


Chapter 8

Examining the Effectiveness of Machine Learning Models for Interest Rate Prediction

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ABSTRACT

The banking sector plays a vital role in economic growth, offering financial services and determining interest rates, influencing borrowing and investment decisions. Traditional uniform rates based on risk assessments and market conditions may not suit today's diverse economic landscape. Leveraging big data and machine learning, the idea of personalized interest rates is explored. The proposed work examines the effectiveness of two machine learning based classification algorithms logistic regression and K-Nearest Neighbours (KNN) for predicting personalized interest rates in the banking sector. The study collects and explores a dataset from Lending Club by conducting thorough exploratory data analysis (EDA). Despite getting low accuracies, this research is pioneering in the field of interest rate prediction and provides a foundation for further research in this area. The EDA conducted during the study contributes valuable insights into the dataset's structure, enabling better understanding and identification of potential challenges and improvements for future models.

1. INTRODUCTION

Interest rates are the lifeblood of financial markets, driving investment decisions, shaping economic policies, and influencing the choices of individuals and businesses. Traditional methods of forecasting interest rates have relied heavily on economic indicators, historical trends, and expert judgment. While these approaches have served us well, the ever-increasing complexity of global financial markets demands a more agile and data-centric methodology as the global

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economy is projected to grow 6.0% in 2021 and 4.9% in 2022 (Abedin et al., 2021). The ability to accurately predict changes in interest rates has profound implications for financial institutions, investors, and policymakers alike. Machine learning, with its capacity to analyze vast amounts of data and identify subtle patterns, presents a promising avenue for enhancing our understanding of interest rate dynamics. As we stand on the cusp of a data-driven revolution, machine learning algorithms have emerged as powerful tools capable of extracting patterns and insights from vast datasets. This research paper embarks on a journey to harness the capabilities of machine learning in the realm of finance, specifically in the context of “Predicting Interest Rates.” This approach, in turn, provides a competitive advantage to banks, attracting and retaining more customers in a fiercely competitive market. Moreover, the precise evaluation of individual creditworthiness and risk empowers banks to improve their profitability through optimized lending portfolios and reduced provisioning. Personalized interest rates also play a key role in promoting financial inclusion, making credit more accessible to those with limited credit histories or belonging to underserved communities, thereby fostering a more inclusive banking environment. Also, interest rates based on individual profile contribute to economic stability by enabling prudent lending practices and reducing the likelihood of systemic risks. In light of these compelling reasons, interest rate predictions have the potential to revolutionize the banking sector, benefiting both financial institutions and their customers.

The motivation behind this research paper is twofold. First, it recognizes the growing demand for accurate and timely interest rate predictions, given the pivotal role of interest rates in economic decision-making. Second, it acknowledges the vast troves of data available today, encompassing financial market indicators, macroeconomic variables, social sentiment, and more. The convergence of these factors underscores the opportunity to employ machine learning to predict interest rates more effectively than ever before. This study aims to provide a comprehensive exploration of the application of machine learning techniques to interest rate prediction. It will delve into the various machine learning models and algorithms to assess their suitability and performance in predicting interest rate movements. Additionally, the research will consider the significance of different data sources and features in improving prediction accuracy.

Financial crises such as the Global Financial Crisis of 2007–2008, and crisis induced by the COVID-19 pandemic have effects on both commodity and financial markets (Abedin et al., 2021). By analyzing historical interest rate data, macroeconomic factors, and financial market indicators, this research paper will seek to uncover hidden patterns and relationships that traditional forecasting methods may overlook. It will also evaluate the potential challenges and limitations associated with machine learning-based predictions, such as model interpretability and data quality. Through the evaluation of machine learning algorithms like Logistic Regression and K-Nearest Neighbors, this research aims to provide valuable insights to empower banking institutions in adopting customer-centric and data-driven approaches to interest rate setting, ultimately fostering a sustainable and customer-friendly financial ecosystem. The outcomes of this research endeavor have the potential to reshape how we approach interest rate predictions, providing stakeholders with more robust and timely insights. It is our hope that this exploration into the fusion of finance and machine learning will contribute to a deeper understanding of interest rate dynamics and open new avenues for informed decision-making in the ever-evolving landscape of global finance.

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