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) refers to the trading of one currency for another at a predetermined rate. In April 2022, the OTC FX markets reached $7.5 trillion per day, with the US dollar being involved in 88% of all trades [1]. The history of foreign exchange dates back to the gold standard and national currencies. After World War II, the Bretton Woods Agreement established fixed exchange rates fixed to the U.S. dollar to promote global trade and restore economic stability [2]. The major participants of the FX market include government and central banks, commercial banks, retail brokers, commercial companies, and retail traders [3]. The US dollar dominates the forex market because of its robust economy, global reserve currency status, and widespread use in cross-border transactions [4]. This project aims to predict currency price movements in the FX market by identifying recurring motifs and patterns. To help the trader make quicker, better decisions and manage risks, changing the way we trade and opening up new areas for study. With machine learning techniques, we will analyse motifs and predict currency prices based on historical data.

LITERATURE REVIEW

Economic news affects forex prices as traders contribute to supply or demand. It's difficult to predict future prices based on country fundamentals alone. FX trading strategies have evolved to include machine learning and technical analysis to anticipate price movements. We review related works in traditional methods, machine learning algorithms, and their applications and evaluations.

TRADITIONAL APPROACHES

FUNDAMENTAL

Fundamental analysis [5] relies on studying the economy, central banks, and politics that drive currency prices. Reference [6] explains how studying basic economic factors helps understand currency price changes. This research looked at major currency pairs from October 2016 to April 2017, a period rich with political and economic events like the U.S. presidential elections and changes in European interest rates. 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. Based on these findings, the study highlights how crucial it is to use fundamental analysis for a deeper and more accurate insight into currency market movements.

The study [7] introduces a way to predict currency market changes using basic economic data, a method not commonly automated. It tests different economic indicators through experiments to see if they can forecast the USD/GBP currency pair's movements. The dataset involves three primary sources of fundamental data related to the USD/GBP

currency pair, tested through neural network-based experiments to establish relationships between market behaviours and external factors. The conclusion highlights the method's success in identifying predictive relationships, especially when combining different sets of fundamental data. The paper suggests more research on selecting data, using news text as input, blending methods for better results, and creating a trading robot based on these findings.

TECHNICAL

In technical analysis [8], traders observe how prices move and try to use past regularities to predict future patterns . The study [9] explores how well technical analysis can predict currency exchange rates using data and various technical indicators. It uses statistical methods and regression to test the effectiveness of these indicators in currency trading. The results show some technical analysis methods are good at forecasting currency exchange rates, suggesting their use in currency market studies. However, the study also points out the limits of technical analysis and the benefit of combining it with fundamental analysis for stronger predictions. This approach aligns with the study's suggestion for a comprehensive method in analysing currency markets. Therefore, our project will include these insights, ensuring our analysis covers both technical and fundamental aspects.

The study [10] explores the integration of chartist/technical and fundamental analysis in foreign exchange trading, focusing on the preferences of traders and financial journalists across European cities. Utilising a combination of questionnaires and interview surveys, the research assesses the relative importance assigned to each analysis method. Key findings reveal a dual reliance on chartist/technical and fundamental strategies among participants. It underscores a noticeable shift towards chartism in the past decade and highlights the influence of forecast duration on the preference for technical analysis. The analysis further delineates variations in analytical practices across different locales. The paper categorises traders into four groups based on their forecasting approaches, illustrating the diverse methodologies within the trading community. It points out that while both types of analysis are valued, technical analysis gains precedence for shorter forecast periods, a trend that might be intensifying over time.

APPLICATIONS OF ML

The literature review [11] examines various forecasting techniques for foreign exchange rates, with a focus on machine learning applications in financial markets. It covers different methods and algorithms such as neural networks, support vector machines, and ensemble methods, discussing their effectiveness in predicting currency movements. The review assesses each approach's accuracy and limitations, noting the challenges of forex rate prediction due to economic, political, and psychological factors. Using the insights from the review, we could apply the mentioned machine learning methods to better predict currency prices in our project.

The paper [12] explores how machine learning algorithms like support vector machines, random forests, and neural networks can predict forex prices. It points out that these models are good at finding complex patterns in financial data, which helps make better predictions and decisions. However, there are challenges like data quality and making the models easy to understand. By using insights from this study leading to stronger models for the forex market, this approach helps in creating models that are better suited to the fast-changing forex market.

The study [13] explored deep learning's potential for forecasting foreign exchange rates, comparing long short-term memory networks (LSTMs) and gated recurrent units (GRUs) against traditional recurrent neural networks and feedforward networks. The dataset comprised daily bilateral exchange rates of major currencies against the U.S. dollar from January 4, 1971, to August 25, 2017. The research demonstrated the suitability of deep networks for predicting exchange rates, despite challenges in model implementation and tuning. Notably, simpler neural network models sometimes outperformed their more complex deep learning counterparts in terms of trading profit. The study suggests further investigation into enhancing the theoretical framework for using machine learning in financial market predictions and calls for future research to explore more advanced models and trading strategies.

The study [14] presents a new model, Multivariate Temporal Convolutional Network (M-TCN), aimed at improving forecasts for complex time series data, such as environmental and energy demand indicators. It tested this model using data on air pollution (PM2.5) in Beijing and electricity demand in the New England region (ISO-NE). M-TCN was found to outperform other advanced models in accuracy, making it a promising tool for predicting multivariate time series. The study concludes with plans to make the model more efficient and explore methods to simplify it for future applications.

EVALUATIONS OF ML

The study [15] investigates how well machine learning models like support vector machines (SVM), random forest, and gradient boosting can predict stock prices. It explains the methods used to check these models, including cross-validation and metrics like accuracy and precision. Instead of just creating a new advanced LSTM model, they suggest a deeply customised prediction system that includes thorough feature engineering. Through reviewing prior research, addressing gaps with a feature extension algorithm prior to recursive feature elimination enhances model performance significantly. This work could help us better understand how to use machine learning to forecast currency prices, showing exciting possibilities for further studies.

The literature review [16] looks into how machine learning algorithms are evaluated,

focusing on the methods and measures used to judge their performance in different areas. It talks about the usefulness of various evaluation methods like cross-validation and metrics such as accuracy and precision, and how to deal with datasets that are not evenly balanced. The review stresses the need for strict evaluation to make sure machine learning models are reliable and can be applied broadly. We could talk about the evaluation methods and measures Smith mentions, specifically in assessing models that predict currency prices. Using Smith's study, we can strengthen our project's theory and learn the best ways to test the effectiveness of machine learning in finance.

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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