Decision Making Model for Stock Selling: A Case Study of Market for Alternative Investment of Thailand

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Abstract. Market for Alternative Investment (MAI) has becomes an attractive alternative for Thai investors for years because it is less sensitive and typically has a high return. Because of the short history in trading, less stock information can be used for making decisions to invest in MAI. Therefore, the decision model for investing in MAI is challenging but indeed required. This paper thus proposes the decision making model for inventing in MAI particularly for stock selling. The proposed model employs three variables including macroeconomics' variables, stock variables and alternative variables modeled by Back Propagation Neural Network. Five years' historical data is used for training and testing the proposed model according to decision primarily made by 10 experts. The proposed model is tested with five companies in MAI of Thailand. The result shows that the proposed model provides 87.27% average accuracy.

Keywords: Decision Making Model, Market for Alternative Investment, Macroeconomic Variables, Back Propagation Neural Network.

1. Introduction

Investment in stock markets is an alternative way for investing money to avoid the effect from inflation rate. Generally, the investment is risky so the investors decide to buy stocks and sell stocks when they believe that they will get high profit return. If investors have enough stock information, they can buy or sell the stocks at the right time. In Thailand, there are 2 types of stock markets including the Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI) which was established by SET in 1998 under the Securities Exchange of Thailand Act [1]. MAI is an alternative stock market for small and medium businesses. MAI does not have high risk comparing to SET. Generally, the difference between SET and MAI is size of businesses. Although the size of business in MAI is not that big comparing to SET, but MAI provides the high return. MAI had a large increase in trading volume between 2010 and 2012, as it has been shown that MAI has trading volume 96,057 million baht in 2010 and 151,022 million baht in 2011[2]. Although MAI has the differences in term of business sizes, the financial situations and dividend yield also affect the investment in MAI. Generally, the decision to invest in MAI [3] is similar to those in SET when the success investment is the appropriate expectation, no more no less, and reasonably in the right time etc. When the investor finds appropriate sell point so that the return profit or high return profit can be returned, the investor will decide to sell their holding stocks. However, if the profit is not appropriate, the investor will hold those stocks. Moreover, if the investors set high return profit, investors must seriously study information that affects the stock such as interest rate, inflation rate, exchange rate, economic situations, and industrial situation [4]. Because there is the requirement of the tool for making decision to invest in MAI as the same as SET, the stock information used in the model for SET may not be appropriate for modeling in MAI. This paper thus proposes the model for making the decision to invest particularly for selling in MAI of Thailand.

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2. Decision Making Model for MAI

Decision making model is generally used in different areas, for example flood disaster evacuation [5], inventory control [6], R&D expenditure [7], stock investment by getting the investment strategy to buy, hold, and sell [8-9, 10]. Although there is already the model to support decision to buy or not buy stock in MAI [4], the model for to hold and to sell is not widely introduced for MAI. Therefore, this paper proposes the model for managing to sell or hold stocks in MAI by using Back Propagation Neural Network, the appropriate tool for making the decision to sell and hold in MAI can be provided for the investors.

3. Back Propagation Neural Network

An artificial neural network is the network of simple elements called neurons which are used for modeling some of the functionality of the human nervous system. Generally, an ANN is considered as a system having three different layers including input layer, hidden layer, and output layer. Moreover, an ANN is particularly useful as a non-linear statistical data modeling or decision making tool [11]. Back Propagation (BP) Neural Network is one of the most popular neural models having the gradient descent algorithm for multilayered feed forward neural networks where neurons have sigmoid signal function as its activation function [11]. The learning process of BP Neural Network is supervised learning which weights are updated based on a pattern-by-pattern according to the given pattern examples. The structure of BP Neural Network is shown in Figure 1.
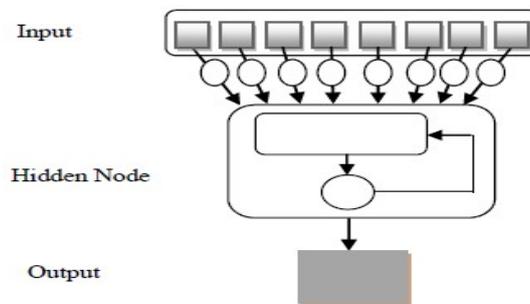

Fig. 1: The Structure of Back Propagation Neural Network.

Generally, neural networks are widely used for creating tools for stock investment and forecasting [12] in SET. The BP Neural Network has also been used for forecasting the stock price in SET using macroeconomics variables, stock price, volatility and stock movement, foreign stock index [13]. Although there has been an attempt to use BP Neural Network for decision making to buy or not to buy stocks in MAI [4], it has not been used for the model of to hold or to sell the stock in MAI yet. This paper thus attempts to study and determine the appropriate BP Neural Network for managing to sell or hold stocks in MAI.

4. Methodology

As mentioned before, this paper studies 5 stocks in MAI as shown in Tables 1 from 10 MAI stocks having high trading volume in 2010 [14]. The input data is monthly data between 2007 – 2012. Those input data are generally macroeconomic variables and stock variables which are the factors affecting the stock market investment [10, 15–16]. This paper believes that besides the macroeconomics and stock variables, the alternative variables are also important because they are the other alternatives ways of investment having high return [15-16]. Therefore, the input data used in this are macroeconomics variables, stock variables, and alternative variables. The macroeconomic variables consist of exchange rate, inflation rate, interest rate, and manufacturing production index. Next, the stock variables consist of stock price and stock trading volume. Finally, the alternative variables consist of bond trading volume and gold price. Additionally, the outputs are to sell or to hold the stock in MAI. The conceptual model of this paper is shown in Figure 2.

Figure 2 shows the conceptual diagram of the proposed model. The input data are randomly chosen for 55 months during 2007 – 2012. The expert knowledge base is made by 10 investment experts. The decision making model consists of 9 input nodes, 10 hidden nodes and 1 output node. The training patterns are 30 patterns and the testing patterns are 20 patterns. The learning rate is 1 and training iteration is 700 times. The activation is sigmoid function.
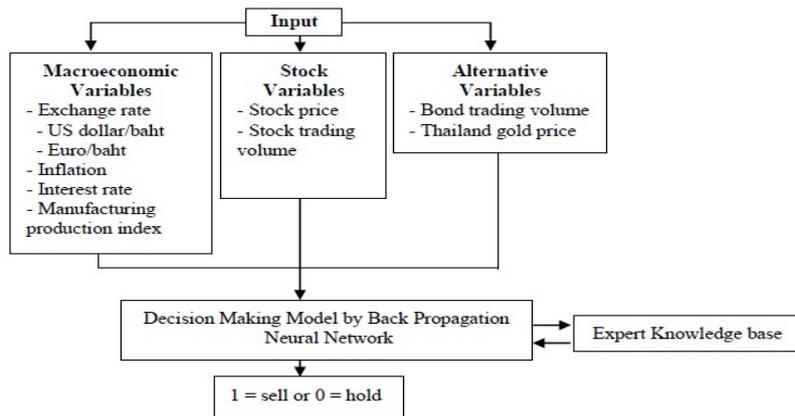
Fig. 2: Conceptual Diagram of the Proposed Model.

5. Experimental Results

The proposed model is trained and tested with the data of 5 stocks in MAI of Thailand. The accuracy of decision support model compare those made by the experts with expert as show in Tab1.

Tab.1: The Accuracy from Decision Making Model Comparing to the decision made by the Experts.

No.	Stock Symbol	Stock Name	Accuracy
1	KASET	Thai Ha Public Limited Company	87.27
2	TRC	TRC Construction Public Limited Company	89.09
3	SLC	Solution Corner (1998) Public Limited Company	83.64
4	E	Evolution Capital Public Limited Company	92.73
5	UEC	Unimit Engineering Public Limited Company	83.64
		Average	87.27

Tab.1 shows that the average accuracy of making the same decisions as those made by the expert is 87.27%. E stock has maximum accuracy which is 92.73% and UEC and SLC stock has the minimum accuracy which is 83.64%. The accuracy of each stock shows that the BP Neural Network has the potential to create the model supporting the decision to sell or to hold the stock in MAI. However, the future work will be focusing in increasing the accuracy and eliminating the error which might happen because the less information used for training as shown in Figure 3.
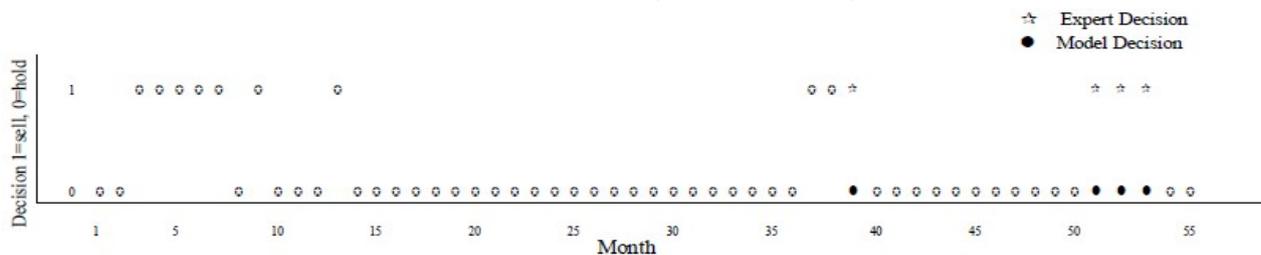

Fig. 3: Decision made by expert and model for E Stock in MAI.

6. Conclusions

The paper proposes the model to support the decision to sell or to hold the stock in MAI by using Back Propagation Neural Network. The variables used for modelling are the macroeconomic variables, stock variables, and alternative variables. The experiment is conducted by using monthly data from the last 5 years data during 2007 to 2012 of 5 famous stocks of MAI in Thailand. The results show that the proposed model provides 87.27% average accuracy for making the same decision as the experts.

7. References

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