WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Stock Market Prediction

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Abstract—

Stocks are possibly the most popular financial investment for building capital and are the core of any investment portfolio Predicting stock market returns is a challenging task due to consistently changing stocks values. Deep learning algorithms are used to build the models. A good accuracy is observed using LSTM algorithms on prediction model. Prediction model tries to evaluate whether there is any similarity between past data trends. Because of the market crash and profits making, it is required to have a secure prediction of the price of the stocks.

Keywords— Predict, LSTM, Stock, Price, Stock Market

Introduction to stock market

Stockmarke tis trading plat form where different investors buy and sell shares according to stock availability. Stock market ups and downs effects the profit of shareholder. Buyers buy stocks with low prices and sell stocks at high prices and try to get huge profit. Similarly, sellers sell their products at high prices for profit purpose [1]. Stock market work as trusty platform among sellers and buyers. A stock (also known as shares) is a representational ownership claims on business by any individual or a group of people. The attempt to estimate the future value of the share price is known as a stock market prediction Fundamental and technical analyses were the first two methods used to forecast stock prices. Artificial Neural networks (ANNs) is the most commonly used technique [2]

Description of Dataset

We will implement LSTM algorithms on different datasets, and we will also analyses the trends of data manipulation of **NSE TATA GLOBAL, HDFC, ITC, TATA MOTORS, SBIN.** Mostly data is obtained from Kaggle.

Obtaining dataset and pre-processing

The obtained data contained five features:

1. Date: Trading Date of Stock Price
2. Opening price: When trading in stock begins each day this is opening price of stock.
3. Closing price: When trading in stock ends each day this is closing price of stock.
4. High: The highest price in a day at which the stock was traded (day).
5. Low: The Lowest price in a day at which the stock was traded during a period(day).

OBJECTIVES

The main objective of this study is to:-

- Study about different methodologies to obtain more accurate stock prediction price and to evaluate them with some performance measures.
- To reduce the error proportion in predicting the future stock prices.
- It increases the chances for the investors to predict the prices more accurately by reducing error percentage and thus gain benefits in share markets.

After getting the idea about different methods of stock market forecasting techniques we can understand that by using which methods we will get more accurate results. Then we will be able to reduce the amount of error by which investors can invest their valuable money in stock market at a right time. In Stock Market Prediction, the aim is to predict the future value of the financial stocks of a company.

The recent trend in stock market prediction technologies is the use of machine learning which makes predictions based on the values of current stock market indices by training on their previous values. Machine learning itself employs different models to make prediction easier and authentic. The

paper focuses on the use of Regression and LSTM based Machine learning to predict stock values. Factors considered are open, close, low, high and volume.

LITERATURE SURVEY

Tsanga (2007), Developed and implemented a model of NN5 for Hong Kong stock price forecasting'. The system was tested with data from Hong Kong stock, the system achieved an overall hit rate of over 70% [3]

- This consider attempted to make models for guess of the market trade and to select whether to buy/hold the stock using data mining and AI technologies. The AI framework like Naive Bayes, k-Nearest neighbors, Support Vector Machine, Artificial Neural Network and Random Forest has been used for prediction of stock market.
- Kim and Han in design a model as a union of artificial neural networks (ANN) and genetic algorithms (GA) with variational of features for predicting stock price index. The data used in their research includes the technical indicators as well as the direction of change in the daily Korea stock price index[4]
- Previous methods of stock forecasting include the use of Artificial Neural Networks and Convolution Neural Networks with an error rate of 20%.
- Machine learning is an efficient way to represent processlike prediction. It predicts a market value close to the noticeable value, thereby decreasing the error. Commencement of machine learning to the area of stock prediction has attract many researches because of its efficient and precise measurements [5]

PROPOSED SYSTEM

We prefer to use LSTM (Long Short-Term Memory) algorithm to obtain accurate stock price prediction.

- LSTM is a special type of RNN, which can learn long-term dependence. Carry information in memory, alike computer memory. It is capable to read, write and delete information in its memory. This memory can be consider as a closed cell, with a closed description, the cell decides to reserve or eliminate information.

- LSTM uses three gates: input, forget and exit gate. These gates determine whether new input (input gate) should be allowed or not.

1. Forget gate: The forget gateway determines when certain parts of the cell will be inserted with information that is more recent.

2. Input gate: Based on the input, this network category reads the conditions under which any information should be stored (or updated) in the state cell.

3. Output gate: Depending on the input mode and the cell, this gate determines which information is forwarded to the next location in the network

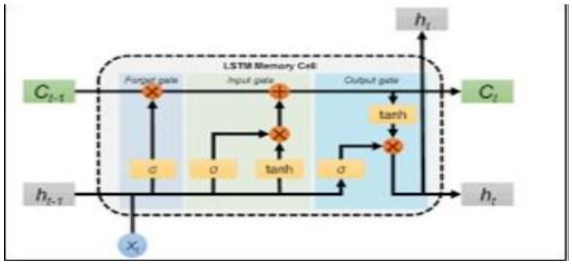

Fig. 1. LSTM MEMORY CELL

Advantages of LSTM

- The main advantage of LSTM is its ability to read median context. Each unit recall details for a long or short period without explicitly using the activation function within the recurring elements. Thus, the data from the last cell can pass through the unchanged cell instead of explicitly increasing or decreasing in each step or layer, and the tool can convert to their appropriate values over a limited time. This allows LSTM to solve a unstable problem.

- The main purpose behind using this model in stock market prediction is that the predictions depends on large amounts of data and are generally dependent on the long term history of the market [6]. So LSTM regulates error by giving an aid to the RNNs through retaining information for older stages making the prediction more accurate [7].

RESULT OUTCOMES AND ERROR CALCULATION

TATA MOTORS

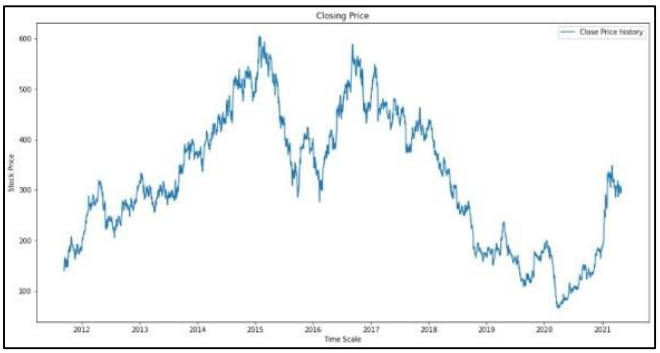

Fig. 2 . Closing Price of TATA MOTORS

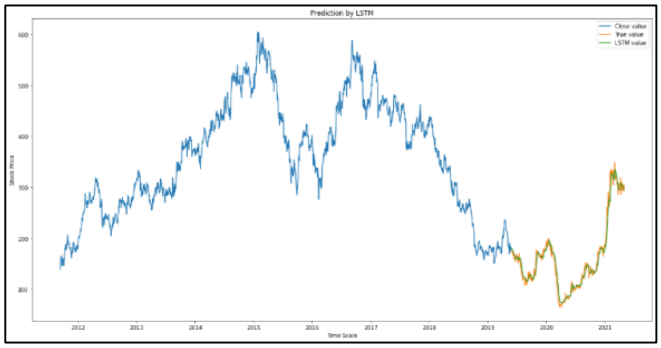

Fig. 3 . Predicted Price of TATA MOTORS

- In Fig. 2. This is the Closing Price of TATA MOTORS stock for the Time Frame of 9 years Ranging from (2012-2021) .
- Fig. 3. describes the Predicted Price of TATA MOTORS based on the LSTM Model. The Data is trained from (2012-2019) , and the Model predicts the closing price of the stock from the range of (2019-2021) with pretty Good Accuracy .

ITC

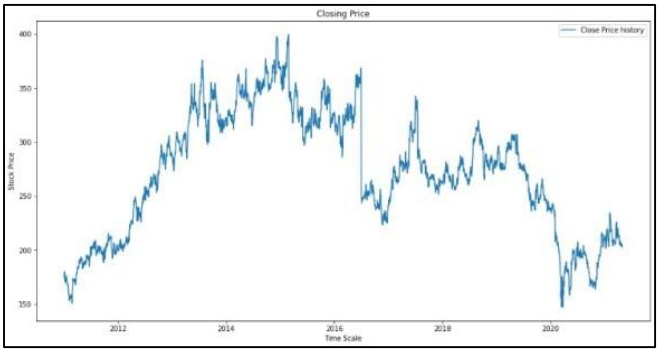

Fig. 4. Closing Price of ITC

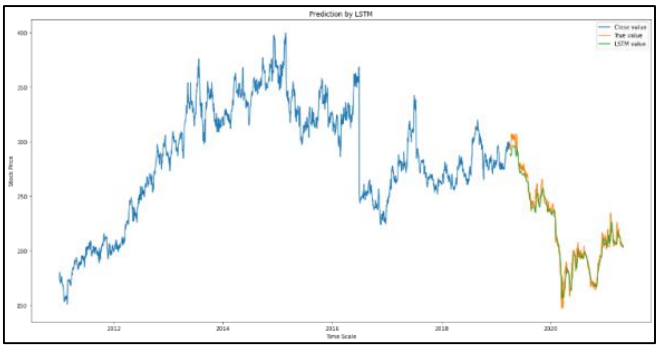

Fig. 5. Predicted Price of ITC

- In Fig. 4 . This is the Closing Price of ITC stock for the Time Frame of 8 years Ranging from (2012-2020) .
- Fig. 5 . describes the Predicted Price of ITC based on the LSTM Model. The Data is trained from (2012-2019) , and the Model predicts the closing price of the stock from the range of (2019-2020) with pretty Good Accuracy .
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SBIN

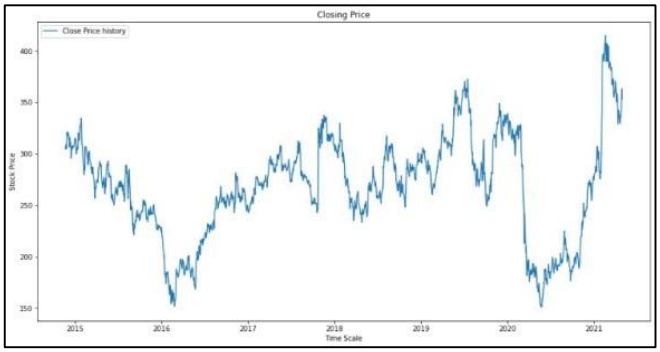

Fig. 6. Closing Price of SBIN

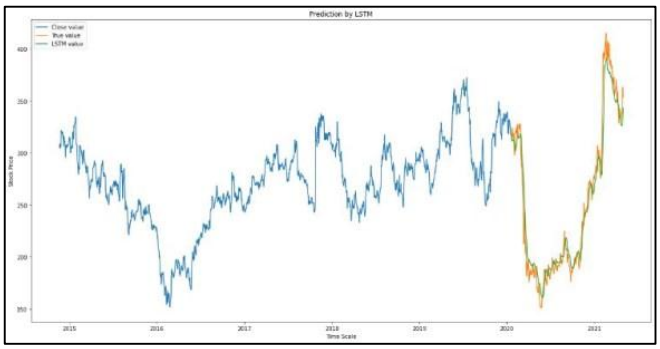

Fig. 7 . Predicted Price of SBIN

- In Fig. 6 . This is the Closing Price of SBIN stock for the Time Frame of 6 years Ranging from (2015-2021) .
- Fig. 7 . describes the Predicted Price of SBIN based on the LSTM Model. The Data is trained from (2015-2020) , and the Model predicts the closing price of the stock from the range of (2020-2021) with pretty Good Accuracy .

The above graphs is plot over the data having values of nearly9-10years. The prediction is shown by green line and the actual trend is shown by blue and orange line. The nearness of these two lines tells, how accurate the LSTM based model is. The prediction approximates real trend when a considerable data is trained. The more the model is trained the greater the precision will be attained

Error Calculation:

To evaluate the accuracy of the model, 5 different dataset are trained. Predicted closing price are subjected to Root Mean Square Error(RMSE), Mean Absolute Percentage Error(MAPE) and Mean Bias Error for finding the minimized error in predicted price.

I. RMSE:

$$\text{RMSE} = \sqrt{\frac{\sum_{i=1}^{n}(x_i - y_i)^2}{n}}$$

where,
n = total window size.
x_i = original closing price.
y_i = predicted closing price .

II. MAPE:

$$\text{MAPE} = \frac{1}{n}\sum_{i=1}^{n}\frac{(x_i - y_i)}{x_i} \times 100$$

where,
n = total window size.
x_i = original closing price.
y_i = predicted closing price .

III. MBE:

$$\text{MBE} = \frac{1}{n}\sum_{i=1}^{n}(x_i - y_i)$$

where,
n = total window size.
x_i = original closing price.
y_i = predicted closing price .

TABLE I. ERROR CALCULATION

COMPANY NAME	ERROR ANALYSIS		
	RMSE	MAPE	MBE
TATA MOTORS	0.49	5%	0.482
ITC	0.30	2%	2.265
TATA GLOBAL	0.76	4%	-7.313
SBIN	0.77	4%	1.317
HDFC BANK	2.05	2%	-5.484

According to research and study the domain range for best fit model are:

- RMSE values between 0.2 and 0.5 shows that the model can relatively predict the data accurately.
- MAPE less than 5% is considered as an indication that the forecast is acceptably accurate
- MBE values between -5 to +5 shows that the model can relatively predict the data accurately

Hence, from the designed model we can conclude that the model for stock price predictionis quite accurate and result obtained are pretty good.

CONCLUSION

✞ Predicting stock market returns is a challenging task due to consistently changing stocks values which are dependent on multiple parameters which form a complex pattern.

✞ The Historical Dataset available on website consist of only few features like high, low, open, close, adjacent close value of stock prices, volume of shares traded etc. which are not sufficient.

✞ To obtain higher accuracy in the predicted price value new variable have been created using the existing variables. Machine learning and LSTM is used for predicting the next Day Closing price of the stock and for a comparative analysis.

✞ The comparative analysis is based on RMSE, MAPE, and MBE values clearly indicate that the model gives good prediction of stock prices.

✞ For future work, this model could be developed which consider financial news article along with financial parameters such as closing price, traded volume, profit and loss statements etc., for possibly better results.

✞ LSTM have been utilized in this paper on the kaggle dataset. The techniques have shown an improvement in the accuracy of predictions, thereby predicting accurate results. It has led to the result that it is possible to predict stock market with more accuracy and efficiency using machine learning techniques. In the future, the stock market prediction system can be further improved by utilizing a much bigger dataset and factors than the one being used currently.

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