The Effect of Behavioral Factors on Stock Price Prediction using Generalized Regression and Backpropagation Neural Networks Models

Payam Hanafizadeh, Department of Industrial Management, Allameh Tabataba’i University, Tehran, Iran
Ahmad Hashemi, University of Science and Culture, Tehran, Iran

ABSTRACT

With regard to the importance of behavioral factors on stock price, which has been mentioned by researchers, this study includes four behavioral factors (overconfidence, representativeness, over reaction and under reaction) in addition to fundamental and technical factors as inputs for neural network models to evaluate the effectiveness of these behavioral factors on stock price prediction accuracy of 10 companies of DJIA index. Multi-layer perceptron (MLP) and generalized regression neural networks are used in this research as models to find the best model for each company based on unique characteristics of its own financial data. This study shows the mentioned behavioral factors are effective on accuracy of predictions of 8 out of 10 companies.

Keywords: Backpropagation Neural Network, Behavioral Analysis, DJIA Index, Generalized Regression Neural Network

1. INTRODUCTION

Improvement of prediction methods in financial market has been considered by a lot of researchers due to unstable and dynamic characteristic of financial markets especially stock market. Unfortunately stock market is essentially dynamic, non-linear, complicated, nonparametric, and chaotic in nature (Tan et al., 2005). In addition, the time series are multi-stationary, noisy, random, and has frequent structural breaks (Oh & Kim, 2002; Wang, 2003). Stock market’s movements are also affected by many macro-economic factors (Miao et al., 2007; Wang, 2002) such as political events, firms’ policies, general economic conditions, commodity price

DOI: 10.4018/IJBIR.2014100104
index, bank rate, bank exchange rate, investors’ expectations, institutional investors’ choices, movements of other stock market, psychology of investors, etc.

Due to these difficulties in forecasting market’s movement by using traditional methods, researchers have been working on more sophisticated methods such as artificial neural networks as models to overcome such limitations which mentioned above. We consider ANNs as an effective model for forecasting because of their suitable characteristics such as the ability of approximating any nonlinear function, noise ignorance and pattern recognition and independence from any statistical distribution.

As Nofsinger (2002) pointed out, there are two dominant assumptions in the field of finance. For the past three decades, the first one is that People make rational decisions and the second one is People are unbiased in their predictions about the future. The assumption of rationality as a simple model of investor’s behavior is one of the main bases of classical finance and almost all the classical finance theories such as efficient market theory and capital asset pricing model are affected by this assumption. However, psychologists have known for a long time that these are bad assumptions. People often act irrational in decision making process and they make predictable errors in their forecasts and this is true for financial decision making too and these predictable decision errors by investors can affect the overall function of the markets. The study of psychological aspect of financial decision making, which is called “behavioral finance”, tries to explain how unreasonable reactions can be influential in markets. Shefrin (2000) organized psychological phenomena pervading the landscape of finance into three themes: 1) heuristic-driven bias; 2) frame dependence; and 3) inefficient markets. A heuristic is the process by which people seek things out for themselves, usually by trial and error; while trial and error can develop into general rules of thumb, it can also culminate in further errors (Shefrin, 2000). In financial markets, these biases include representativeness, overreaction, underreaction and overconfidence, as well as availability bias, anchoring-and adjustment, aversion to ambiguity and gambler’s fallacy, and stock market prediction. The second theme of behavioral finance presents, frame dependence, distinguishes between form and substance in decision-making. It reflects a mix of cognitive and emotional elements. The third one is about common question in finance, whether the market is efficient or inefficient (Lee, 2009). This study focuses on four biases: representativeness, overreaction, underreaction and overconfidence. We want to evaluate the impact of thesis biases on prediction accuracy.


2. LITERATURE REVIEW

As mentioned above behavioral finance tries to explain how unreasonable reactions can be influential in markets. Shefrin (2000) organized psychological phenomena pervading the landscape of finance into three themes: 1) heuristic-driven bias; 2) frame dependence; and 3) inefficient markets. A heuristic is the process by which people seek things out for themselves, usually by trial and error; while trial and error can develop into general rules of thumb, it can also culminate in further errors (Shefrin, 2000). In financial markets, these biases include representativeness, overreaction, underreaction and overconfidence, as well as availability bias, anchoring-and adjustment, aversion to ambiguity and gambler’s fallacy, and stock market prediction. The second theme of behavioral finance presents, frame dependence, distinguishes between form and substance in decision-making. It reflects a mix of cognitive and emotional elements. The third one is about common question in finance, whether the market is efficient or inefficient (Lee, 2009). This study focuses on four biases: representativeness, overreaction, underreaction and overconfidence. We want to evaluate the impact of thesis biases on prediction accuracy.
