

Chapter 29

Simulation of Stock Prediction System using Artificial Neural Networks

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ABSTRACT

Stock trading, used to predict the direction of future stock prices, is a dynamic business primarily based on human intuition. This involves analyzing some non-linear fundamental and technical stock variables which are recorded periodically. This study presents the development of an ANN-based prediction model for forecasting closing price in the stock markets. The major steps taken are identification of technical variables used for prediction of stock prices, collection and pre-processing of stock data, and formulation of the ANN-based predictive model. Stock data of periods between 2010 and 2014 were collected from the Nigerian Stock Exchange (NSE) and stored in a database. The data collected were classified into training and test data, where the training data was used to learn non-linear patterns that exist in the dataset; and test data was used to validate the prediction accuracy of the model. Evaluation results obtained from WEKA shows that discrepancies between actual and predicted values are insignificant.

INTRODUCTION

A stock is a share of a firm, held by an individual or group of peoples, which are bought and sold on exchange in a stock market. A stock (or equity) market may be defined as the aggregation of buyers and sellers who transact on shares, stocks, government bonds, debentures, and other approved securities (Okobia, 2000). The stock market has been identified as an institution that contributes to the economic growth of emerging economies (Abiola & Okodua, 2008). Thus, such a market is a bazaar where small and large investors buy and sell stocks of companies and government agencies through stock brokers.

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Prelude to the age of computer systems, stock trading was primarily done based on human intuition. However, as the level of investing and trading grew, people searched for tools and methods that would increase their gains while minimizing associated risks (Adebiyi *et. al.*, 2012). Hung *et. al.*'s study (as cited in Govindasamy & Thambidurai, 2013) states that stock price prediction model can be used to solve classical and important problems such that insight about market behavior can be gained over time and spot trends that would not have been noticed. Stock price prediction is one of the most important topics in finance and business. However, the stock market domain is dynamic and unpredictable (Gerasimo *et. al.*, 2005; Roh, 2007).

The Nigerian stock market which is by jurisdiction managed by the Nigerian Stock Exchange (NSE), was established in 1960 through the Acts of Parliament. It started her operations in 1961 with 19 securities listed for trading and presently has more than 260 companies listed on the Exchange. Most of these companies have multinational affiliations and represent a cross-section of the economy, ranging from agriculture through manufacturing to services. The public trust in NSE has grown tremendously with about 3 million individual investors and hundreds of institutional investors using the Exchange facilities. A major challenge posed at stock investors which serves as a great concern, to both institutional and individual investors, is their inability to predict stock prices (Cheh *et. al.*, 1999).

Stock price prediction is one of the most important topics in finance and business. However, the stock market domain is dynamic and not easily predictable (Gerasimo *et. al.*, 2005). In several studies, variations in stock prediction were attributed to different factors which can cause fluctuation of stock market (Jiuchang *et. al.*, 2014). A proper analysis had recourse to several research efforts towards accurate prediction in stock market for profit making. For instance, Philip *et. al.* (2007) report several techniques that were used in different studies to have provided different results although, many techniques, including those reported in the later study, were concluded in Yang & Wu (2006) to be ineffective in predicting stock market prices and suggested intelligent techniques such as Artificial Neural Network to build resourceful predictive models.

Neural network (NN) is a soft-computing tool that has been applied to tackle prediction and pattern recognition related problems. Artificial Neural Network (ANN) is an art that emulates the biological processes of neurons for processing parallel distributive information that could otherwise be seen as complex patterns within available data (Wong *et. al.*, 1998). In ANN, each network is a collection of neurons that are arranged in specific formations (Chung, 2001). Unlike conventional programming, ANN can solve problems that do not have algorithmic solution.

Artificial Intelligence is an important area of research in different fields of Science and Engineering with applications in Accounting, Marketing, and Law among others (Atajeromavwo *et. al.*, 2015) but forecasting is a difficult aspect that stands as a great challenge to human astuteness. The ability of ANN in mining valuable information from mass history of data is considerably practical (Tang *et. al.*, 2003) that application of ANN to financial forecasting have been in gesticulation in recent times (Abu-Mostafa *et. al.*, 2001; Zhang *et. al.* 2005). Since the last decade, concepts of ANN have been applied in the fields of business, finance and economics for several purposes like time series forecasting and performance measurement (Avci, 2007). Hence, the growing need for a veritable prediction tool in stock price prediction serve as impetus for this study. Such tools are vital for investment policy makers and assist investors in making better and quality decisions.

This study focuses on the development of an ANN-based stock price prediction system which can be used to forecast future stock price of the NSE more accurately. The remainder of this article is organized that Section 2 presents an overview of NSE, stock price prediction, and ANN, with review of

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