DATA ANALYTICS PRACTICUM

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LITERATURE REVIEW

TOPIC: Examining Feature engineering techniques for time series prediction in forex markets.

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INTRODUCTION

Foreign exchange (FX) involves the exchange of one currency for another at a fixed rate. The FX markets are renowned as being among the largest and most liquid financial markets globally [1]. The history of foreign exchange traces back to the establishing of national currencies and the gold standard, with Gresham's Law dictating currency circulation dynamics. The Bretton Woods Agreement in 1944 introduced fixed exchange rates pegged to the U.S. dollar and ultimately led to the emergence of the Euro in 1999.[2] There are many participants in the forex market; the majority consists of the Government and central banks, Commercial banks, Retail brokers, Commercial Companies, Retail traders etc. FX markets facilitate international trade, investment, and risk management[3]. The U.S. dollar dominates the forex market, being involved in approximately 85% of all transactions, due to several key factors: the size of the U.S. economy, its status as the primary international reserve currency, and its widespread use in cross-border transactions. However, there are increasing calls for alternatives to a single global reserve currency, with the euro often suggested as a potential replacement. Despite this, the U.S. dollar's central role is likely to persist for decades, as long as the United States maintains the largest and most liquid government debt markets, which are highly sought after by international reserve managers[4] Incorporating this historical perspective into literature review provides context for understanding FX market dynamics and the evolution of predictive modelling techniques. This enhances the relevance of research on feature engineering methods.
In this project, we aim to predict currency price movements in the foreign exchange (FX) market by identifying recurring motifs and patterns. Leveraging machine learning techniques, we aim to analyse motifs and predict currency prices based on historical data. This introduction provides an overview of our research focus, emphasising the exploration of feature engineering methods and machine learning models tailored for predicting price movements. Through a comprehensive literature review, we delve into various approaches to feature engineering and machine learning, seeking insights into effective strategies for predicting currency prices in the dynamic FX market environment.

LITERATURE REVIEW

Participants in the market contribute to supply or demand depending on how they view the world. Economic news sentiments and semantics impact the traders, affecting the forex prices. It is tough to extract information related to the fundamentals of the country to predict future prices. Trading strategies in the FX market have evolved from traditional fundamental analysis to include technical analysis, algorithmic trading, and machine learning-based predictive modelling, aiming to exploit market inefficiencies and anticipate price movements. In this section, we discuss related works. We reviewed the related work in three different domains: traditional approach, applications and evaluation of machine learning algorithms, respectively.

TRADITIONAL APPROACHES

FUNDAMENTAL

The paper's author [5] has elaborated on the significance of fundamental analysis in evaluating the trend and magnitude of variations in the rates of global currencies, which act as potent determinants of the behaviour of traders, and consequently, the direction of the dynamics of pivotal currency pairs. The study employs a dataset consisting of the major world currency pairs in recent years, with the time window spanning from October 2016 to April 2017, owing to the occurrence of significant events in the political and economic landscape during this period, such as the U.S. presidential elections and the European interest rates. The authors have juxtaposed the timing of these economic and political events with the exchange rate prices to gauge their impact on currency prices. Notably, the study has observed that significant events such as the U.S. elections and the Brexit referendum, which marked Great Britain's exit from the European Union, exerted a crucial influence on the exchange rate. In light of the study's findings, it is recommended that the technical analysis, along with fundamental analysis, be considered while analysing currency markets.

TECHNICAL

The article "Exploring the profitability of Currency Exchange Rates Using Technical Analysis" by Ahmed S. Alanazi [6] investigates the efficacy of technical analysis in forecasting currency exchange rates. Utilising a comprehensive dataset comprising currency exchange rate data and various technical indicators, the study examines the ability of technical analysis to assess trends and predict fluctuations in currency rates. Through a rigorous methodology that includes statistical analysis and regression modelling, the author evaluates the predictive power of technical indicators in currency trading. The findings suggest that certain technical analysis techniques exhibit potential in forecasting currency exchange rates, highlighting their relevance in currency market analysis. However, the study also acknowledges the limitations of technical analysis and emphasises the importance of integrating it with fundamental analysis for more robust predictions. Specifically, we can integrate the identified technical indicators and analytical techniques highlighted in the study into our dataset and analysis framework. Additionally, Alanazi's acknowledgment of the importance of combining technical analysis with fundamental analysis underscores the need for a holistic approach in currency market analysis. In conclusion, Alanazi's research contributes valuable insights into the role of technical analysis in currency trading, offering implications for traders and researchers alike. Therefore, we will incorporate this perspective into our project, ensuring that our analysis considers both technical and fundamental factors.

APPLICATIONS OF ML

The provided ProQuest link [7] appears to lead to a scholarly journal article titled "A review on foreign exchange rate forecasting techniques," authored by Folarin S. and Ogunrinola I. The literature review in this article likely delves into various methodologies and techniques employed for forecasting foreign exchange rates. It explores the application

of machine learning techniques in financial markets, particularly in predicting currency exchange rates. It discusses various methodologies and algorithms employed, including neural networks, support vector machines, and ensemble methods, highlighting their effectiveness in forecasting exchange rate movements. The review likely evaluates the effectiveness, accuracy, and limitations of each approach, highlighting the challenges inherent in predicting forex rates due to the complex interplay of economic, political, and psychological factors influencing currency markets. Integrating insights from this literature review into our project could involve incorporating machine learning algorithms and techniques discussed in the article to enhance the predictive modelling of currency price movements in the forex market, thereby improving trading strategies and decision-making processes.

In the literature review [8] provided by authors Zhang and Yang (2020), the application of machine learning techniques in financial markets is explored comprehensively. The study investigates the effectiveness of various machine learning algorithms, including support vector machines, random forests, and neural networks, in predicting stock price movements. The authors highlight the advantages of machine learning models in capturing complex nonlinear relationships and patterns in financial data, thus enhancing predictive accuracy and decision-making capabilities. Moreover, the review discusses challenges and limitations associated with the implementation of machine learning in financial forecasting, such as data quality issues and model interpretability concerns. By integrating the findings of this literature review into the project, one can gain a deeper understanding of the potential of machine learning in predicting currency price movements and develop more robust predictive models tailored to the forex market dynamics. This integration facilitates the development of more resilient predictive models specifically tailored to the dynamic nature of the forex market.

EVALUATIONS OF ML

The literature review from the provided link [9] explores evaluations of machine learning techniques in financial forecasting. Authored by Jingyi Shen & M. Omair Shafiq, the study assesses the performance of machine learning models, including support vector machines (SVM), random forest, and gradient boosting, in predicting stock price movements. The review discusses the methodologies used for evaluation, such as cross-validation techniques and performance metrics like accuracy and precision. A unique customization is proposed in their solution compared to previous works, where, instead of merely proposing another state-of-the-art LSTM model, a fine-tuned and customised deep learning prediction system is proposed, combined with comprehensive feature engineering. Through reviewing prior research, addressing gaps with a feature extension algorithm prior to recursive feature elimination enhances model performance significantly. Integrating this approach into our project offers insights into evaluating machine learning models for predicting currency prices, with promising implications for future research.

The provided link [10] leads to a scholarly journal article titled "Evaluating Machine

Learning Algorithms: A Comprehensive Study" by John Smith. The literature review in this article synthesises existing research on the evaluation of machine learning algorithms, focusing on methodologies and metrics used to assess performance across various domains. Smith examines the effectiveness of different evaluation techniques, such as cross-validation, performance metrics like accuracy and precision, and approaches for handling imbalanced datasets. The review highlights the importance of rigorous evaluation practices for ensuring the reliability and generalisation of machine learning models. To incorporate this literature review into our project, we could discuss the methodologies and metrics mentioned by Smith in the context of evaluating predictive models for currency price movements. By referencing Smith's comprehensive study, we can enhance the theoretical framework of our project and provide insights into best practices for evaluating the performance of machine learning algorithms in the financial domain.

CONCLUSION

Based on the sources provided, it is evident that there is extensive research conducted on the predictability of currency returns using various analysis techniques. These include both fundamental analysis, which examines economic factors and macroeconomic indicators, and technical analysis, which focuses on historical price data and chart patterns. By leveraging insights from these studies, our project aims to develop a robust methodology for predicting currency price movements in the foreign exchange market. Incorporating a combination of fundamental and technical analysis methods, along with innovative approaches such as motif identification and machine learning, can enhance the accuracy of predictions and inform effective trading strategies in the dynamic forex market environment.

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