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CURRENCY EXCHANGE RATE FORECASTING

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ABSTRACT

➢ The impact of fluctuations in currency exchange rates on a nation's economy underscores the critical need for precise forecasting within the realm of the money market.

➢ This research delves into the efficacy of various hybrid models, namely **LSTM-ARIMA, LSTM-SVR, LSTM-RF**, and **SVR-RF**, in their capacity to predict FOREX fluctuations.

➢ Leveraging datasets containing information on **EUR/INR, NZD/USD**, and **USD/INR**, this study meticulously evaluates the performance of each model. The findings consistently demonstrate that the LSTM-SVR hybrid model exhibits superior predictive capabilities compared to its counterparts.

➢ By employing the adaptive learning rate method (ADAM) optimization approach, this research endeavors to ascertain the optimal weights for the suggested model.

➢ This innovative methodology not only enhances precision but also provides a more nuanced understanding of foreign exchange rate estimation. The commendable performance of the **LSTM-SVR** hybrid model underscores its potential as a robust forecasting tool for discerning currency exchange rate movements.

➢ These insights carry significant implications for policymakers, financial institutions, and investors alike, as they navigate the intricacies of the global currency market with heightened accuracy and confidence.

INTRODUCTION

A currency exchange rate is the value of one currency compared to another. It represents how much one currency can be exchanged for another. Exchange rates fluctuate based on various factors such as supply and demand, economic stability, geopolitical events, and government policies.

Currency exchange rates serve several purposes:

➢ International trade

➢ Economic Stability

➢ Investment Decisions

➢ Monetary Policy

PROBLEM STATEMENT

1. **Complexity of Exchange Rate Dynamics:** Exchange rates are influenced by a myriad of factors, including macroeconomic indicators, geopolitical events, monetary policies, and market sentiment..

2. **Volatility and Uncertainty:** Exchange rates are inherently volatile and subject to sudden fluctuations due to unexpected events and market reactions..

3. **Data Limitations and Noise:** Currency exchange rate data often contain noise, irregularities, and missing values, posing challenges for model development and evaluation

4. **Model Selection and Performance Evaluation:** Choosing the most appropriate forecasting model and evaluation metrics is a critical decision in currency exchange rate forecasting

Problem Statements
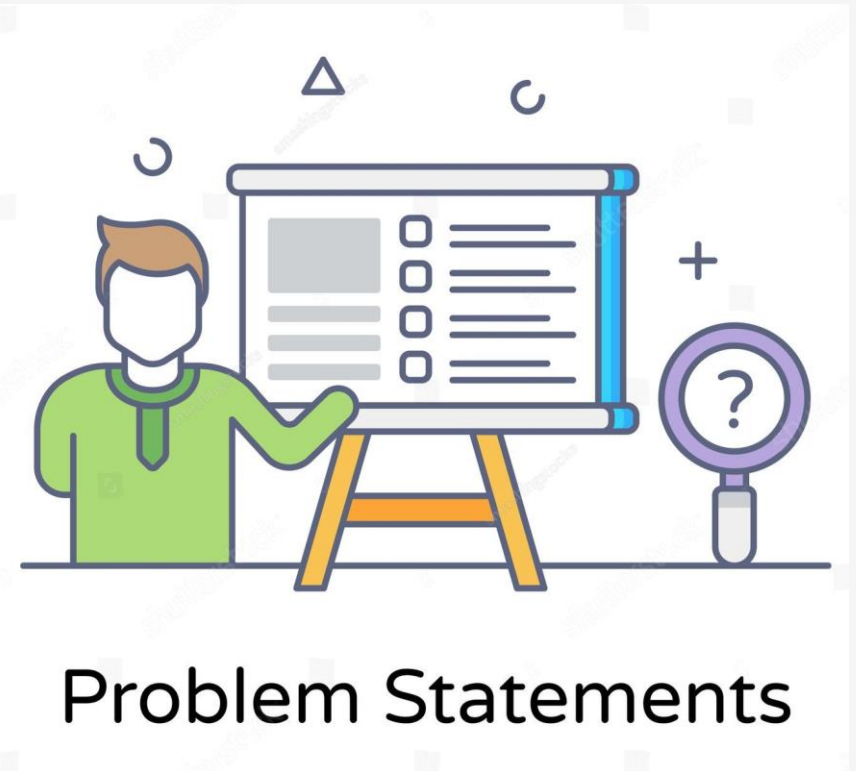
EXISTING SYSTEM

1. **Time series analysis**:

   Weakness: struggle with capturing sudden changes or anomalies in the data and may not incorporate external factors influencing exchange rates.

2. **Technical Analysis**

   Weakness: Susceptible to false signals and market noise. It often disregards fundamental factors driving exchange rate movements, which can limit its effectiveness in longer-term forecasting.

3. **Econometric Models**

   Weakness: Requires complex data analysis and may struggle with short-term forecasting due to the lagged nature of economic indicators.

4. **Machine Learning**

   Weakness: Requires extensive data preparation and feature engineering. Interpretability of results may be challenging, and overfitting can be a concern without proper regularization techniques.

Economic Indicators and Exchange Rates

01 Gross Domestic Product (GDP)
02 Inflation
03 Interest Rates
04 Trade Balance
05 Political Stability

PROPOSED SYSTEM

➢ The Proposed System for currency exchange rate forecasting will use a Hybrid Approaches to predict future exchange rates.

➢ By blending these methodologies, the approach aims to overcome the limitations of each method individually.

➢ Below is an overview of these algorithm combinations:

1. LSTM-ARIMA

2. LSTM-SVR

3. LSTM-RF

4. SVR-RF

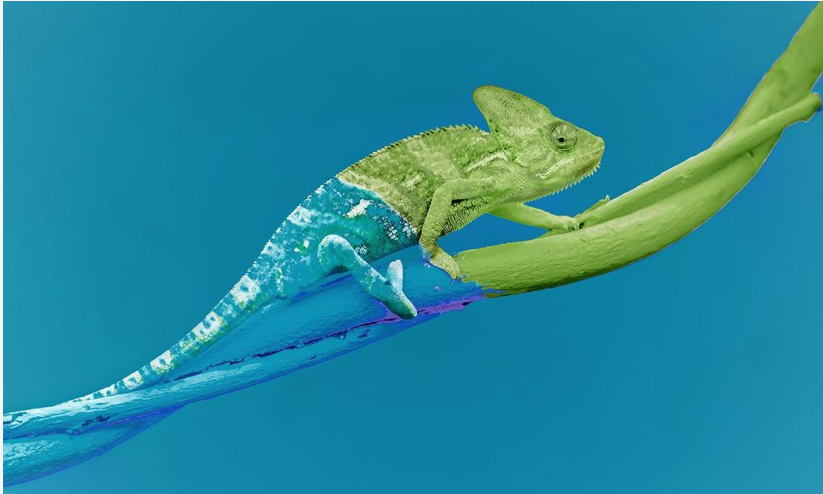# STRENGTHS OF PROPOSED SYSTEMS

1.Improved Accuracy

2.Robustness

3.Adaptability

4.Complementary Strengths

5.Reduced Overfitting

6.Enhanced Performance Across Time Horizons

HARDWARE AND SOFTWARE REQUIREMENTS

Hardware Requirements:

❖ Windows 10

❖ 8GB Ram

❖ 256 internal memory

❖ intel processor

Software Requirements:

❖ Anaconda navigator(Anaconda jupyter)

❖ VS code
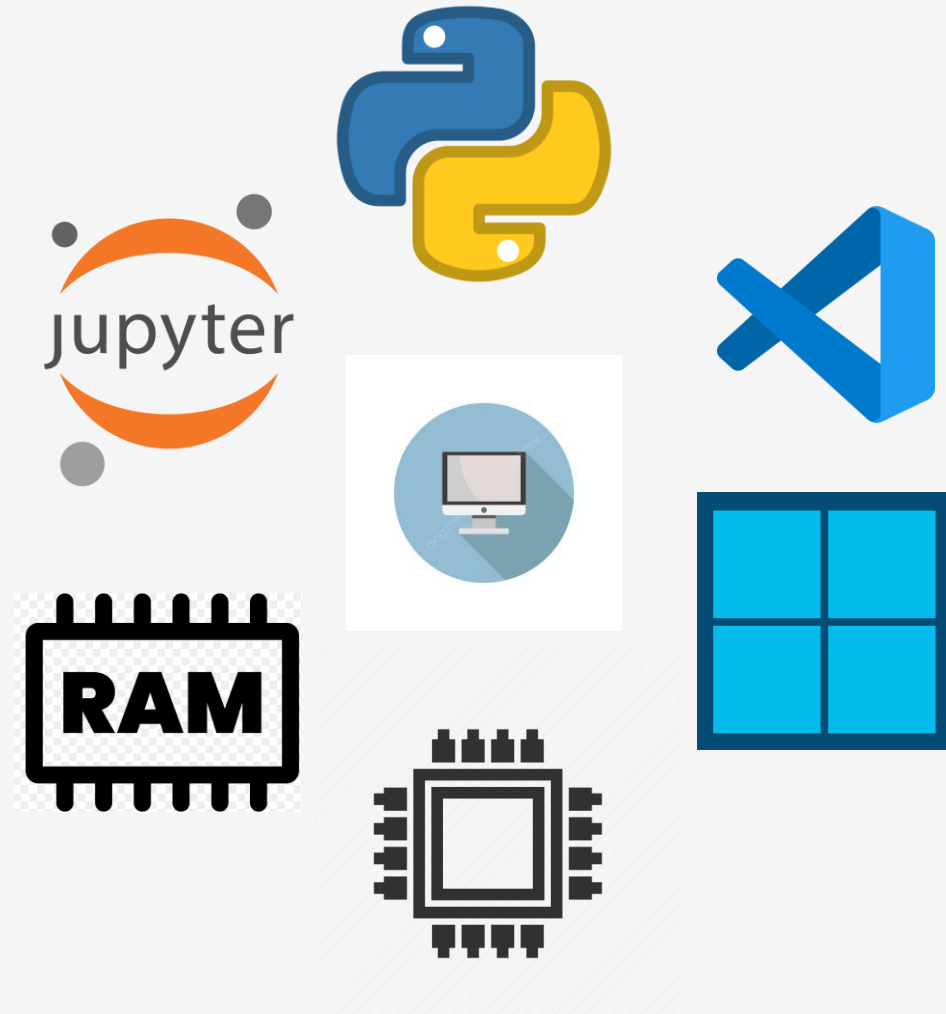
DATASET DESCRIPTION

Three datasets downloaded from Google Finance database. These three datasets have the following attributes which are used for the forecasting task.
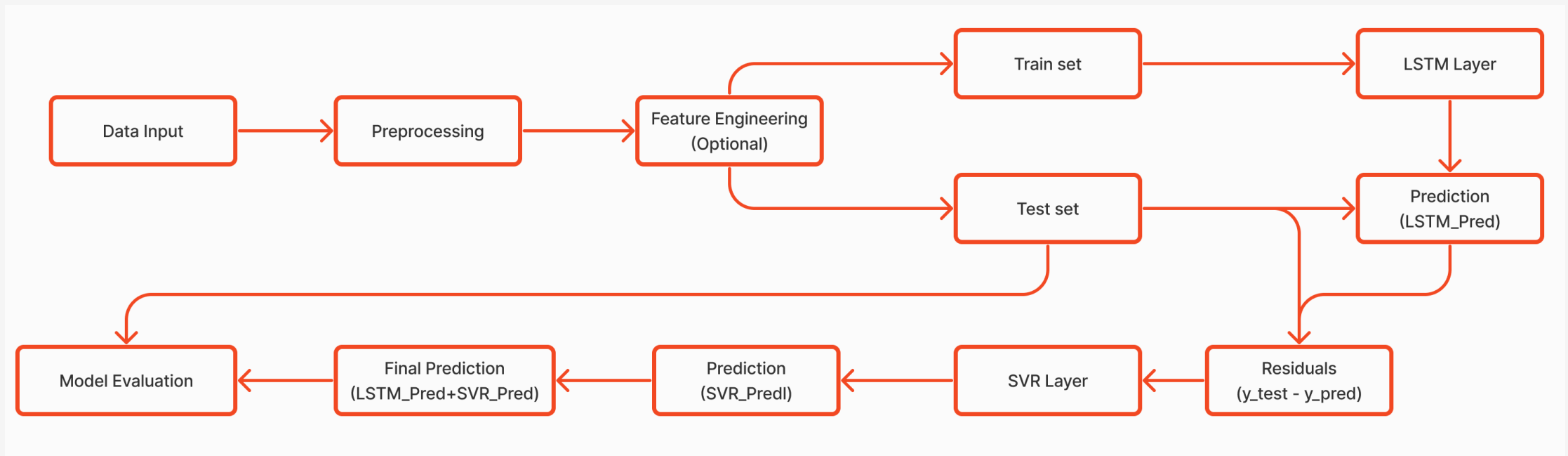• Date
• Close
The last attribute which is close is used for output and forecasting each day close price.

|	NZD/USD	EUR/INR	USD/INR
Data range	2002-2023	2002-2023	2002-2023
No. of observations	7964	7512	7716
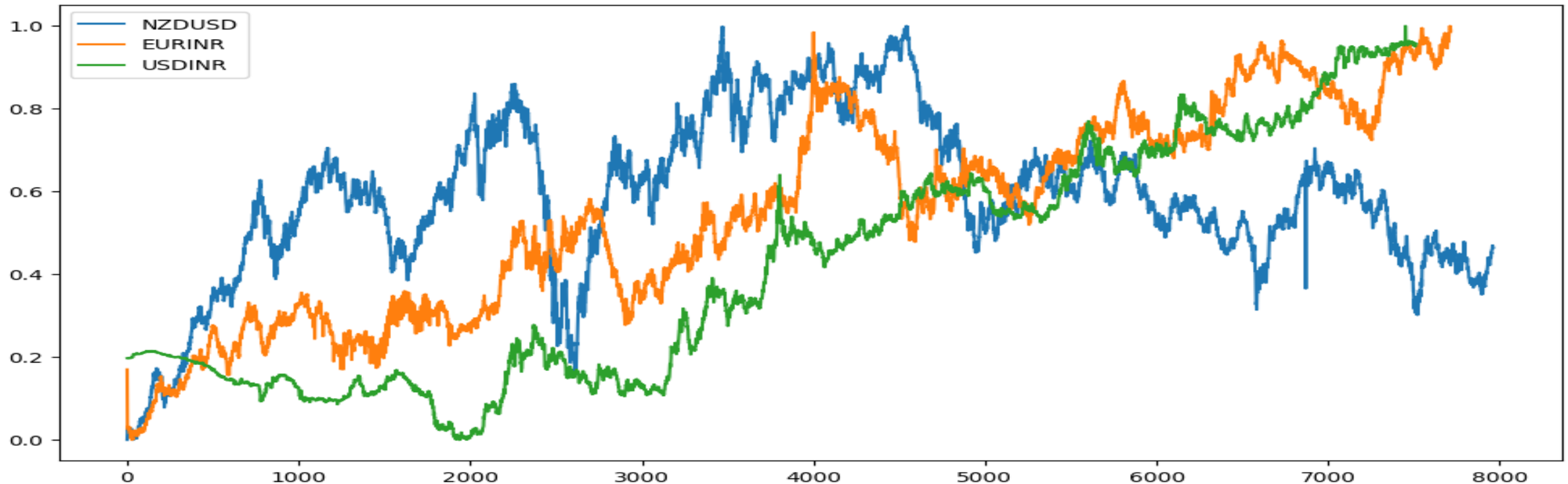
# WORK FLOW DIAGRAM FOR PROPOSED MODEL

This approach can be building other hybrid models

RESULTS AND DISCUSSION

NZD/USD Currency Pair : To make it visualize model evaluation and more understandable that how much the models is able to forecast these, better is visualized to show how close or far the prediction and the real values are
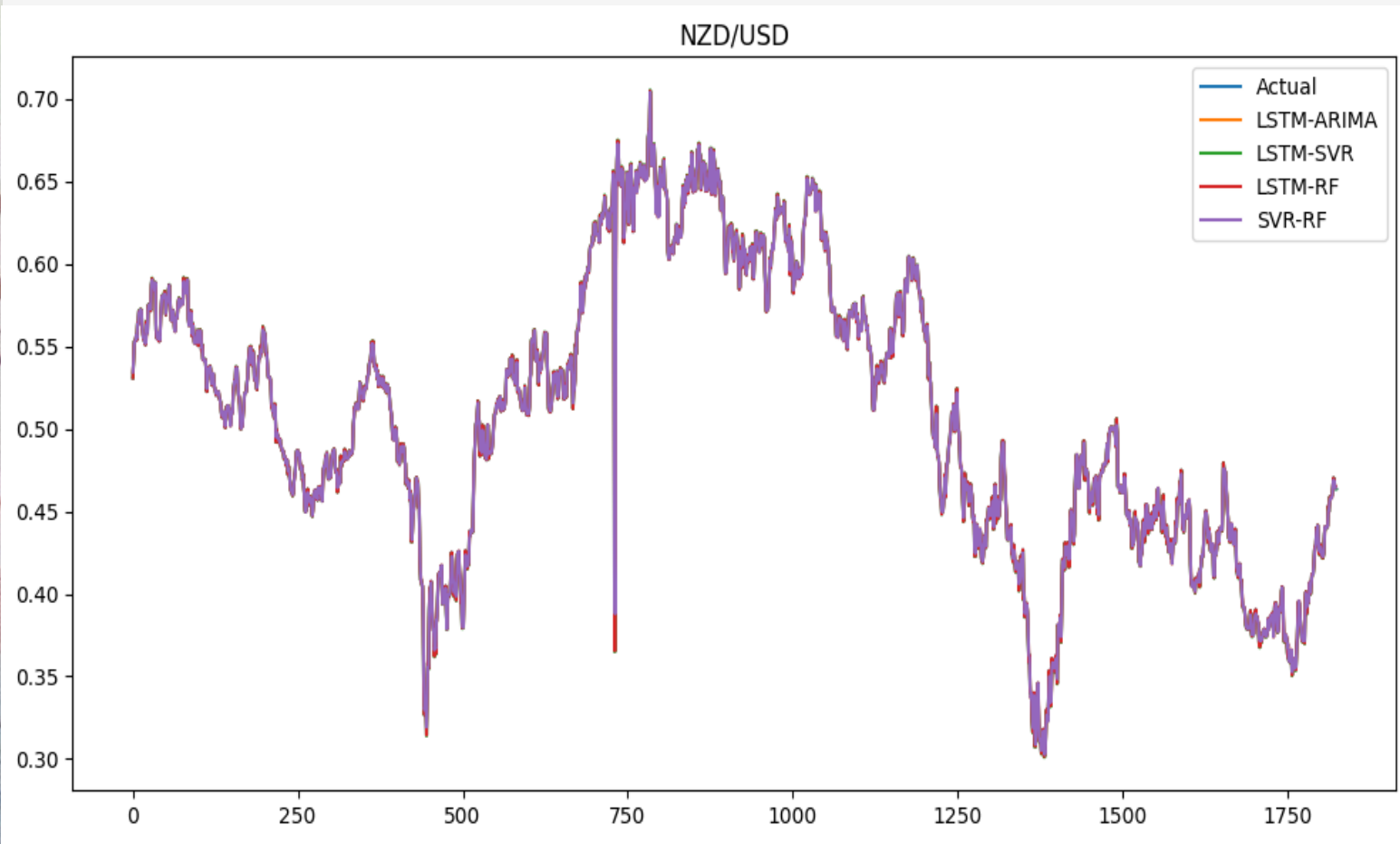

| NZD/USD	MAE	MSE	RMSE
LSTM-ARIMA	0.0042453	0.00006747	0.008214
LSTM-SVR	0.00005968	4.86E-09	6.97594E-05
LSTM-RF	0.005924	0.000155	0.01248
SVR-RF	0.0062535	0.00015	0.012436
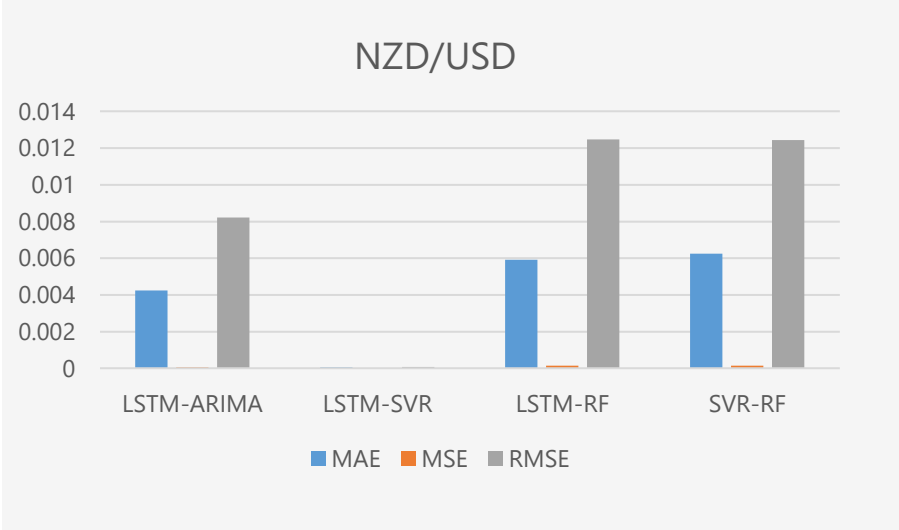
RESULTS AND DISCUSSION

EUR/INR Currency Pair : To make it visualize model evaluation and more understandable that how much the models is able to forecast these, better is visualized to show how close or far the prediction and the real values are
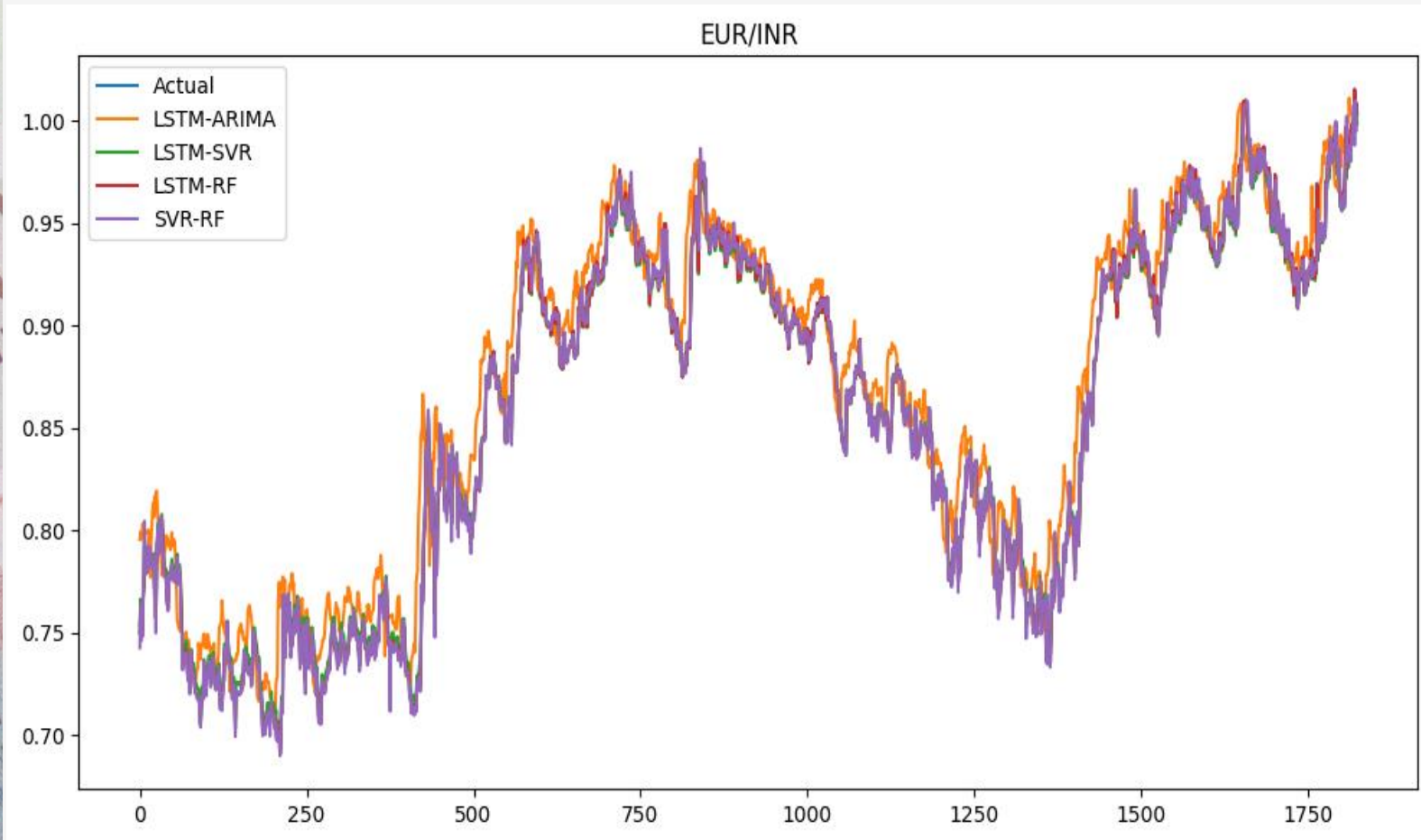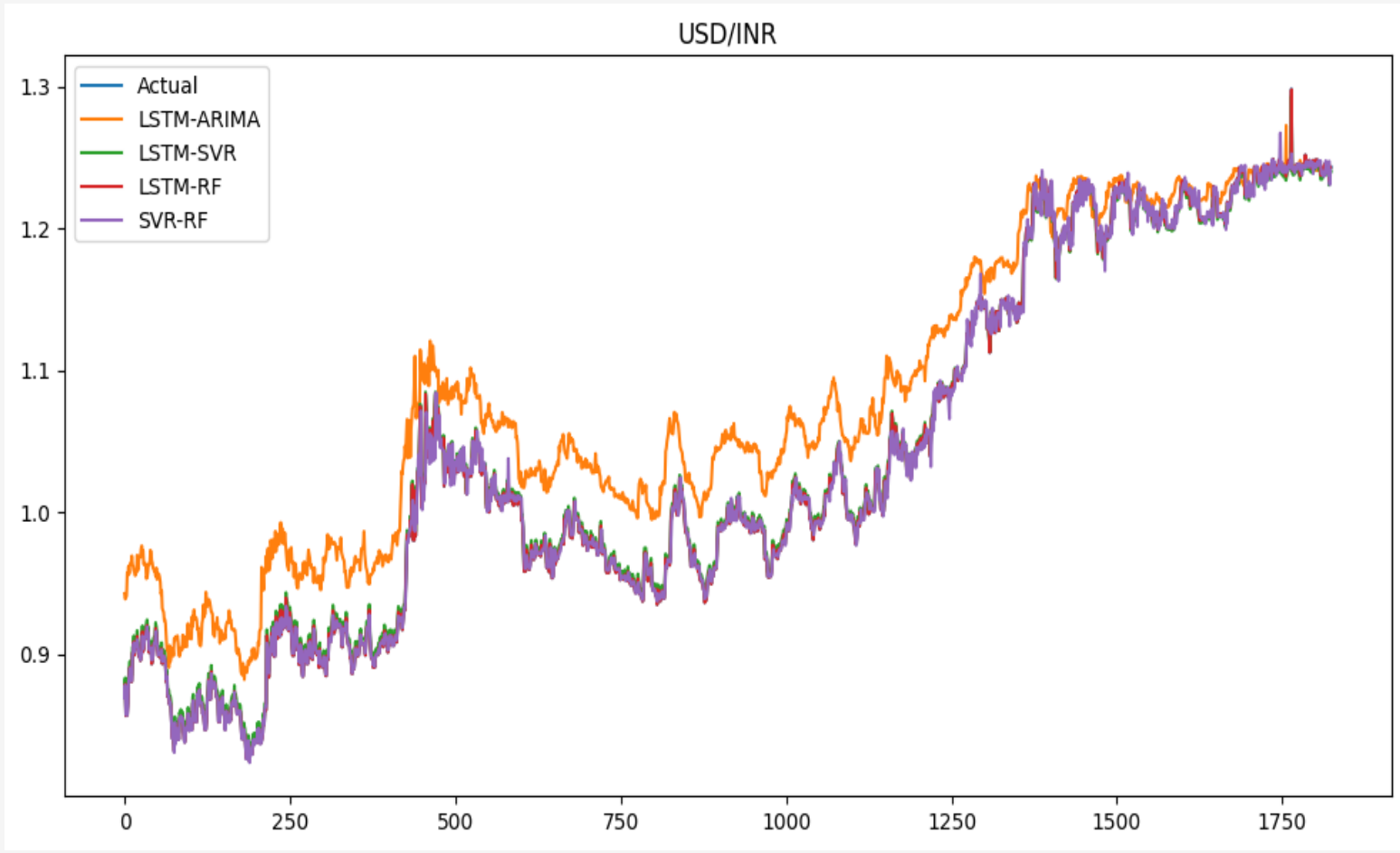

| EUR/INR	MAE	MSE	RMSE
LSTM-ARIMA	0.011947	0.000208	0.014432
LSTM-SVR	0.001744	0.00000417	0.002044
LSTM-RF	0.00438	0.0000516	0.00719
SVR-RF	0.00555	6.56E-05	0.0081
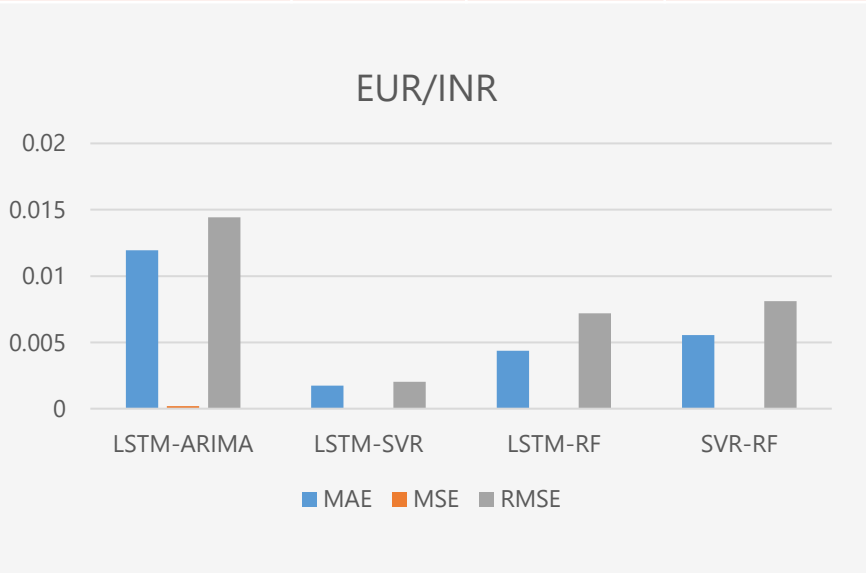
RESULTS AND DISCUSSION

USD/INR Currency Pair : To make it visualize model evaluation and more understandable that how much the models is able to forecast these, better is visualized to show how close or far the prediction and the real values are

| USD/INR	MAE	MSE	RMSE
LSTM-ARIMA	0.0260441	0.0008961	0.0299359
LSTM-SVR	0.006235	0.00004498	0.0066707
LSTM-RF	0.004382	0.000051438	0.0071859
SVR-RF	0.0058193	0.000075933	0.008714
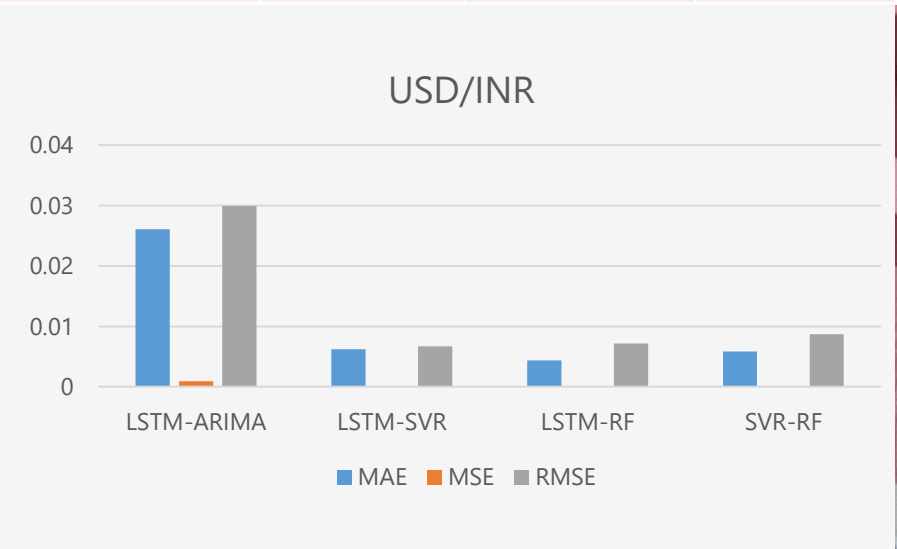
CONCLUSION AND FUTURE WORK

❖ This study developed four models to forecast three pair currency prices in Forex market comparatively. The models are worked well.

❖ **LSTM-SVR** outperformed other three models and LSTM-ARIMA performed least than others.

❖ The model's performance was great due to rich data on the training phase. But the fact that different factors still remain which the currency rate has many aspects thus forecasting only time series and historical data is good but not enough.

❖ The **future work** can be a combination of **historical data with daily financial and political news analysis with Natural Language Processing (NLP) models**.

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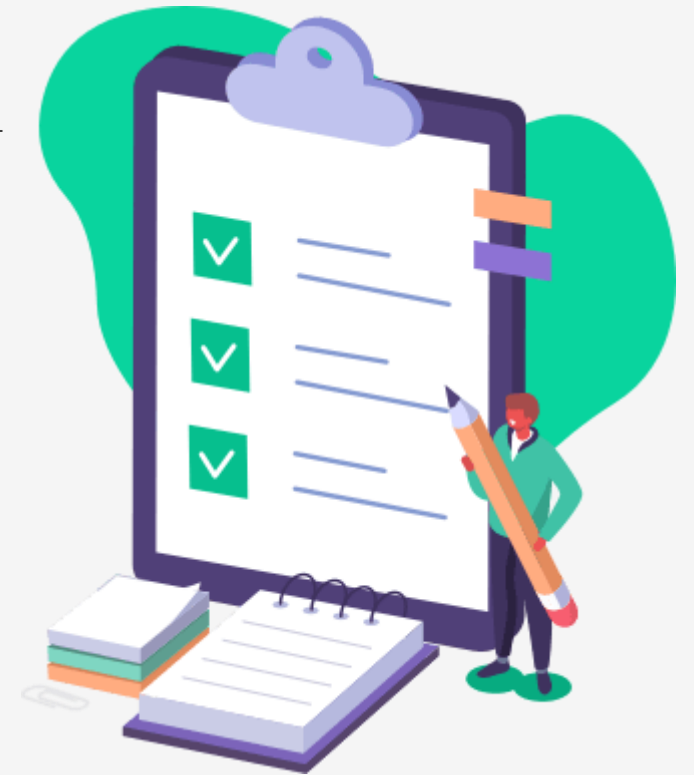
THANK YOU

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