

CURRENCY EXCHANGE RATE PREDICTION USING MACHINE LEARNING TECHNIQUES

Sumanjit Das¹, Mohammed Siddique²

¹Indian Institute of Technology, Bhubaneswar, Odisha, India

²Department of Mathematics, Centurion University of Technology and Management, Odisha, India

Corresponding Author:

Mohammed Siddique

Department of Mathematics, Centurion University of Technology and Management, Odisha, India

Email: nayaksasmita484@gmail.com

Abstract

The financial status of any nation measured on different parameters, the value of foreign currency is one of the major factors. The economical condition of any nation signifies from its currency value in international market. The international market deals with United States Dollar as standard currency for any kind of international transactions but currencies like EURO etc are also popular in international market. We can say if our nation currency is less than the international standard currency then our economy is not good. The value of currency makes changes depending of many factors and conditions. So it makes more challenging to predict the value of our currency in international standard like US Dollar or EURO. This paper introduces a machine learning model to predict the exchange rate of foreign currency values with respect to Indian rupees. The efficiency of the proposed model is measured and validated using standard performance measured techniques like MAPE, MAE and MSE. The performance of the proposed model is good enough to be accepted.

Key words: Forecasting; Machine Learning; Exchange rate; Currency

Introduction

The developing countries are moving forward in different dimension with many more possibilities across the globe. They are focus on international import and exports of goods and services for their development. Exchange of technology and man power makes it possible to work in different environments for growth of individual as well as growth of their respective countries. From the exchange rate one can know the value of currency of a country to another country. The currency exchange value can be influenced by components like [1] natural calamities, political and economical uncertainty without any prior knowledge. So working on these situations with irregular data to predict exchange rate [2] may leads to high error. Many researchers pushing hard to design realistic framework to anticipate actual exchange rates. To predict more accurately most of the researchers focused on artificial intelligent based models like instead of statistical models [3]. In the study a large number of thrilling work on exchange rate on non parametric, parametric and in some cases together for improved outcome on financial data. The time series data are keep changing with respect to time known as non linear data makes it more challenging for prediction. So models like ARCH and GARCH are used to handle this kind of frequent changes in financial data [4]. One model designed [5] using ARIMA with DE to predict exchange of Yen and Pound with USD. The authors used variance and mean after normalizing the data which yields better result in comparison with other similar schemes. The above features of statistics have been used by [6] to forecast exchange value of USD to INR and Pound. The authors demonstrated the fantastic result of their adaptive non liner model.

The main objective of this paper is to predict currency exchange rate in advance of a week and in a day before. The exchange rate are focus on USD to INR and USD to EURO in a week advance open price and one day advance open price. The historical data is used to predict the exchange rate of international standard

currency to INR. The performance of the model is given in form of experimental results in the result section and finally comparison with some existing models. The last part of paper concludes the work with future scope of the work.

Data Processing

The currency value of two different nations can be determine by the rate of exchange from one currency to another. It depends on the demand of products of that nation to another nation. If the demands of Indian goods are more than INR value will be more in international market. Every listed currency is having a buy & a sell price in the while exchange rate are calculated. For the purpose of study and experiment in this paper USD to INR and EURO has been selected. As per practice the entire database has been split into training and testing datasets. A brief description of used database is given in table 1. The datasets is normalized within the range of 0-1 positive values by help of equation (1) as stated below. The normalized standard data are given to the model for training then the test and validation process starts to forecast exchange rate of USD to INR and USD to EURO in advance. The collected data are from forex database which are available from online sources in certain range.

$$Y = \frac{(Y - Y_{\min})}{(Y_{\max} - Y_{\min})} \quad (1)$$

Where, Y represents one record of database which consisting of all attributes. Y_{\min} and Y_{\max} are the minimum and maximum values of the database.

Table.1.Description of Data used by the model

Data Used for Prediction	Type of Data	Records in Dataset	Training	Testing
USD to INR	Time Series Numerical	5200	3200	2000
USD to EURO	Time Series Numerical	5200	3200	2000

Flow of the Prediction Model

The prediction model takes input from the database which is normalized as shown in equation (1). This machine learning model predicts efficiently the exchange rate by considering historical time series data. The model uses optimization techniques to predict open price of exchange rates. The mean square error is referred as loss value of the predicted model. The flow to data and working process by the predicted model is given in the fig. 1.

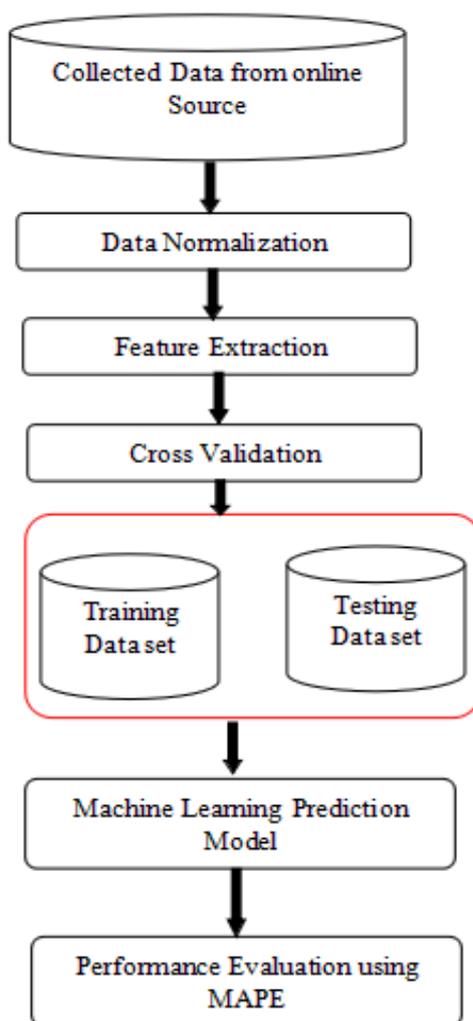


Figure.1. Data Flow of Predictive Model for exchange rate prediction

The performance of the model is evaluated using the standard equations as given in equation (2) for mean, equation (3) for mean square error and equation(4) for Mean Absolute percentage error.

$$Mean = \frac{1}{n} \sum_{i=1}^n X_i \quad (2)$$

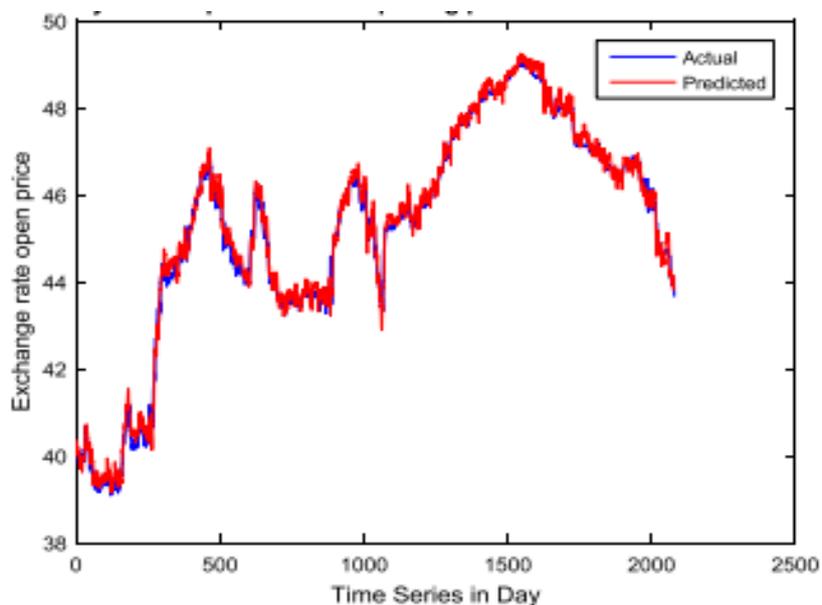
$$MSE = \frac{1}{n} \sum_{i=1}^n (Y_i - \hat{Y}_i)^2 \quad (3)$$

$$MAPE = \frac{1}{n} \sum_{i=1}^n \left(\frac{Y_i - \hat{Y}_i}{\hat{Y}_i} \right) \quad (4)$$

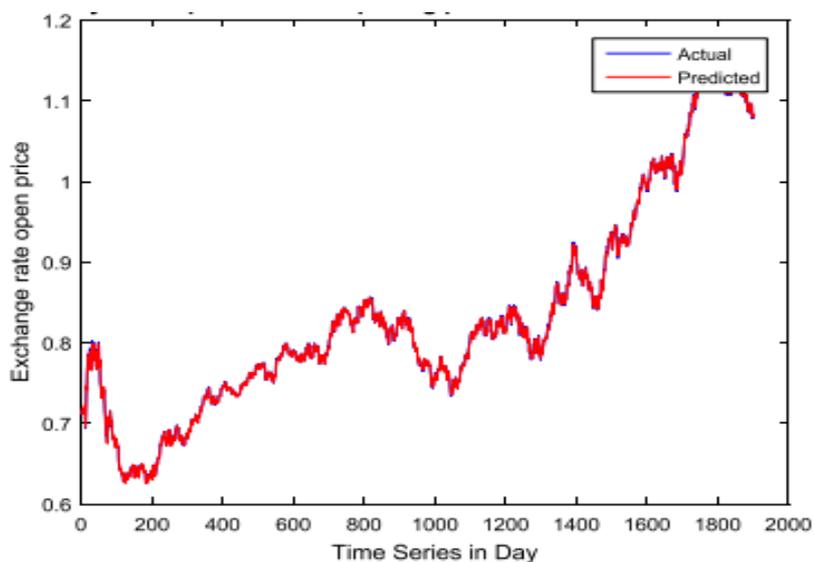
Experimental Result

The predicted model executed with help of certain parameter to yield good performance on exchange rate for USD to INR and USD to EURO. From the result it is observed that predicted values by the machine learning

model are very much similar to the actual time series values. The actual vs Predicted for dollar to Indian rupees exchange rate is given in fig.2 and dollar to EURO is given in Fig.3. The red line shows predicted values and the blue line shows actual values. The achieved result of the predictive model is given table 2 and in fig.4.



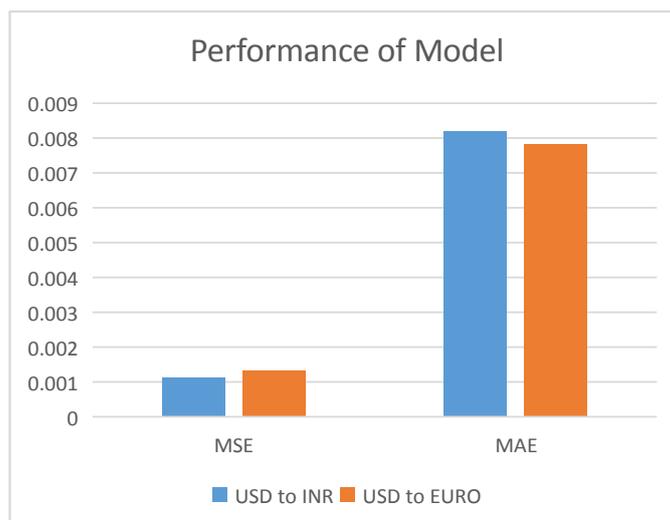
Actual Vs Predicted value for USD to INR



Actual Vs Predicted value for USD to EURO

Table.2. Performance evaluation of predictive model

Exchange Rate	MAE	MSE
USD to INR	0.008213	0.00112
USD to EURO	0.007823	0.00132



The Performance of the Model

Conclusion

The machine learning model tested with time series database to predict open price for exchange rate of dollar to Indian rupees and also to EURO. From the result it is observed that the prediction of the model is very close to actual price. The model is executed in certain range of parameters and conditions with the support of colab.

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