar. The investment data resides on Morningstar servers and is updated daily. Frequently used data are cached on the client-side to ensure speedy response times.

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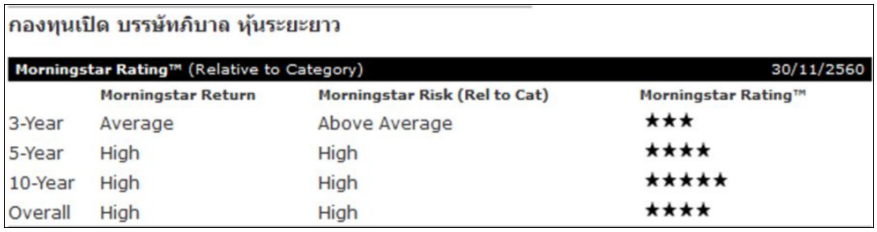

กองทุนเปิด บรรษัทภิบาล หุ้นระยะยาว

Morningstar Rating™ (Relative to Category)			30/11/2560
	Morningstar Return	Morningstar Risk (Rel to Cat)	Morningstar Rating™
3-Year	Average	Above Average	★★★
5-Year	High	High	★★★★
10-Year	High	High	★★★★★
Overall	High	High	★★★★

Figure 2.8: Fund's risk-adjusted return measured by Morningstar Rating

Figure 2.9: Morningstar Categorie

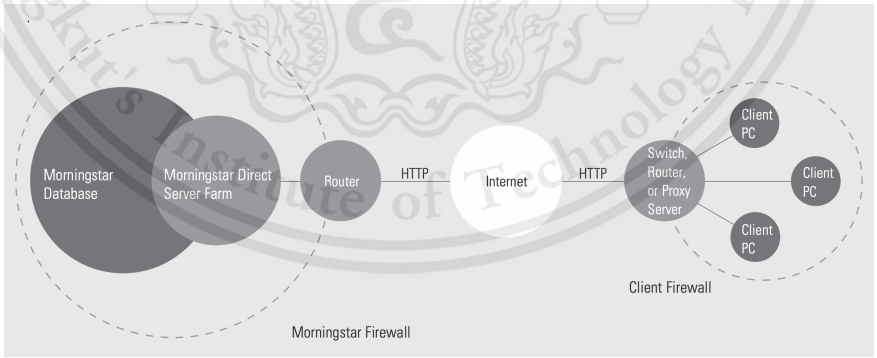

Figure 2.10: Network architecture of Morningstar

2.1.4 Finvest

Finvest is a digital investment platform with a concept that meets the needs of all investors. Investors can open an account and buy mutual funds from leading asset

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management companies within Thailand. Investors will receive content which is easy to understand and helpful in setting investment goal. Finvest also offers investors opportunities to diversify their portfolio for risk reduction by featuring good funds offered by 15 leading securities firms in Thailand and beyond.

What makes Finvest application different from the others is features provided for all investors, from beginners to experts. The application grants investors easy access to investment. It also becomes a platform providing investors with alternative options for accessing an efficient investment channel through analytic, ranking, and products screened by a team of professionals and an executive on the Product Screening Committee. With present content in articles and video clips, investors can choose which mutual fund they should invest in. Figure 2.11(left) shows curated set of attractive funds and figure 2.11(right) is the feature provides concise and user-friendly contents

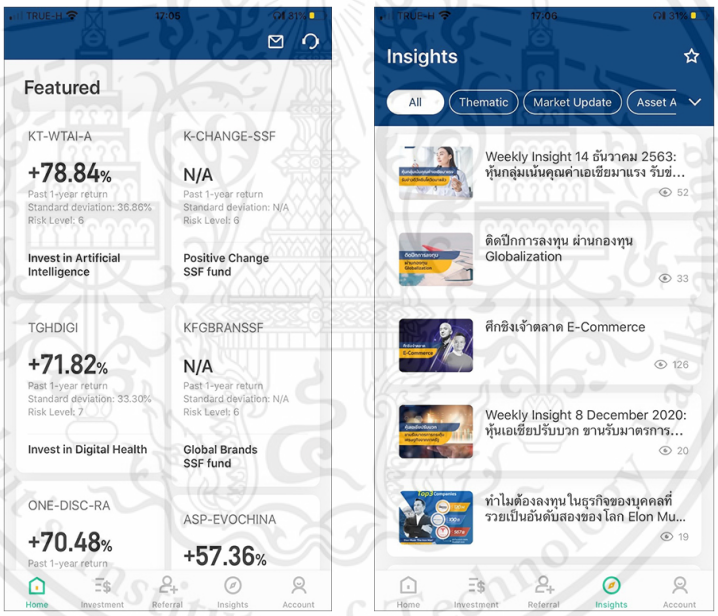

Figure 2.11: Finvest application

2.1.5 Steaming Click2Win

Steaming Click2Win is a Thai trading strategy and stock simulation application. The stock data is in real-time from the real market. In other words, users can access stock market information and trade fake cash with real-time data. The application has convenient access via Line or Gmail users to easily view market summary and simulate trading on the market easily.

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The features of the application are similar to other investment applications except that it is a trading simulation. Investors log in, set up an account, and get a set amount of simulated money to make simulated investments. As shown in figure 2.12, the application provides real-time data to view the market summary, create portfolio, view top ranking, and information. Since the mutual funds that investors chose to invest in will reflect the real-world prices, they can use simulators to see how they would have performed if they were investing in the markets.

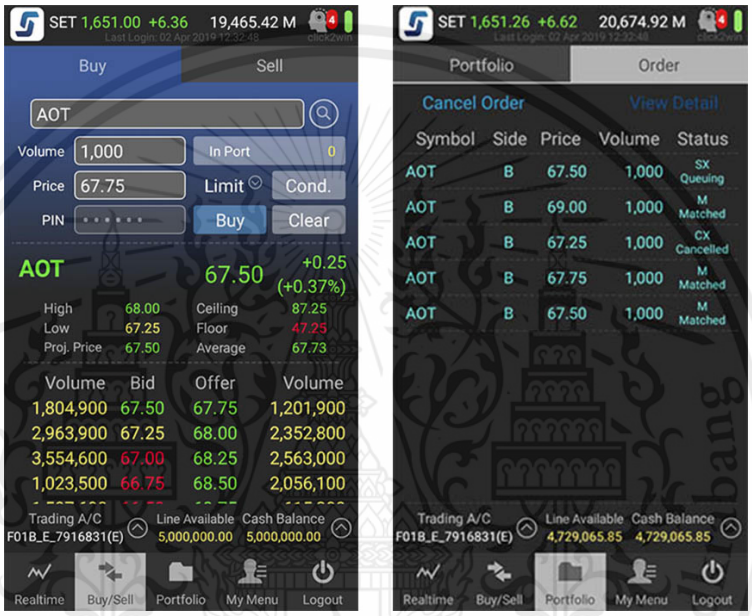

Figure 2.12: Buy/Sell and portfolio

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Chapter 3
Background Knowledge

This chapter explains the background knowledge of the proposed project. This project's background knowledge consists of three parts: The unified Modeling Language(UML) diagram, development tools, software libraries, and mutual fund investment. The first part is a quick review of UML. For the second part, we discuss software development tools. The final part gives the necessary knowledge (limited to investment in Thai Mutual Fund) of finance.

3.1 Unified Modeling Language Diagrams

United Modeling Language (UML) defines a modeling language that is intended to visualize the design of the system. In software engineering, UML is used to describe, construct, specify, and document information about software-intensive systems. The use of UML makes the software development process more efficient.

3.1.1 Use case Diagram

The use case diagram represents the functional requirement, which is how users interact with the system. In other words, it shows the relationship between users and different use cases in which the user is involved.

3.1.2 Activity Diagram

The activity diagram is a flowchart. It represents the dynamic of the system from one activity to another activity.

3.1.3 Class Diagram

In terms of UML, class diagrams represent the static view of the application. The use of class diagrams describes the system's structure by representing the system's

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class, attributes, operations, and the relationship among objects.

3.1.4 Sequence Diagram

The sequence diagram is an interaction diagram that describes how operations are carried out with others in the sequence of order.

3.2 Development Tools And Software Libraries

3.2.1 Bootstrap

Bootstrap is a free framework for developing responsive web applications. It is a combination of HTML, CSS, and Javascript code designed to help build user interface components.

3.2.2 Vuejs

Vuejs is a front-end Javascript framework for creating single-page apps and UIs. The significant factor of using Vuejs is its flexibility, lightweight, high performance, and modular.

3.2.3 FastAPI

FastAPI is a web framework for building APIs in Python. It is built on top of Starlette, a lightweight Asynchronous Server Gateway Interface (ASGI) framework.

3.2.4 Gin

Gin is a micro-framework in Golang that helps reduce boilerplate code that would typically go into building these applications. It also lends itself very well to creating reusable and extensible pieces of code.

3.2.5 InfluxDB

InfluxDB is a time-series database (TSDB)[1] optimized for time series data, a sequence of data points stored in time order.

[1] A software system that is optimized for storing and serving time series through pairs of time(s) and value(s)

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3.2.6 MongoDB

MongoDB is a document-based non-relational database engine. It is dynamic and horizontally scalable for storing data that is not related to time, such as user data.

3.2.7 IDB - IndexedDB With Usability.

Index-Data-Base (IDB) is a client-side database. It is a library that mostly mirrors the IndexedDB API, an alternative for the deprecated web SQL database. It stores data on the client end itself (in browser) as cache/local storage does. IDB is neither a structured query language nor a relational database. It stores key-pair values.

3.3 Thai Mutual Fund

Mutual Fund is an investment vehicle for investors who wish to invest in the capital market but have limitations preventing them from investing independently. To achieve expected returns, investors choose Mutual Funds as an investment tool. These expected future benefits come from dividends[2] and capital appreciation[3] with risk distribution that the investors can accept. Mutual Fund is managed by the asset management companies licensed by the Minister of Finance and under the Securities and Exchange Commission of Thailand (SEC).

3.3.1 Net Asset Value

The net asset value (NAV) represents the net value of an entity and is calculated as the total value of the entity's assets minus the total value of its liabilities. Most commonly used in the context of a mutual fund, the NAV represents the per share/unit price of the fund on a specific date or time.

- Net asset value, or NAV, is equal to a fund's or company's total assets less its liabilities.
- NAV is commonly used as a per-share value calculated for a mutual fund.
- For an investment fund, NAV is calculated at the end of each trading day based on the closing market prices of the portfolio's securities. A fund's shares may trade in the market at levels that deviate from its NAV.

[2] A distribution of profits to a class of its shareholders

[3] A rise in an investment's market price that can be calculated by the difference the purchase price and the selling price of an investment

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3.3.2 Prospectus

A mutual fund prospectus is a brochure that provides information about a mutual fund. Mutual fund companies must give potential investors a prospectus, free of charge, before they invest. Investors can get a prospectus by calling the mutual fund company directly or by visiting the fund's website. Before investing in a mutual fund, investors must read the prospectus thoroughly in order to carefully consider the fund's investment objectives, risks, fees, and expenses.

3.3.3 Dividend

Dividends are mostly profits that the companies share with stockholders/shareholders. The profits are earned by selling the funds at a price higher than the price they were purchased. The asset management company (AMC) adds these profits to the Net Asset Value (NAV).

The Asset Management Company can choose to pay dividends on a daily, monthly, quarterly or annual basis. The dividend amount is never fixed. An investor must also understand that under the dividend option, the Net Asset Value is not allowed to grow higher than a specified value. Once the NAV reaches its critical value, the fund house pays out the dividends.

3.3.4 Dividend Yield

Dividend Yield is the dividend paid per unit divided by the market price. Dividend Yield Mutual Funds are equity funds which invest in equity and equity-related instruments of companies which are known to declare high dividends.

3.3.5 Asset allocation funds

Asset allocation funds are mutual funds that invest in a varied class of assets. These assets can be equity-oriented, debt-oriented or even other asset classes like gold, other metals, and commodities.

3.3.6 Portfolio

Mutual funds are investment strategies that allow investors to pool money together with other investors to purchase a collection of stocks, bonds, or other securities. The combined holdings of the mutual fund are known as its portfolio.

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3.3.7 Risk tolerance

Typically, investments that offer the potential for big gains, such as high-yield mutual funds and most stock investments, also come with a greater amount of risk than investments that offer more modest returns. If you have a low-risk tolerance, avoid mutual funds that invest in highly volatile securities or employ aggressive investment strategies that seek to beat the market.

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Chapter 4
Requirements Analysis

4.1 Software Requirement

4.1.1 Functional

- The system provides users with authentication systems, including login and registration systems.
- The system has a risk profile questionnaire to create a better understanding among investors with regard to risk tolerance.
- The system provides guidelines of mutual fund basics to help beginner users get the fundamental knowledge in investment.
- The system has a searching system with auto completion to search for the existing Thai mutual fund.
- The system has a category search to get filtered mutual funds if users want to see top lists in a certain category.
- The system provides fundamental Thai mutual funds such as the latest price, dividend, and current NAV.
- The system has a historical graph for easy analysis of portfolio and prediction of market change in the future.
- The system recommends top mutual funds by giving a percentage of the chance to invest in mutual funds. For example, if the percentage is 30, there is a chance of 30that the fund will be increasing.
- The system allows signed-in users to use a mutual fund simulator and create their Wallet (personal simulator account).

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- The system allows signed-in users to top up virtual cash in the Waller to invest in a mutual fund.
- The signed-in users can purchase and redeem funds using the virtual money in the Wallet, and those transactions will be displayed in the dashboard.
  The virtual money in Wallet shall be deducted for every purchase made.
  The virtual money in Wallet shall be added for every sale made.

4.1.2 Non-Functional

- The User Interface is easy to understand and user-friendly.
- The system shall host the mutual fund prediction as an colored sign showing either the return is up or down.
- The system shall display the information of Thai mutual fund correctly.
- The system shall not allow unauthorized users to create Wallet for mutual fund simulation.
- The system shall be a web application that runs on a web browser.
- The system has user guidance for supportability.
- The information and data are managed by MariaDB.
- The system can respond in real time with the help of WebSocket.
- The system allows logged-in users to only access their own Wallet.

4.2 System Requirement

4.2.1 Non-Functional

- The system is developed by using VueJS, Bootstrap, Vue Material.
- The system uses MariaDB as a database management system.
- The system shall be available in the form of a website, which will allow it to be accessed by most browsers.

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4.3 Use Case Diagram

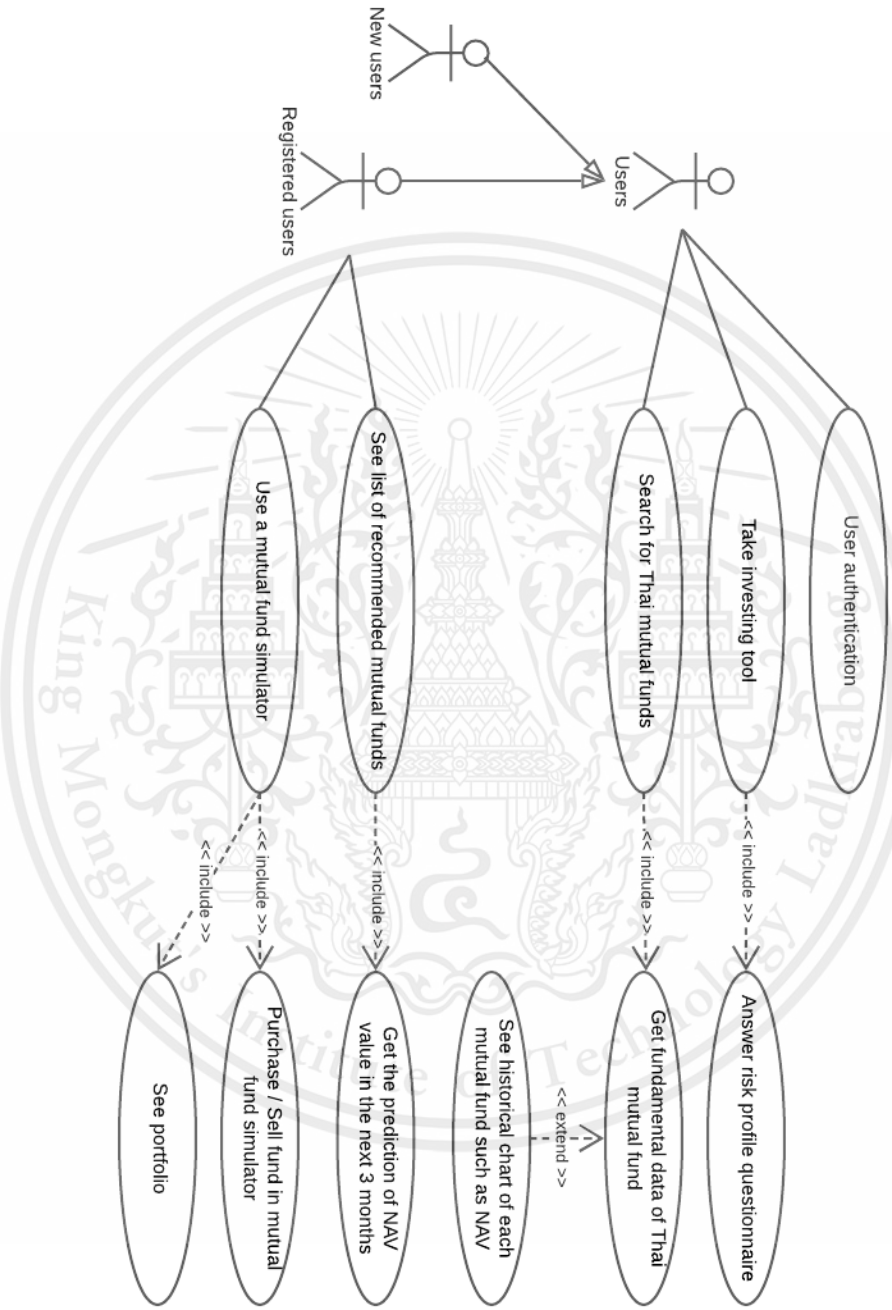

Figure 4.1: Use Case Diagram

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Usecase	**Sear for a mutual fund**
Primary actor	Guess users (any users)
Precondition	When users are already in homepage website
Goal	To search for a specific mutual fund
Overview	Users type a fund name through search box shown on the website. After click enter, the fund information page will be shown
	Flow of event
Actor actions	**System response**
1. User types a fundname in search box. 3. User select the fund name.	2. The system shows auto complete based on the input. 4. The system redirects page to fund information of the selected mutual fund.

Table 4.1: Search for a mutual fund

Usecase	**Take risk profile questionnaire**
Primary actor	Guess users (any users)
Precondition	When users are already in homepage website
Goal	To know risk tolerance (type of investors)
Overview	Users can view the result of questionnaire to create better understanding among investors with regards to risk tolerance.
	Flow of event
Actor actions	**System response**
1. User answer each questions in the form, then click submit button.	2. The system shows the result based on given answers with the details.

Table 4.2: Take risk questionnaire

Usecase	**View fundamental data of a mutual fund**
Primary actor	Guess users (any users)
Precondition	When users are already in homepage website
Goal	To view information of selected mutual fund
Overview	Users can see basic informations of a fund such as name, historical NAV or fund dividend
	Flow of event
Actor actions	**System response**
1. User selects/searches a mutual fund.	2. The system shows the information of the fund searched by the user.

Table 4.3: View fundamental data of a mutual fund

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Usecase	**View list of recommended mutual funds**
Primary actor	Registered users
Precondition	When users are already log-in to website
Goal	To see list of funds that have good performance through the table
Overview	Users navigate the recommended mutual funds and see the prediction based on percentage of the performance.
	Flow of event
Actor actions	**System response**
1. User select the recommendation button.	2. The system shows the table of mutual funds that are recommended with the result of prediction in percentage.

Table 4.4: View list of recommended mutual funds

Usecase	**View the prediction of NAV value**
Primary actor	Registered users
Precondition	When users are already log-in to page of recommended mutual funds
Goal	To know whether the NAV value of recommended mutual funds will be up or down
Overview	In the list of recommended mutual funds, users are able to know the uptrend or downtrend of NAV in the next 3 months.
	Flow of event
Actor actions	**System response**
1. User select the recommendation button.	2. The system shows the table of mutual funds that are recommended with the prediction of NAV (up or down).

Table 4.5: View the prediction of NAV value

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Usecase	**Purchase a mutual fund**
Primary actor	Registered users
Precondition	When users are already log-in to website
Goal	To enter a trade to buy a mutual fund
Overview	User picks a Mutual Fund to invest in and fill an amount of money to purchase a certain number of units.
	Flow of event
Actor actions	**System response**
1. User selects a Fund from searching and fill the input field, then click “submit” button.	2. When the user purchases the unit of a mutual fund, the system puts the trading transaction in queue. 3. The transaction will be executed when NAV of the selected fund is announced. 4. The purchased fund is added to their own portfolios.

Table 4.6: Purchase a mutual fund

Usecase	**Sell a mutual fund**
Primary actor	Registered users
Precondition	1. When users are already log-in to website 2. Users must have at least one purchased mutual fund in their portfolios in order to redeem.
Goal	To sell a mutual fund in portfolio
Overview	User picks a Mutual Fund to invest in and fill an amount of money to sell a certain number of units of that fund.
	Flow of event
Actor actions	**System response**
1. User selects a Fund from searching and fill the input field, then click “submit” button.	2. When the user sells the unit of a mutual fund, the system puts the trading transaction in queue. 3. The transaction will be executed when NAV of the selected fund is announced. 4. The system updated amount/unit of the mutual fund that has been sold.

Table 4.7: Sell a mutual fund in portfolio

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Usecase	**View portfolio**
Primary actor	Registered users
Precondition	When users are already log-in to website
Goal	To view own portfolio that contains number of mutual funds hold in their own portfolio
Overview	Users can see balance and changing collection of transaction of their holding mutual fund.
	Flow of event
Actor actions	**System response**
1. User logins to website. 3. User can navigate his portfolio and see all transaction done on each holding mutual funds.	2. The system shows user's portfolio that is visible only to him upon login.

Table 4.8: View portfolio

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4.4 System Architecture

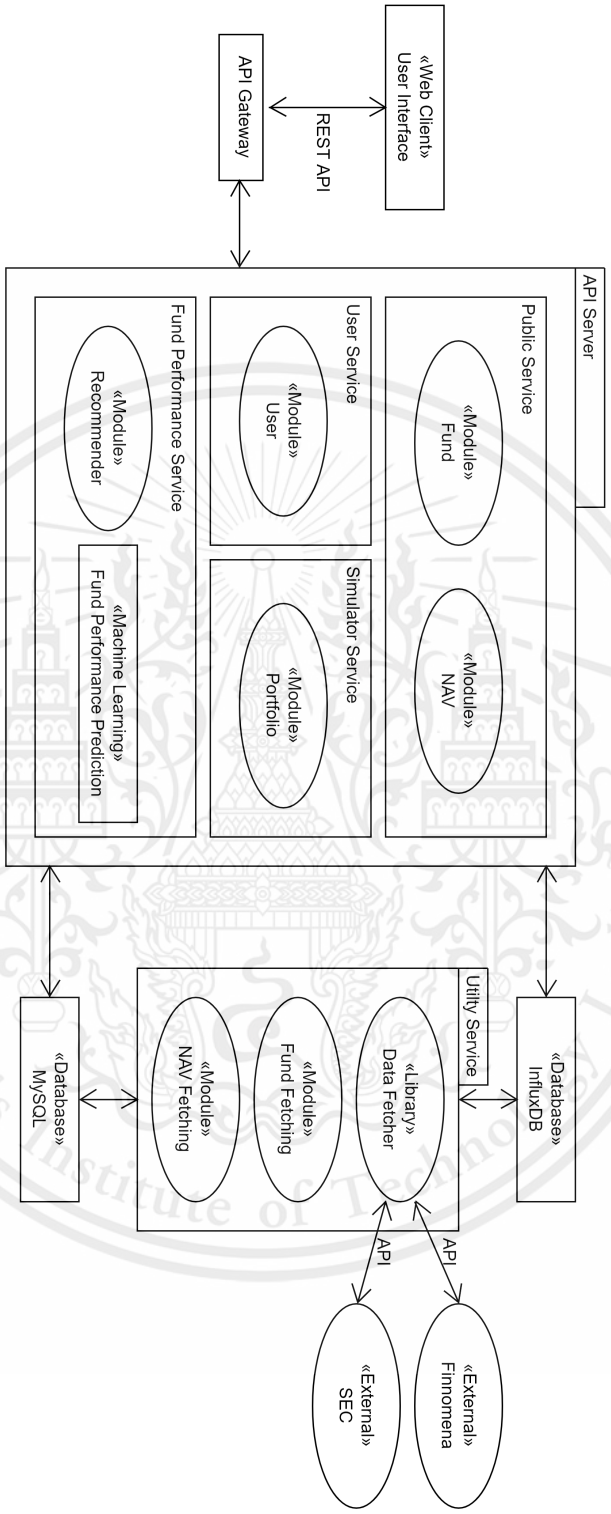

Figure 4.2: System Architecture

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Chapter 5
Development

This chapter provides an explanation on software design in detail. Initially, Section 5.1 describes the development tools used in the system.

5.1 Software Development Tools

5.1.1 Front-End

The part of software that runs on the user's computer for website so that users can see and interact with them directly. The objective is to ensure that when users open app the web application, they see the information in the format that is easy to read and understand.

Vuejs

Vuejs is a progression framework for building a user interface. Vue is designed from the ground up to be incrementally adoptable. Composition API is one of the new concepts introduced in Vue 3. It gives better code organization as it is easier to reuse the code and share the code between Vue components.

Bootstrap

The project uses Bootstap to provide a comfortable way for designing responsive user interface.

5.1.2 Back-End

The part of software refers to the server side of development where primarily focused on how the site works. Making updates and changes in addition to monitoring functionality of the site will be in this part.

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Web framework

Gin is used as web framework. Since Gin provides many commonly used functionalities, e.g. routing, middleware support, rendering, that reduce code and make writing web applications simpler.

Time series database

For time-series data, this project uses InfluxDb to support keeping high value, high precision data, and good performance for the data with high throughput real-time querying. The time-series data is the historical SET index, historical NAV value, etc.

Database

MariaDB is used to store data that is not related to time. The reason for using MariaDB over MySQL is due to faster and more efficient performance. It provides optimized performance as well as performance improvement of loading speed. The data is such as holding fund data, user information, and portfolio of each user.

Virtual private server (VPS)

VPS hosts server environments within a shared server. The project uses VPS to host back-end services, back-end tools and pull a docker image from Docker Hub, which runs here.

5.2 Development

Continuous Integration and Continuous Delivery (CICD)

Docker Hub is an online respiratory of Docker images and the login that Docker Desktop will connect to. The deployment script consists of pushing the Docker image from the CI tools and pulling the Docker container from the server.

Authentication

The system uses JSON Web Tokens (JWTs) as part of OAuth 2.0 frameworks to authorize a route and restrict client access to API Gateway, which validates the JWTs that clients submit with API requests. It allows authentication without actual storage of user information on every service (as opposed to session-based authentication).

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When the user is authenticated, the system issues JWT and sends the token back to the frontend client. The client has to attach this token to back-end services to know which user sends a request to it.

API Gateway

In a microservice architecture, kong is an engine as API Gateway to help accelerate development time. It acts as a gateway for microservices requests, which run in front of any RESTful API while providing load balancing, logging, and rate-limiting.

Server Monitoring

The monitoring is set up on servers using a combination of Prometheus, NodeJS, and Grafana. Prometheus collects metrics from different services obtained from Kong Gateway, e.g., total requests per second (RPS), and stores those metrics (usage data) all in one place.

Grafana takes all the metrics Prometheus has aggregated and displays them as graphs and diagrams organized into dashboards.

Public Service

For the public service, it responses a publicly accessible data. This publicly available refers to data that is accessible to anyone in public without the need for permissions. The data in the system includes fundamental information of the Thai Mutual Fund. For example, fund name, historical NAV of mutual funds, fund statistics.

Simulator Service (Private)

Private services are visible to the individual users' profiles. This private data include portfolio information and transaction history. The portfolio shows all funds with units bought by users each time and transactions of buy/sell for the mutual fund. Updating and creating simulator data in the database is also done once the user has submitted the transaction each time.

Fund Performance Service (Private)

The service responds to data from machine learning model created by another team.

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5.3 Development Techniques

5.3.1 Time-series data

There are several drawbacks for storing time-series data in a relational databases and NoSQL databases.

- Traditional databases are designed to persist data in transactional format and retrieve data as records while TSDBs query by aggregating data by time intervals.
- Traditional databases are designed for updating purpose thus they carry the overhead of locking and synchronization that are not required for the immutable time-series data. This results in slower-than-required performance for both ingest and queries.
- Traditional databases require scheduled jobs for cleaning up old data. Contrary to TSDBs which provide a desirable retention policy to clean the data automatically.
- Relational databases enforce a rigid structure for labels and cannot accommodate unstructured data.

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Chapter 6
Preliminary Result

6.1 Web Application

6.1.1 Users

There are two types of users for the application. The first one is to guest users. These users are only able to access some features of the website. The parts they can use are those apart from the fund simulator, including the purchase/redeem process and fund recommendation.

To have their Wallet, users need to log in to create an account to become authenticated users. Once they log in successfully, they will be able to try the fund simulator feature. This feature is the application's core, which contains fund prediction and recommendation, fund purchase, fund redeem. Registered users get a better understanding of mutual funds by using this feature and will be able to trade in the real market.

6.1.2 Features

Figure 6.1 shows the first page of the web application. Guest users are allowed to access only the features in this page. There are four main parts which are search, fund table, risk tolerance questionnaire, and fund knowledge.

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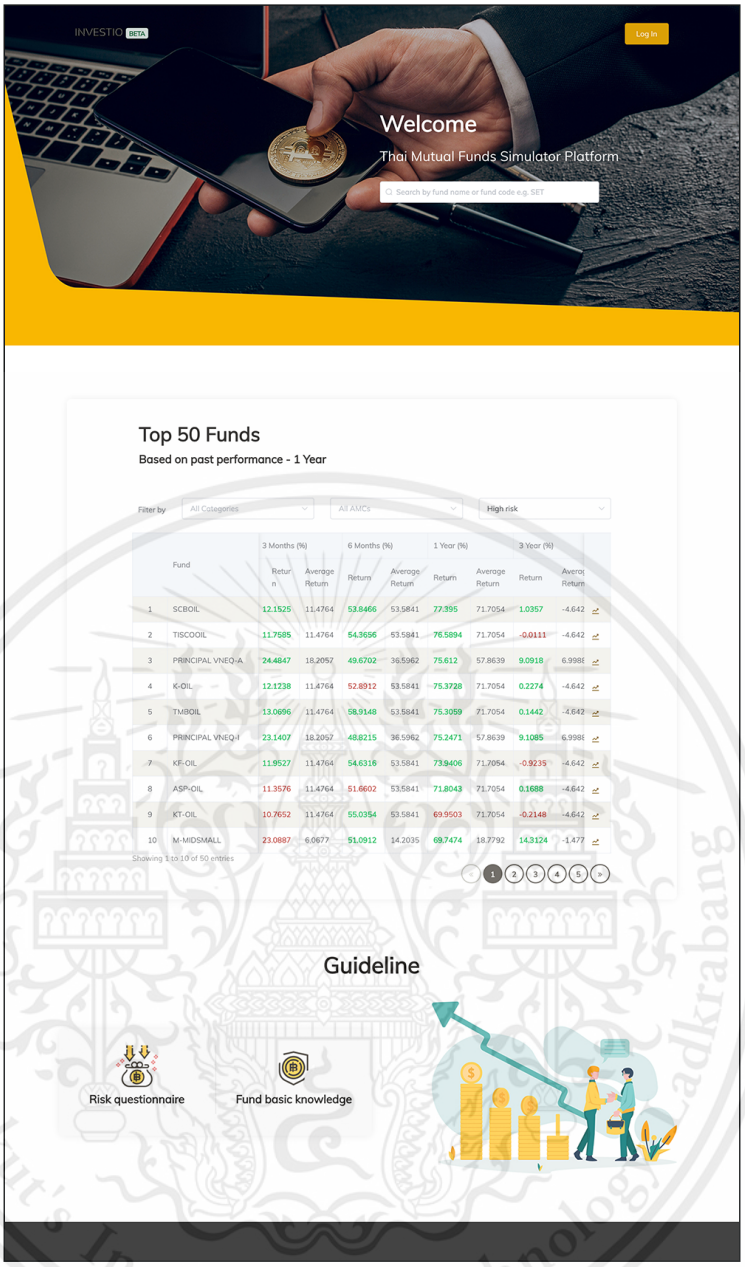

Figure 6.1: Home Page

Search for a mutual fund

Users are able to search for a mutual fund by name. The search box also provides auto completion in case users mistype the fund name or code. This makes it easier to find the selected fund according to names as many are similar and difficult to get the correct code sometimes.

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Get top fund according to selected category

Mutual fund types are organized into categories by asset class, style, and objective or strategy. Learning how a fund is categorized helps an investor understand how to select the best funds for asset allocation and diversification purposes. The application, therefore, provides a category feature that sorts top funds shown in a table based on selected categories and Asset Management Company.

Access to fund fundamental information

Figure 6.2 shows the information page. Once users have searched for a fund name or selected a top fund through the category, the page redirects to the information page of the selected fund. The information contains three parts.

The historical NAV value of mutual funds is displayed as a graph for easier development of investment strategy. Since investors must consider a fund's valuation point, the application provides this historical pricing to make a trading decision based on old information and calculation. Past performance of total returns is also offered to give a more accurate representation of the return. Users can download fund fact sheets that are beneficial for analysis and evaluation of the fund scheme.

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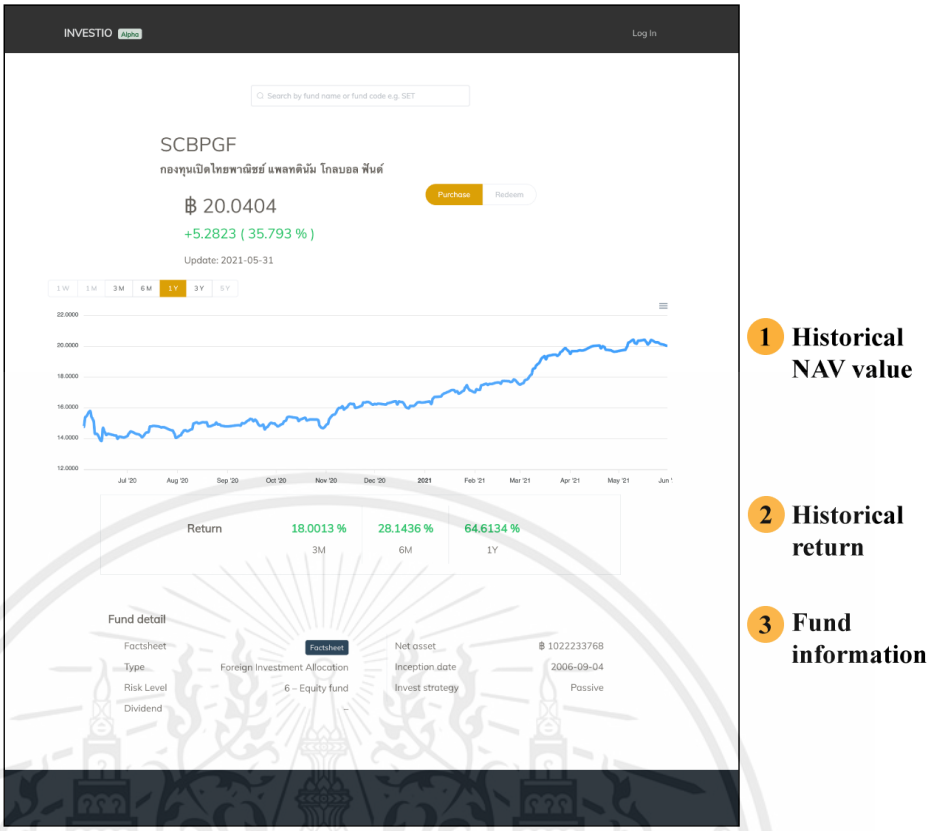

Figure 6.2: Fund fundamental information

Take risk tolerance questionnaire

A risk tolerance questionnaire consists of a set of survey questions that help individuals understand the investment style and what kind of investment for the users to better reflect their situation with the investment.

Once users have finished answering questions, the investor questionnaire provides asset allocation suggestions based on the information they enter. However, there is no guarantee that any particular investment will meet investment objectives. Therefore, the questionnaire only suggests a broad guideline for investment decisions.

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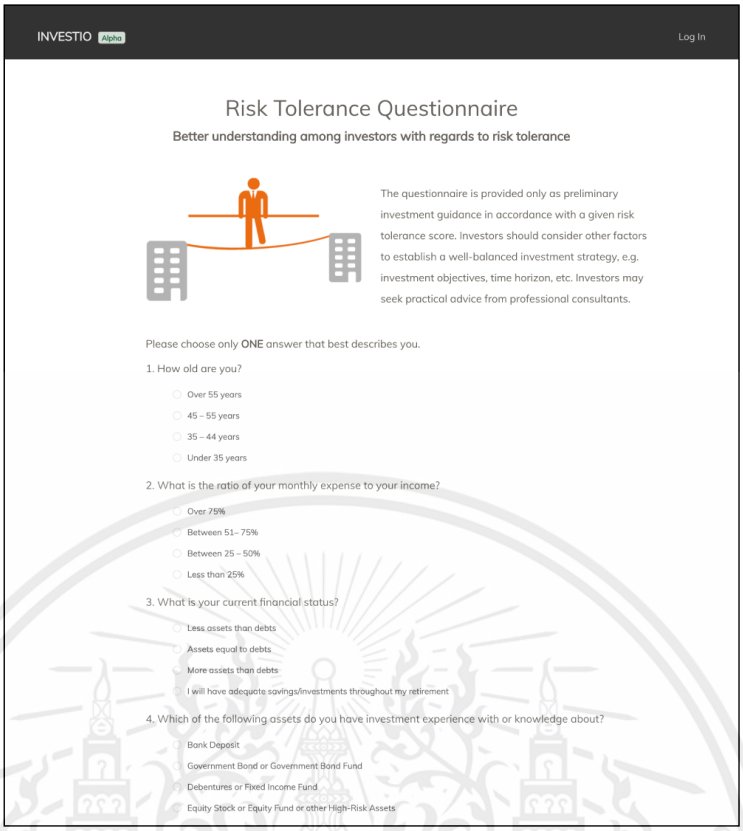

Figure 6.3: Risk tolerance questionnaire

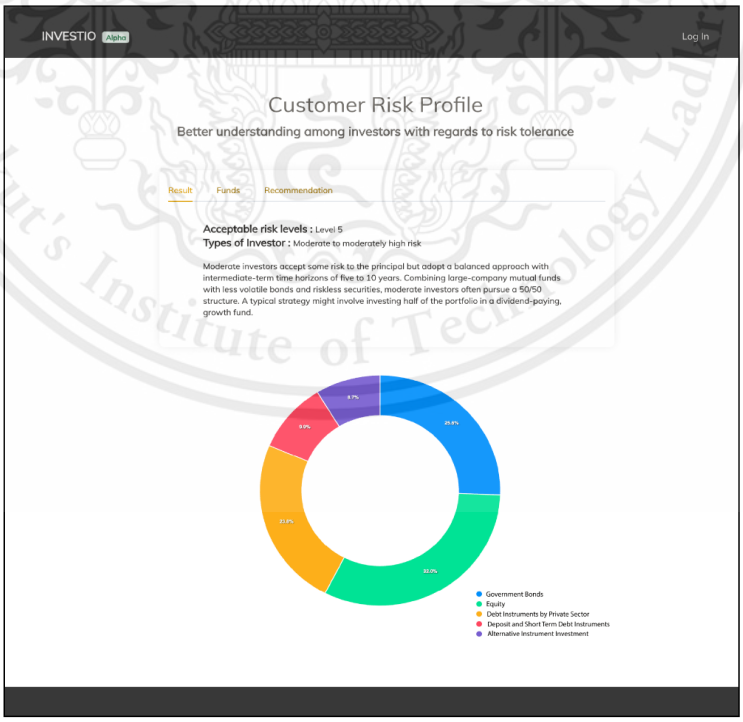

Figure 6.4: Result of investment risk

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Get beginner guide for mutual funds

If users are a new investor, selecting a mutual fund that suits the financial profile and expectations can be confusing and intimidating. This guide to mutual funds is designed to help users understand what they are, how they work, and things that users may want to consider when investing.

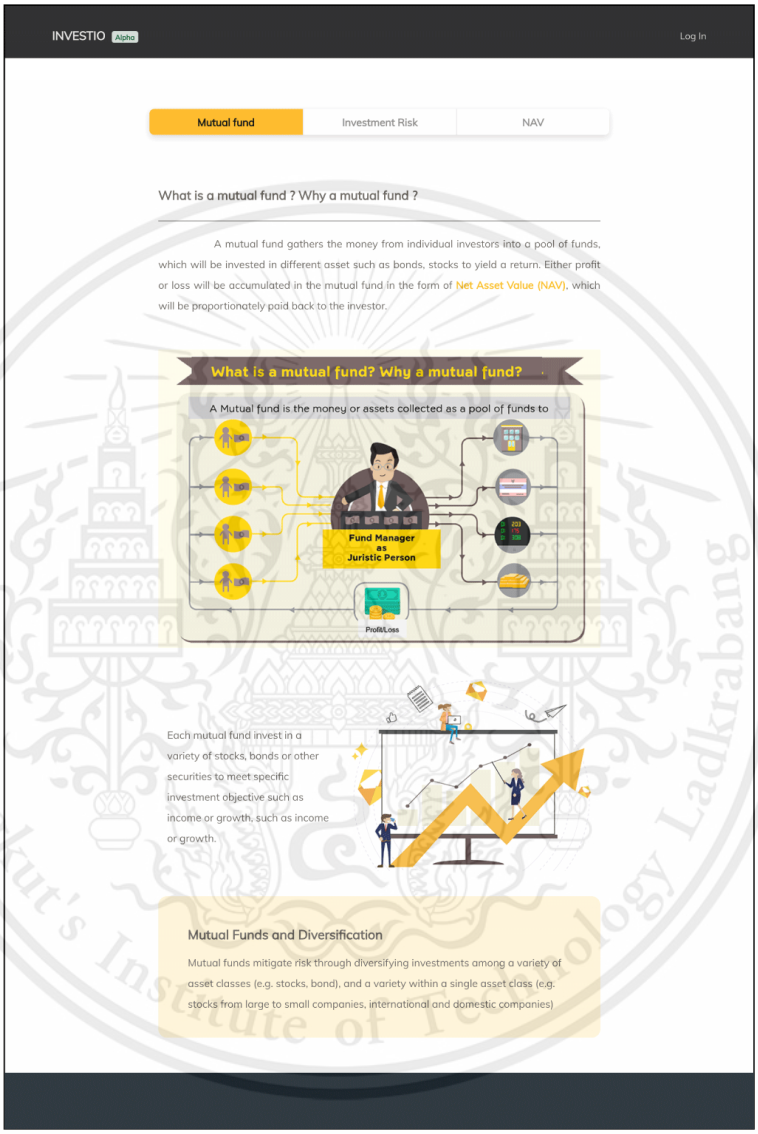

Figure 6.5: Guidelines to invest in Mutual Funds

Access top recommended mutual funds

Users can get suggestions of the trending of some mutual funds in the next three months. The prediction tells whether those funds' values will either be upward or downward and the percentage of these possibilities. The list of recommended mutual funds

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contains top funds that give the highest upcoming trend with the highest chances. Users can purchase these funds through the list to ensure that it will provide the exact results according to the predictions provided by the system.

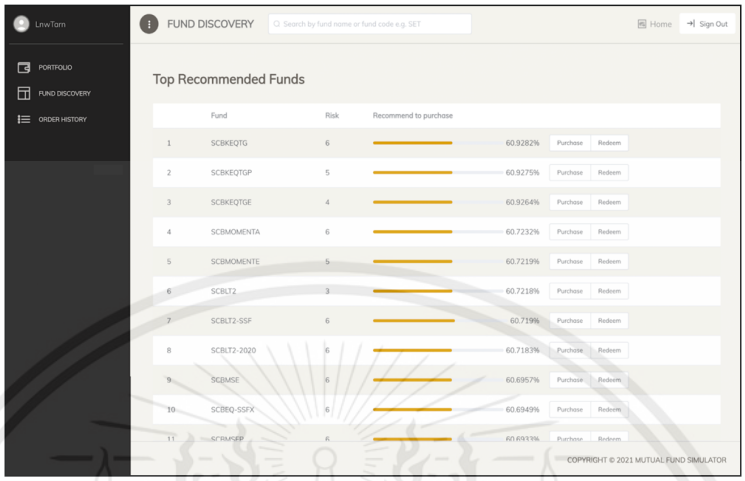

Figure 6.6: Lists of top recommended mutual funds

Lists of top recommended mutual funds

Users need to be authenticated to purchase or redeem a mutual fund if users are using an application as a guest user. After login, the user will be redirected to the Wallet that contains the portfolio, buy/sell the fund, and fund recommendation. The user can then search for the fund name and process the purchase. The history table shows all past transactions, and users can then redeem the existing fund in their account after purchasing.

Figure 6.7 shows purchasing a fund, which is similar to when redeems a fund. The following step explains how the users buy the fund in the application.

1. Once the users log in to the account, they can purchase a fund. First, they can search for a fund name by typing in the search box.
2. The system redirects users to the information page of the selected fund, and users click the purchase button.
3. The system pops up a purchase form for users to input the money they want to buy the fund. The system calculates the given units of the fund based on the input money and current NAV. Then, the users need to confirm the purchase date to process the transaction successfully.

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4. Finally, when users have confirmed the transaction, the selected fund is in a portfolio that the users can later redeem.

5. The portfolio provides each fund with the information, including average cost unit, average cost value, current NAV, and current value (this is done using profit/loss from NAV at the purchase time for the calculation). Users can redeem those purchased funds in the future.

6. The system also records the purchase transaction into the system and shows it in the transaction history.

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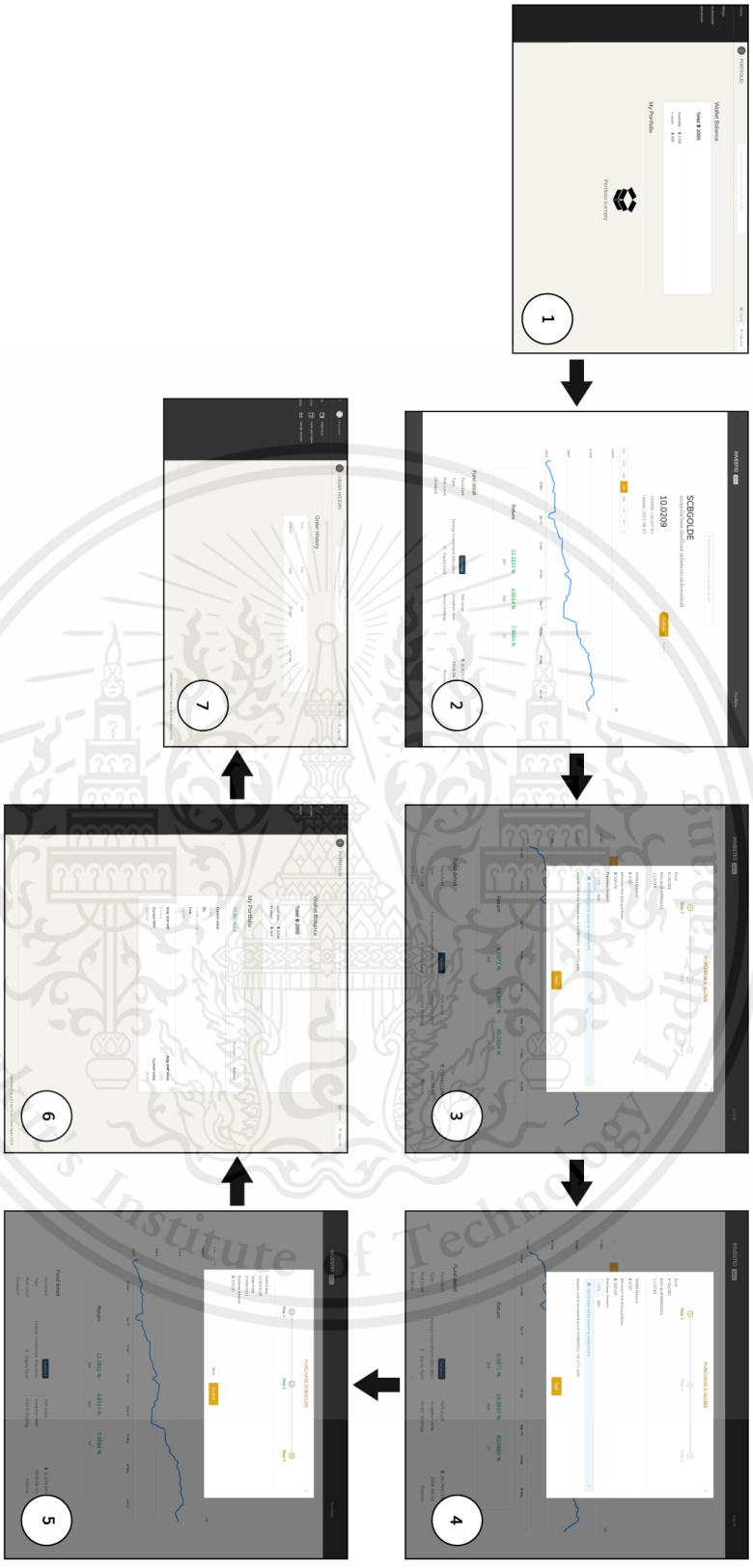

Figure 6.7: Flow of purchase/redeem a mutual fund

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6.2 Example of data shown in the application

6.2.1 NAV result

The result shows the value of NAV retrieved from implemented API. The result gives the response of latest NAV value and figure 6.8 shows the response of historical NAV.

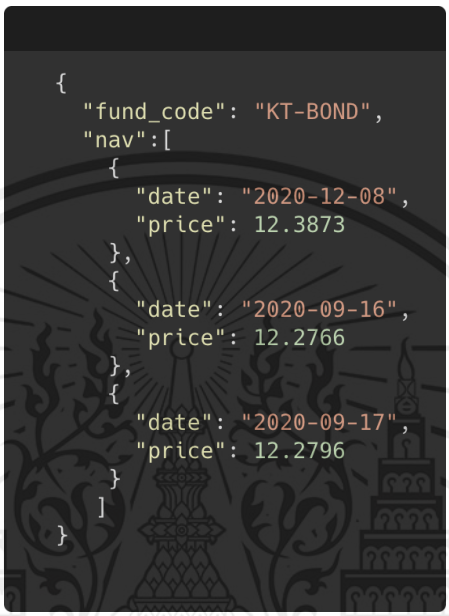

Figure 6.8: NAV result retrieved from API

6.2.2 Fund information

Figure 6.9 shows list of fundamental information of the mutual fund such as fundname, factsheet, and AMC. The information is provided after the user enters a specific mutual fund by searching.

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```
{
    "fund_id": "07f22fb5",
    "code": "ABEG",
    "name_en": "Aberdeen Standard European Growth",
    "name_th": "กองทุนเปิด อเบอร์ดีน สแตนดาร์ด ยูโรเปี้ยน โกรท ฟันด์",
    "is_predict": false,
    "is_fnpick": false,
    "is_dividend_payout": false,
    "factsheet_url":
"https://secdocumentstorage.blob.core.windows.net/fundfactsheet/M0363_2549.p
df",
    "invest_strategy_en": "",
    "invest_strategy_th": "ลงทุนในหน่วยลงทุนของกองทุนต่างประเทศ ชื่อ Aberdeen
Standard SICAV ...",
    "short_desc_en": "",
    "short_desc_th": "",
    "inception_date": "2006-12-06T00:00:00Z",
    "amc_name_en": "Aberdeen Standard Investments"
}
```


Figure 6.9: Fund information (GET /public/v1/funds/:fundCode/info)

6.2.3 Fund performance

Figure 6.10 gives the best performing mutual funds to buy by highest weighted return (measure of how much a fund has changed in the one year period).


```
[
    {
        "data_date": "0001-01-01T00:00:00Z",
        "total_return_1y": "169.5699",
        "total_return_p_1y": 75,
        "total_return_avg_1y": "42.1405",
        "net_assets": "3658178451.89",
        "fund_id": "cede9cd7",
        "code": "ONE-GECOM",
        "name_en": "ONE Global E-Commerce",
        "name_th": "กองทุนเปิด วรรณ โกลบอล อีคอมเมิร์ซ",
        "cat_name_en": "Global Equity",
        "cat_name_th": "หุ้นทั่วโลก",
        "amc_code": "ONEAM",
        "amc_name_en": "",
        "amc_name_th": ""
    },
```


Figure 6.10: Fund performance

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6.2.4 Fund category

Figure 6.12 shows the fund divided into several kinds of categories, representing the kinds of securities users invest in, their investment objectives, and the type of returns they seek.

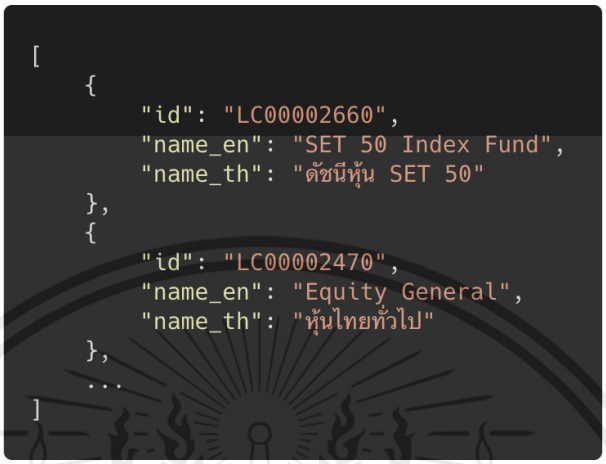

Figure 6.11: List of all fund's categories

Figure 6.12: List of AMCs

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Chapter 7
Conclusion

This chapter provides a conclusion of this project. This conclusion can be divided into three main parts. First of all, Section 8.1 gives a summary of the project. Section 8.2 compares this project with the existing system. Finally, Section 8.3 talks about how we plan to develop the project in the future.

7.1 Project summary

We have developed a web-based application that helps any users, especially beginner investors, get familiar with a mutual investment with a better understanding of how they can use the information provided by the system and adapt it to suit their trading strategy. The application has led the production to meet the objectives set in the first part of the project. Users can get the experience of how to invest in mutual funds without losing actual losses.

7.2 Comparison with other systems

7.2.1 Comparison with Jitta

Jitta is a financial tech company with the idea to help streamline users' decision-making processes and maximize their returns. However, its application requires subscriptions from users to be able to access the portfolio features. The amount of money needed to invest in Jitta is not that many regular investors will pay immediately. The portfolio requires at least 100k bahts to open an account. With this huge amount of money, users have to ensure that they have enough knowledge, experience, and understanding to face the loss of a strategic plan that does not work as expected.

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7.2.2 Comparison with Streaming Click2win

Streaming Click2win is an equity/derivatives trading simulation application. However, the application is built with a complicated user interface and has no feature trending prediction. For beginner investors, it might be challenging to start trading with such an application as it has designs of specific terms and features that only long-term investors have used. Additionally, the application does not provide predictions and recommendations. Therefore users are required to have enough knowledge and experience before using the application.

7.3 Future work

There are several possible improvements to our project.

1. Support advanced applications v 2.0 elements and features such as line trending, profit/loss prediction, portfolio management.
2. Create a data summary of users' investments from time to time.
3. Predict mutual funds with a more accessible interface to create better investment strategies such as uptrend/downtrend line, top funds ranking.

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