

AN INTELLIGENCE APPROACH IN FUND INVESTMENT SUGGESTION

AUTOMATION ENGINEERING PROGRAM

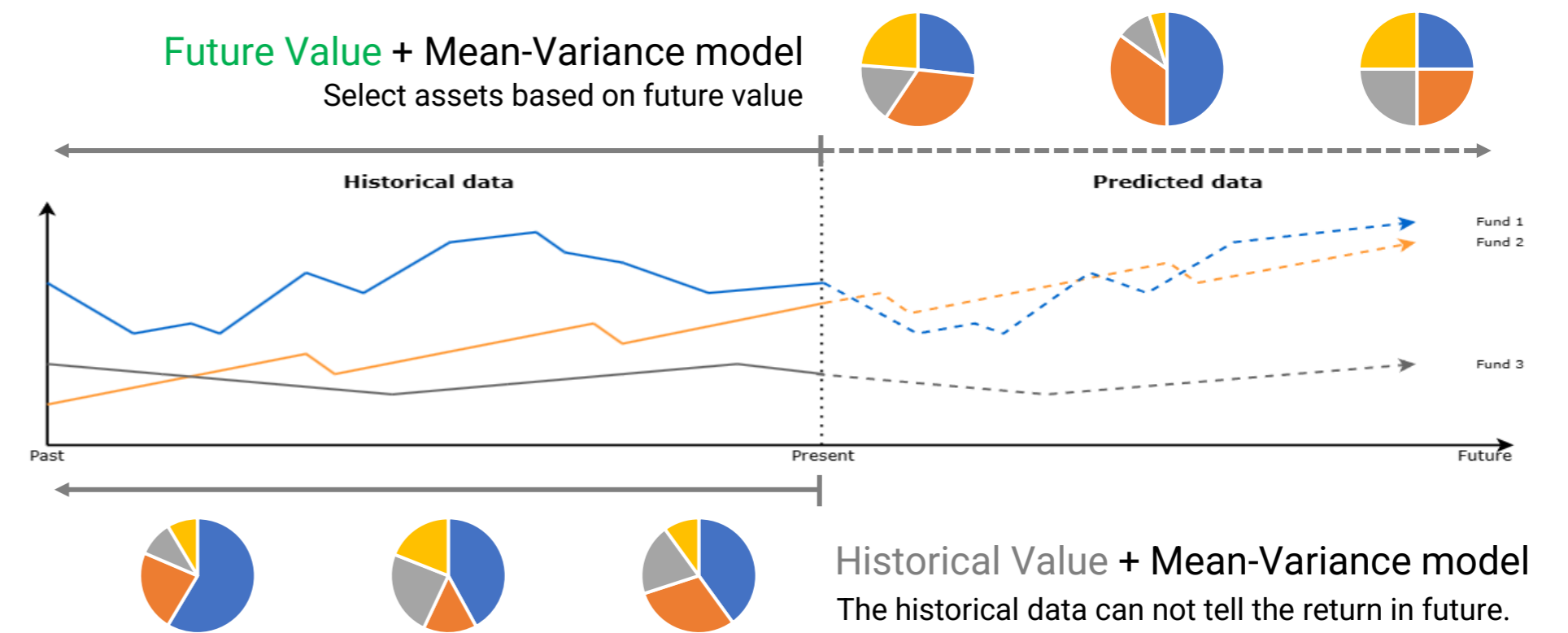
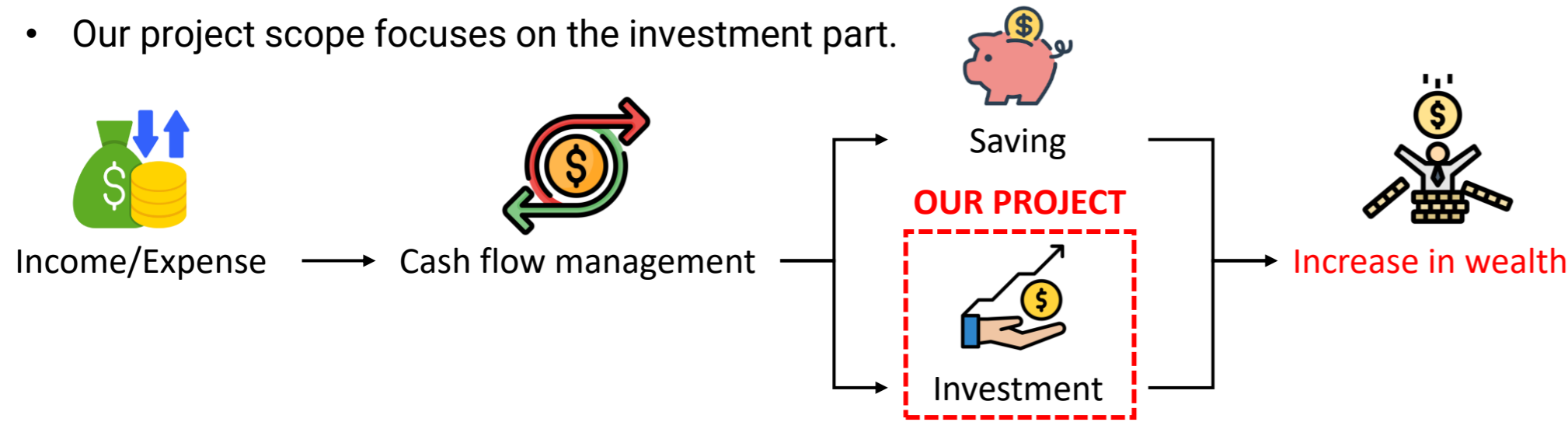
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Abstract

The problem with middle-class people on the investment is no time to find the potential assets for investment. Much research proposed a method to solve this problem by using machine learning with portfolio optimization but did not consider the economic factors. The economic factors reflect the economic situation of the country or the world which affect the investment decision of the investor. This project proposed Long-Short-Term Memory networks for predicting the future value of funds based on historical data and the economic factors combined with the mean-variance model to determine the optimal portfolio. In addition, we also studied the dataset in the normal period and crisis period. The result from the prediction shows that the MSE loss of equity fund is equal to 0.271, the MSE loss of fixed income fund is equal to 0.399 and the loss of mixed fund is 0.317. After we got the predicted price, we used the MV model to determine the optimal portfolio. We got the result which are investment in the equity fund when the economy is in a normal period and invest in the mixed fund and fixed income fund when the economy is in the crisis period.

Introduction

- Many middle-class people have difficulty reaching their financial goals.
- Then, they need efficient cash flow management to create wealth and reach financial goals by saving and investing.
- Our project scope focuses on the investment part.



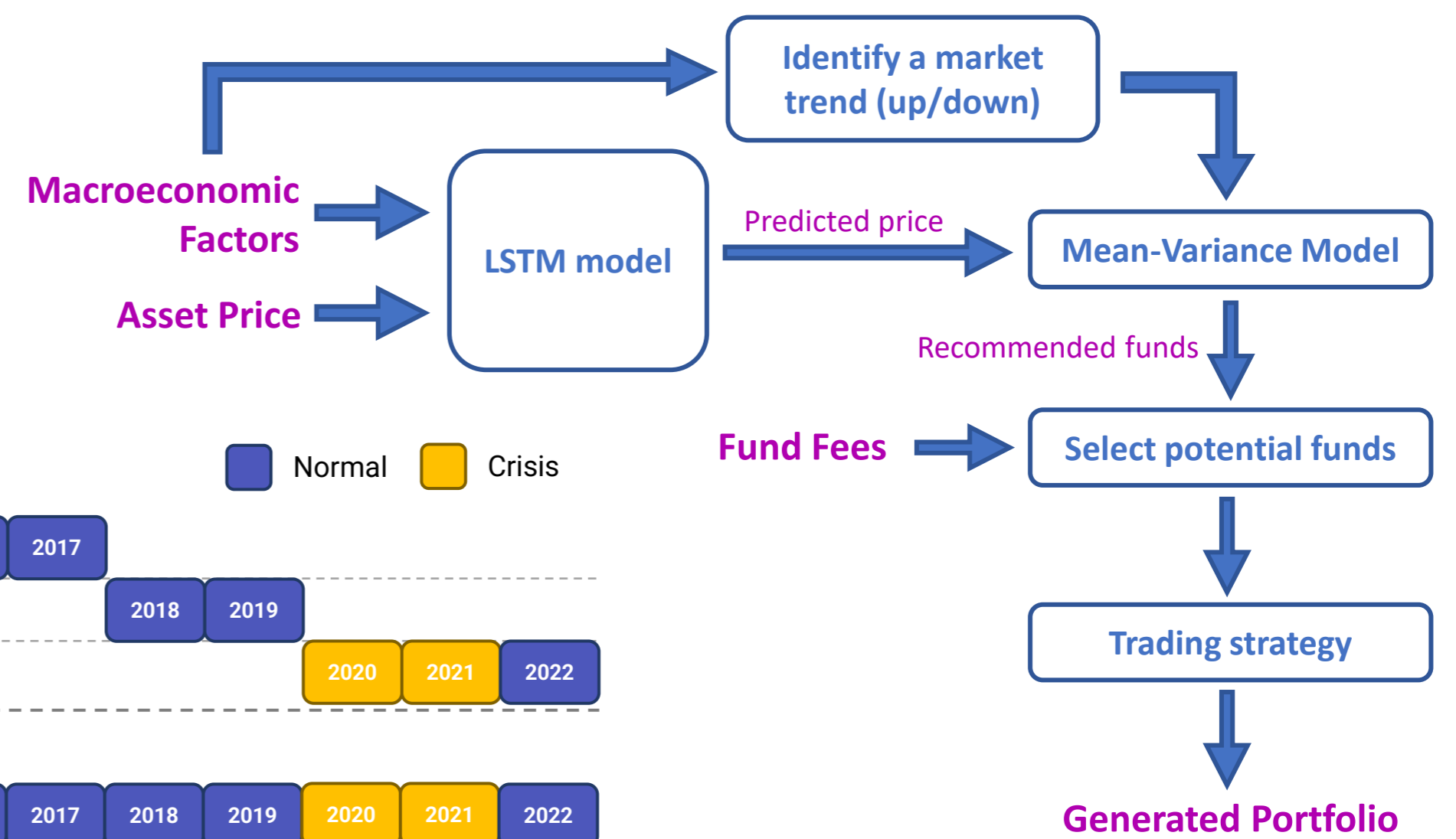
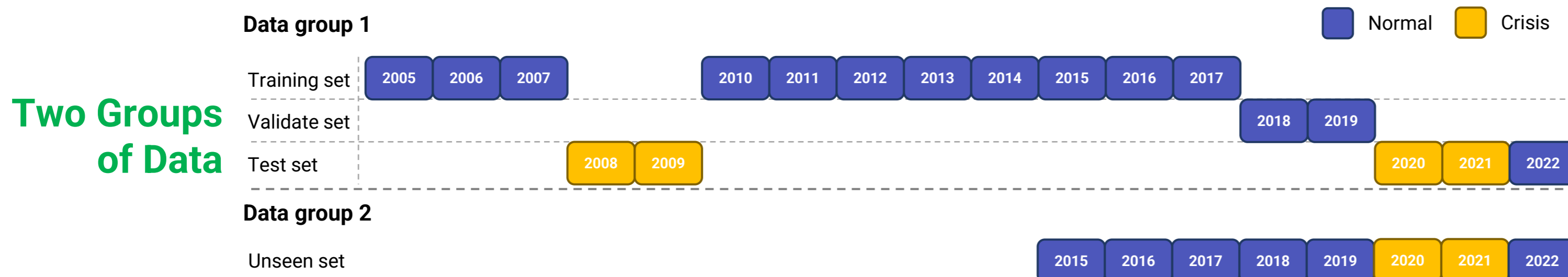
Methods

This project aims to determine the optimal portfolio in each economic situation. To achieve this objective, we predicted the fund price by using historical data of asset and economic factors for training the Long-Short Term Memory (LSTM) networks. We selected the fund based on fund fees and economic trends where the fund price comes from the prediction of LSTM networks and used the portfolio optimization which is the Mean-Variance model (MV model) to determine the weight of each fund in the portfolio. This project uses 3 types of funds which are equity funds, fixed-income funds, and mixed funds. The type of fund was categorized by The Securities and Exchange Commission (SEC), Thailand.

Features	Equity Fund	Mixed Fund	Fixed Income Fund
Fund price	✓	✓	✓
Fund Fee	✓	✓	✓
SET index	✓	✓	✓
Interest rate	✓	✓	✓
Gross Domestic Product (GDP)	✓	✓	✓
Headline Consumer Price Index (HCPI)	✓	✓	✓
Core Consumer Price Index (CCPI)			✓

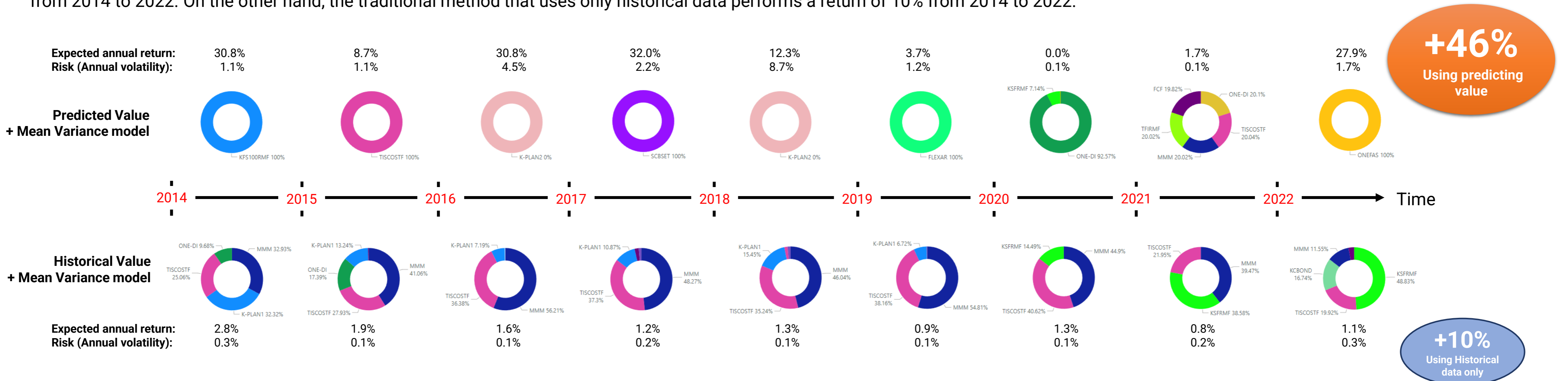
System Overview

To select the fund from the prediction, we considered the fee of the fund and the economic factors. The economic factors that were used in this project included the GDP, HCPI, and the policy interest rate of Thailand. In addition, this method selected the fund that has the lowest fee. Then, we used the MV model to determine the weight of the portfolio based on the selected funds and we also used the predicted price for the input of the MV model. The MV model minimizes the risk of the portfolio when the economy is downtrend and maximizes the return when the economy is uptrend.



Results

The result of our proposed method was divided into 2 parts. The first part is the prediction part which performs well when the fund is an equity fund and has a mean square error loss (MSE loss) equal to 0.271. The MSE loss of mixed funds is 0.317. The worst MSE loss comes from the fixed-income fund type which has MSE loss is 0.399. In the portfolio optimization part, the MV model suggests users invest in high-return assets when the economy is in a normal situation and diversify the risk when the economy is in a crisis. From this strategy, we got 46% return on investment from 2014 to 2022. On the other hand, the traditional method that uses only historical data performs a return of 10% from 2014 to 2022.



Conclusion

This project aims to determine the optimal portfolio in each economic situation. This project used the LSTM networks to predict the future value of funds, then we used the mean-variance model to determine the optimal portfolio. The result from the prediction shows that the MSE of equity is 0.271, the MSE of the mixed fund is 0.317, and the worst MSE is 0.399 which comes from the fixed income fund. From the portfolio optimization, the MV model suggests the user diversify the risk when the economy is on the downtrend and invest in high-risk funds when the economy is on the uptrend.

Reference

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