


Chapter 13

Challenges of Stock Prediction

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ABSTRACT

The challenge of the stock price forecast is the most crucial component for companies and equity traders to predict future revenues. A successful and accurate prediction to the future stock prices ultimately results in profit maximisation. This chapter proposes the use of autoregressive integrated moving average (ARIMA) and the artificial neural networks (ANNs) models to predict the future prices of the stock. Using Walmart's stock index, the results show that both ARIMA and the ANNs models provide accurate forecasting performance. However, for short-term forecasting, the performance of ANNs outperformed ARIMA models.

INTRODUCTION

Stock price forecast is the most crucial component for investors and companies to predict future revenues and any possible negative earnings. The essence of the stock market investments involves high risk and high profits; thus, it is a source of attraction to many businesses, investors and economists. Traditionally, the firm's growth valuation depends on forecasting earnings and cash flows using an appropriate discount rate for cash flows to arrive at the value of the firm. However, this traditional forecasting earning is merely possible if a firm has either positive earnings, comparable firms or a long history of performance. We attempt to overcome this problem and provide appropriate solutions and tools for financial managers and investors to assist in making successful business decisions. In particular, we apply several quantitative techniques with a set of examples which help to forecast and predict the future prices of the stock. It also allows investors and businesses to make informed decisions about whether to buy or sell the stock of interest.

Additionally, the stock market data is prone to non-economic factors such as natural disasters and political decisions; thus, it is naturally noisy and unpredictable. The unpredictability of the stock data is also due to the incomplete information from the past behaviour of the stock market to enable capturing the dependency between future and previous prices (Tay and Cao 2001). The incomplete information

DOI: 10.4018/978-1-7998-1086-5.ch013

Challenges of Stock Prediction

concerning the stock market data is often regarded as noisy characteristics, making it a challenge to predict the future price of a stock. Due to the rapid increase in trade and investment, the need for the appropriate tools and methods to mitigate risks and maximise gains equally increased.

To address this issue, we explore several (linear and nonlinear) time series models in the literature with accurate forecasting performances. In the recent competitive forecasting-literature, the aim is to construct models which can predict the future stock prices with greater accuracy. Nonetheless, the literature in exponential smoothing methods still inconclusive, Gardner (2006) developed the work of Brown (1959); and Holt (2004a) from theoretical and practical perspectives. Theoretically, and based on a new class of the state-space models, Gardner introduced a complete statistical rationale for exponential smoothing method. Practically, he developed a robust method for smoothing damped multiplicative trends.¹ ARCH and GARCH models are also essential tools for the analysis of time-series data; however, according to Engle (2001), they are especially useful for the analysis and forecasting volatility. Several other prediction models also made available in the literature, for example, Support Vector Machine models (Sai et al., 2007; Karathanasopoulos et al., 2016); structural time series models and the Kalman filter, (Harvey, 1990). Besides, using Sunspot data, Babu and Reddy (2014) proposed a hybrid ARIMA-ANN model based on a moving-average filter. Their results show that for both one-step and multistep ahead forecast, the proposed hybrid model has higher prediction accuracy.

For more than half a century, linear autoregressive integrated moving average (ARIMA), and the nonlinear artificial neural networks (ANNs) models have dominated time series forecasting area. In this chapter, we investigate with a set of examples, the forecasting performance of the autoregressive integrated moving average (ARIMA) and the artificial neural networks (ANNs) models in predicting the future prices of the stock market. Several distinguishing features of both ARIMA and the ANNs models make them vital tools for valuable forecasting tasks.

The ARIMA model; known as Box-Jenkins methodology, is widely used in the literature as an efficient and accurate tool for forecasting time series data. It can only perform well using a stationary time series data; for other case scenarios, the data should be made stationary (by, differencing) to meet the requirements for accurate forecasting results. Thus, the time series prediction using ARIMA model assumes the case under study generated from linear processes; because it relies on the previous values of the series and the past error-terms for forecasting, (Khashei and Bijari 2010; Wang et al. 2012; Adebisi and Adewumi 2014).

Artificial neural networks (ANNs) are also one of the most accurate and extensively applied forecasting models in various real-life applications including social, economics, stock problems, engineering and foreign exchange (Khashei and Bijari, 2010). It is because; ANNs are data-driven and self -adaptive methods which can be used as universal function approximators. As nonlinear models, the ANNs received overwhelming attention in recent literature for time series forecasting, in particular, the prediction of the stock market prices.

This chapter contributes to the contemporaneous challenges of the stock price prediction. The aim is to capture challenging and frequently changing prices more quickly and minimise risks to stock market investors and financial decision-makers. Our study contrasts different time series forecasting tools such as ARIMA and ANNs models to accurately predict the future prices of a stock; using Walmart' stock data as an example. Based on daily adjusted closing prices of Walmart's stock index, our predictive results presented here contributes significantly to the higher level of building profitable strategies. Besides, to enhance our contribution reliability, we employ some important technical indicators such as simple moving average (SMA) and moving average convergence/divergence (MACD) as auxiliary forecasting tools.

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