Digital Signal Processing for Predicting Stock Prices Using IBM Cloud Watson Studio

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Abstract

Research on automated systems for stock market price prediction has gained much momentum in recent years due to its potentials to yield profits. As it is shown in the review of related works, researchers have experimented different algorithms in Artificial intelligence with the aim of achieving greater accuracy rate. In this work, the research presents a review trading systems and demonstrates how it works using Neural Network algorithm and Linear predicting algorithm embedded in IBM cloud Watson studio.

Keywords: *machine learning, IBM Cloud, digital signal processing, artificial intelligence*

I. Introduction

A stock market prediction is forecasting price outcomes based on certain considered factors. Stock prices are usually erratic and a careful study and understanding of necessary. Every investor wants returns on investment and constant loss of money due to price drop or market crash is never the anticipation of a stock market investor. There is not much debate over the existence of bubbles in the financial market, however, understanding the inefficiencies and predicting when the price bubbles will burst is a highly difficult task [1]. If an investor can reliably build up and predict when the market crash will occur, the investor will not only make a profit while prices are on the increase but also sell at the right time to avoid loses.

This is the concept of this project, if the recurring price structures found exist, it should be possible to forecast or predict outcomes using machine learning algorithm to learn these patterns and predict accordingly.

A. Statement of problem

The stock market runs with price. This is to say that price is everything as it is easily influence by many factors such as uncertainty in election outcome, decisions of policy makers, sudden change in government, a natural disaster, season and so many others. This is the reason why it is relevant to have a system that could predict future prices with some level of accuracy and assurance.

B. Aim and Objectives

The aim of this research is to simulate a stock market price predicting system.
The objectives are to;
i. Highlight the relevance of stock market price predicting system
ii. Demonstrate the process using algorithms in machine learning

II. Related work

This section contains reviewed works relating to stock market price prediction, concepts, considerations, and models.

A. Stock Market Prediction

The intrinsic volatility in the stock market across the globe makes the task of price prediction challenging. Diverse models and forecasting tools and mechanism has the implemented. Some of this models and techniques are usually more successful than the others not necessarily because of the complexity rather the use of major unforeseen variables within the model.

[2] work centred on an attempt to answer the question if real stock prices are forecastable – the forecastability of real stock prices. The research used what he called martingale hypothesis, which mainly considered the forecastability of price changes or returns. At the end, the research also considered efficient market theory. Thus, indicating that prices at the stock market is a dependable variable which is liable to shift with just a mere social media tweet.

The work of [3] is an attempt to control or reduce the investment risk on the stock market by developing an experimental framework for the classification of problem which predicts whether stock prices will increase or decrease with respect to the price prevailing in *n* days earlier. The research used two main algorithms –random forest and gradient boosted decision trees. The results showed certain level of improvement and accuracy.

Wanjawa and Muchemi [4] proposed the use of Artificial Neural Network that is feedforward multi-layer perception with error backpropagation and develops a model of configuration 5:21:21:1. It test running the model in a controlled environment, it showed MAPE of between 0.71% and 2.77%

In [5], it reviewed different approaches and algorithms that has been used in predicting stock market prices. While each algorithm and approach has its own strengths, it concluded that Long Short-Term Memory (LSTM) and Neural Network has better results in comparison other methods.

Singh [6] research used machine learning and deep learning techniques with Python codes to develop a predicting system. The work demonstrated the use of different algorithms such as k-Nearest Neighbours, Linear Regression, and moving average.

In [7] work exploited the temporal correlation that exist between the various stock market variables employing concepts of adaptive filters and signal modelling in order to predict future trends and prices, using linear regression algorithm and finite impulse response. While the linear regression algorithm is used for real time prediction, finite impulse response is an iterative process that minimises the mean square error.

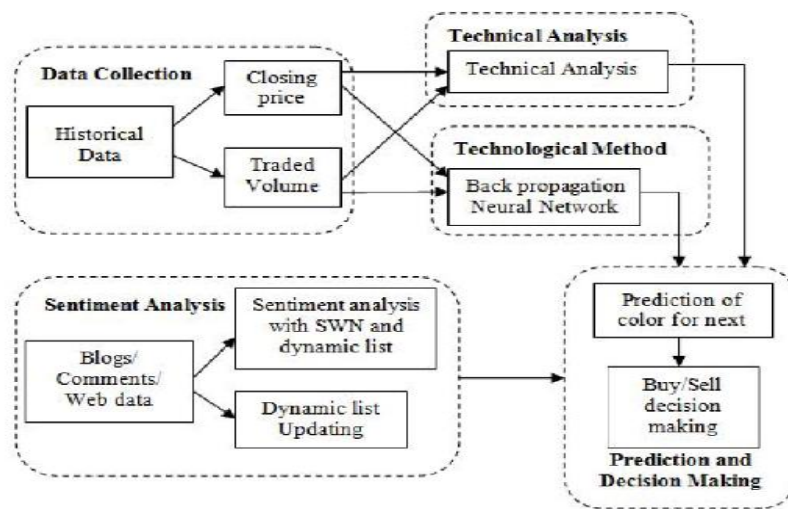## III. Methodology

A. stock market price prediction frame

Fig 1: stock market price prediction framework (2013)

Source: https://www.semanticscholar.org/paper/Automated-stock-price-prediction-and-trading-for-Bhat-Kamath/727bb873c53dc0d665d7055f6ef03580ab2a45b7

B. Tools Selection

i. IBM Watson Studio – embedded machine learning algorithm for prediction
ii. Numpy
iii. Sklearn
iv. DataSet - https://finance.yahoo.com/quote/AMZN/history/

C. Procedure

i. Create an account with IBM cloud
ii. Download dataset and extract. Identify the train and test dataset with .csv file extension.
iii. Select IBM studio and create a project
iv. Set parameters, upload dataset, create and embed the required scripts.
v. Refine data

IV. Results and Discussion

In running the embedded script in the dataset, it selects the variables you have defined such as the date, low, high, close to make the prediction.
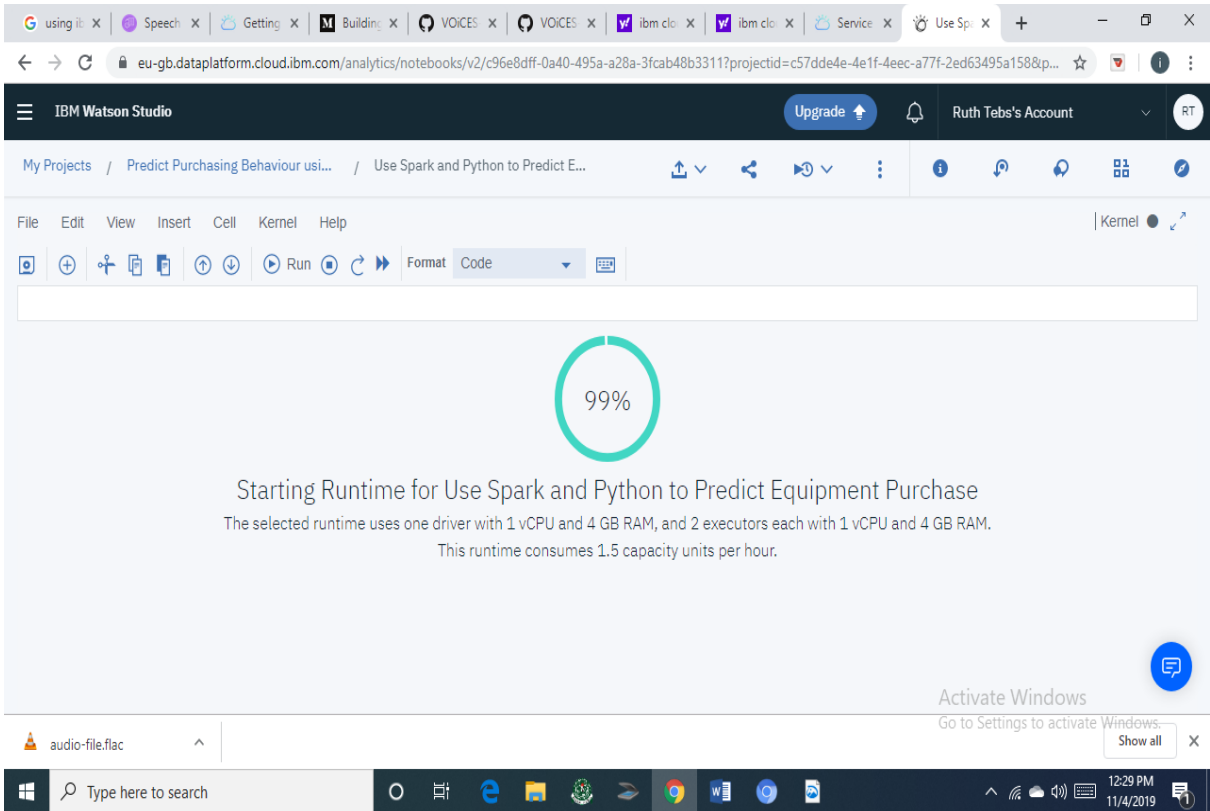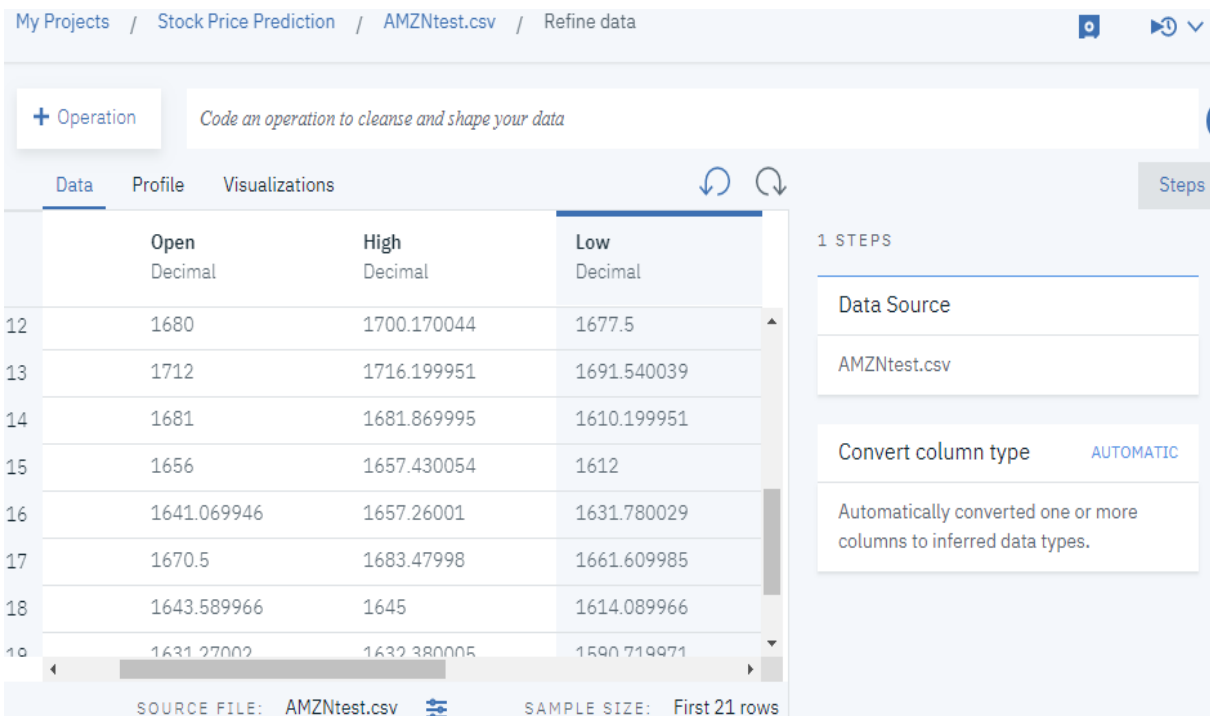
Fig 2: running script screen

Fig 3: Data output

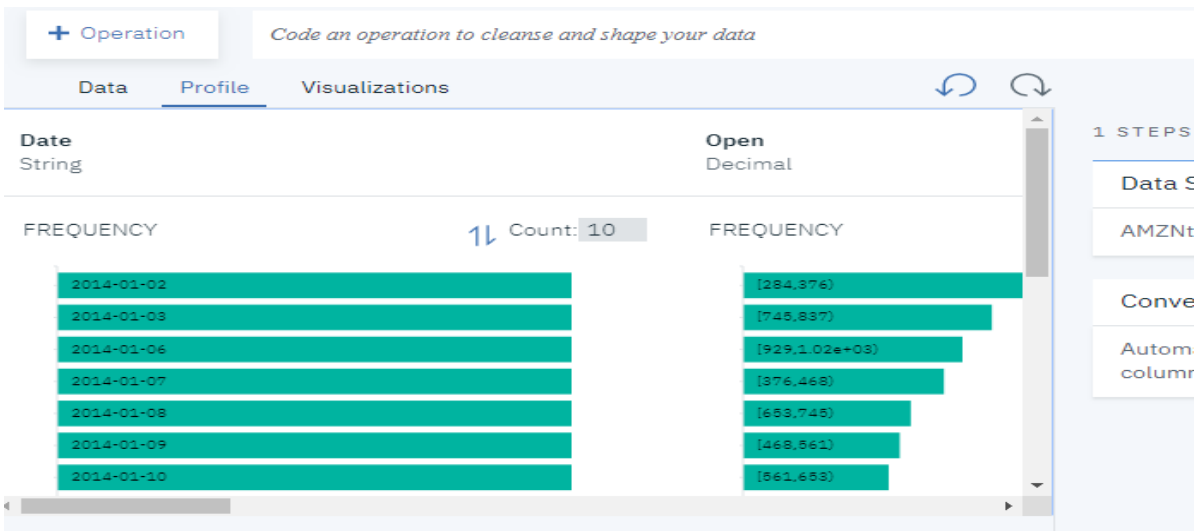If the screen is extended it will display the predicted close price and the volume

Fig 3: the frequency
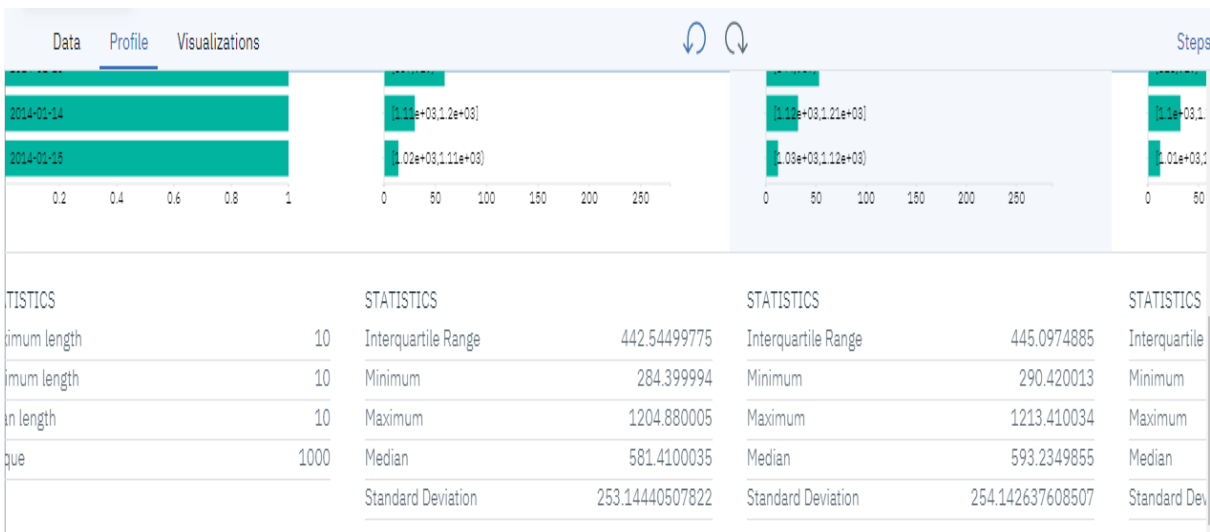

Fig 4: the graphical representation of the indices

Fig 5: summary of the statistic

V. Conclusion

Predicting or forecasting stock prices with some level of accuracy is necessary especially for the business investor. However, it requires the right application of machine learning or deep learning algorithm to achieve high rate of accuracy. A singular algorithm may not do much taking into consideration the different known and unknown factors that affects it. Worthy of note is that simulated works in a controlled environment may not always produce expected rate of accuracy in real time.

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