

Modelling of Neural Network Using Machine Learning Forecasting Algorithm

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Abstract:

International Accounting Standards IAS 32 and 39 define a financial instrument as "any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity". Financial instrument price forecasting is one of the most widely studied and challenging problems, attracting researchers from many fields including economics, history, and finance, mathematics, and computer science. The model attempts to forecast the price that will appear sometimes in the future candle. Our model attempts to forecast the future prices of GBPUSD using machine learning techniques and neural network (stacked LSTM).

Keywords —GBPUSD, Stacked LSTM, Forecast, Neural Network.

I. INTRODUCTION

Financial Instrument forecasting is the act of trying to determine the future value of financial instrument traded on an exchange. Currency trading is gaining significant amount of attention in many countries, hence we have decided to forecast currency trading values. Currencies are traded in pairs in which first listed currency is base currency and the second listed currency is quote currency. The currencies are traded by comparing the value of both currencies and it indicates quantity of quote currency needed for the purchase of base currency. There are many currency pairs but four of them are widely traded worldwide which are EUR/USD, USD/JPY, GBP/USD, and USD/CHF amongst which we have tried to forecast the value of GBP/USD by feeding historical data to the stacked LSTM. The motivation for research in this field is that if we will be able to forecast the correct price then it will enable us to provide the information to the people for their betterment of future and may reduce/eliminate the poor sector from the world. As the Efficient Market Hypothesis (EMH), says that

in "an efficient market, stock market prices fully reflect available information about the market and its constituents and thus any opportunity of earning excess profit ceases to exist". So, if there is a system that can consistently forecast the direction of the dynamic price movement or its value at a particular instance of time will enable the traders to make decisions based on it. The successful Forecasting of the future price of GBP/USD could yield significant profit. This is done by using stacked LSTM and feeding it average of High value and low value (HL average) of large historic data of GBP/USD and confirming that the time series patterns have statistically significant forecasting power for high probability.

II. METHODOLOGY

Various types of neural network can be developed by the combination of different factors like network topology, training method etc. For this experiment, we have considered stacked Long Short-Term Memory.

In this section we will discuss the methodology involved in forecasting.

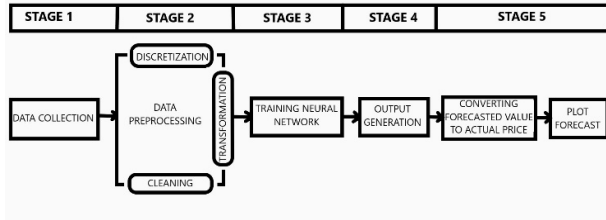


Fig. 1 Model

A. Data Collection

This project attempts to forecast the GBPUSD value with respect to its previous value and trends. It requires historic data of stock market as the project also emphasizes on data mining techniques. So, it is necessary to have a trusted source having relevant and necessary data required for the Forecasting.

We have used <https://strategyquant.com> website as the primary source of data. This website contains all the detail such as: Opening value, Closing value, highest value, lowest value. The site is updated on daily basis and it is also a repository for years of market data.

B. ANN Design and Training

The main problem in forecasting is that the market is a chaos system. There are many variables that could affect the market directly or indirectly. There are no significant relations between the variables and the price. We cannot draw any mathematical relation among the variables. There are no laws of forecasting the price using these variables.

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C. Dataset Creation

First, a dataset is created for training the artificial neural network. The collected data are arranged according to the format for the library we use for training.

The dataset should be of exact format that ANN specifies. It includes number of training pair, number of input and number of outputs in the first line of the dataset file and data from the second line.

D. Data Pre-processing

The pre-processing stage involves: -

- a) Data discretization: -Part of data reduction but with particular importance, especially for numerical data
- b) Data transformation: - Normalization.
- c) Data cleaning: - Fill in missing values.

E. Training of neural network

In this stage the data is fed to the neural network in our case it is stacked LSTM the best parameters which we have achieved with 10 epoch, 4 batch size and verbose 1, is shown in figure.

```

model=Sequential()
model.add(LSTM(50,return_sequences=True,input_shape=(100,1)))
model.add(LSTM(50,return_sequences=True))
model.add(LSTM(50))
model.add(Dense(1))
model.compile(loss='mean_squared_error',optimizer='adam')

model.summary()

Model: "sequential"
-----
Layer (type)                Output Shape              Param #
-----
lstm (LSTM)                  (None, 100, 50)         10400
-----
lstm_1 (LSTM)                (None, 100, 50)         20200
-----
lstm_2 (LSTM)                (None, 50)               20200
-----
dense (Dense)                (None, 1)                51
-----
Total params: 50,851
Trainable params: 50,851
Non-trainable params: 0
    
```

Fig. 2 LSTM Model

F. Output generation and plotting

After training the neural network and forecasting the price the forecasted value is normalized back to original by using inverse transform and the value is then plotted as shown in result.

G. Result

We have carried out forecasting(F1,F2...) on GBP/USD 4-hour candle and forecasted next 5 candles at different time of random months which is shown below: -

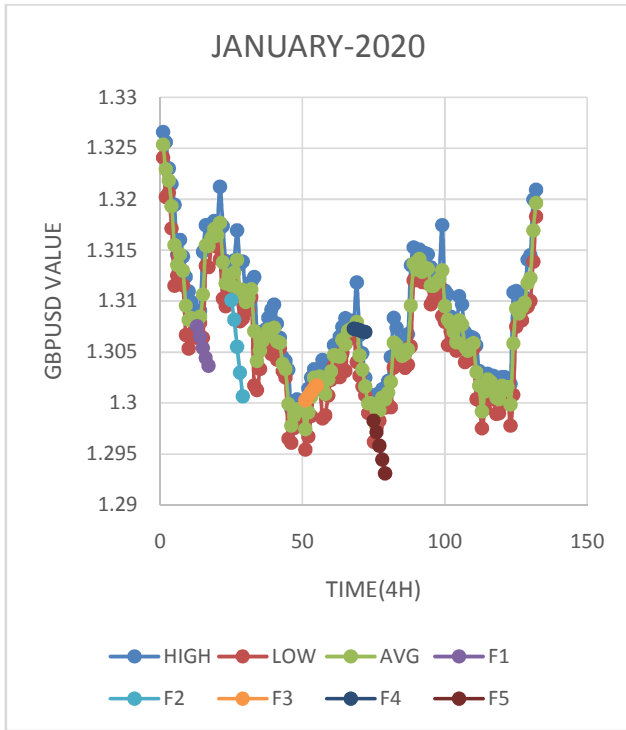


Fig. 3High/Low/HL average/Forecasted.

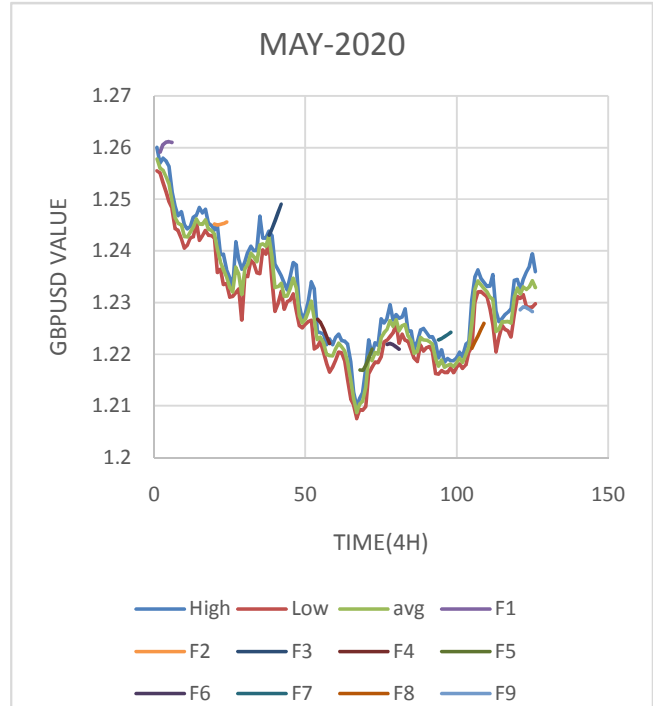


Fig. 5High/Low/HL average/Forecasted.

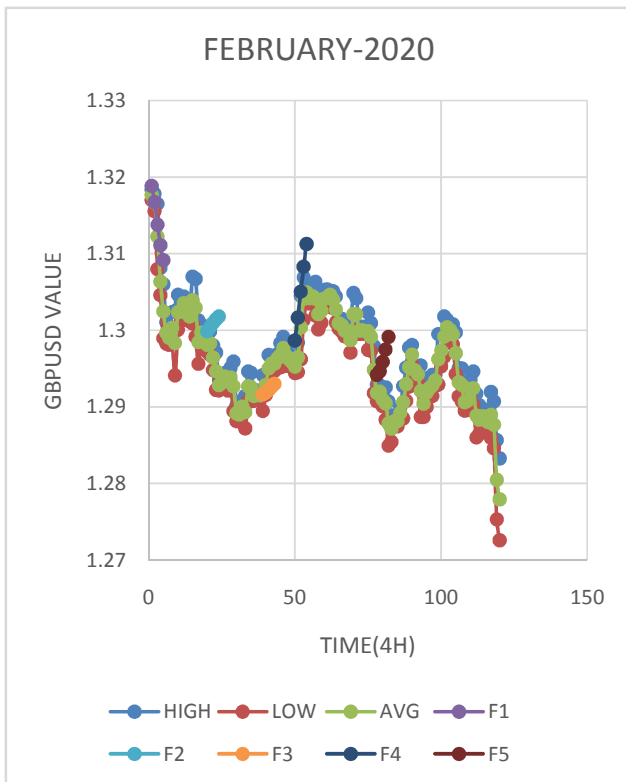


Fig. 4High/Low/HL average/Forecasted.

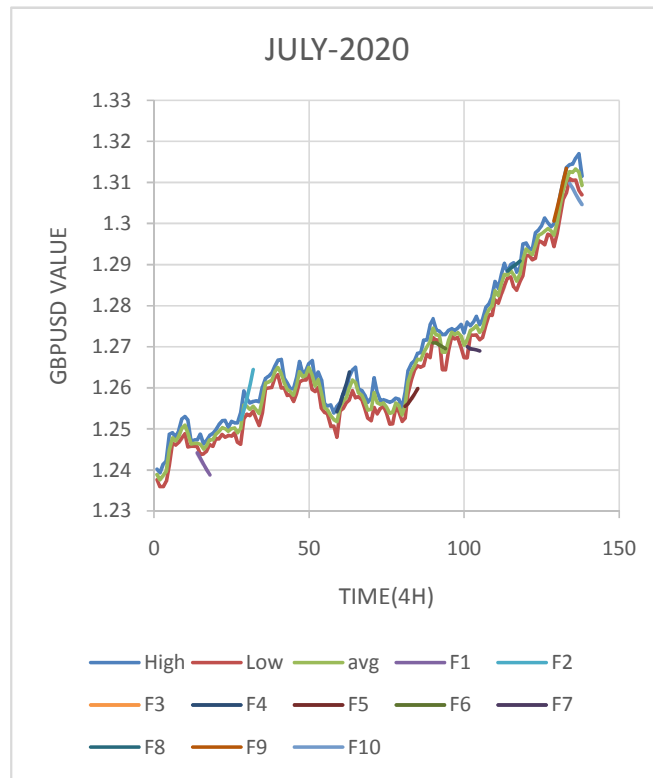


Fig. 6High/Low/HL average/Forecasted.

III. CONCLUSION

We have implemented the application of Artificial Neural Network to the task of Forex major (GBPUSD) 4-hour time frame forecasting by using stacked LSTM model and salient feature.

The model shows that there is significant correlation between the high-low average of historical data to forecast the price accurately.

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