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THE ROLE OF BIG DATA IN IMPROVING MARKET MICROSTRUCTURE EFFICIENCY: A LITERATURE REVIEW

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ABSTRACT

The development of information and communication technology has resulted in an unprecedented explosion of data, known as Big Data. This phenomenon has influenced various aspects of the economy, including Market Microstructure, which is a highly detailed study of the behavior and structure of financial markets. Big Data has enabled market researchers and practitioners to improve the efficiency of Market Microstructure in an unprecedented way. This study utilizes the literature review method to investigate the role of Big Data in improving Market Microstructure efficiency. The results of the literature review show that Big Data has the potential to change the Market Microstructure landscape in several key ways. First, Big Data enables more sophisticated and real-time market monitoring, allowing for faster and more accurate decision-making. Second, Big Data can be used to analyze larger and more complex market data, which can reveal patterns and trends that were previously difficult to discover. Thirdly, Big Data enables the development of better predictive models to forecast price movements and market liquidity. In addition, the literature review also revealed challenges and issues associated with the use of Big Data in Market Microstructure, including data privacy and security concerns, as well as difficulties in managing and analyzing massive and diverse data. Therefore, the use of Big Data in Market Microstructure requires careful attention to ethical and regulatory aspects. In order to improve the efficiency of the Market Microstructure, Big Data has opened up exciting new opportunities, but also presents challenges that need to be addressed. With the right approach, Big Data can provide valuable insights and improve our understanding of financial market behavior, which in turn can improve market efficiency and benefit stakeholders in the financial markets.

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1. INTRODUCTION

The information and communication technology revolution has had a profound effect on many facets of human existence, including the financial sector, in a more sophisticated digital age. Financial markets, being an important part of the global economy, have undergone rapid changes along with technological developments. In this context, Big Data has emerged as a key factor influencing the efficiency of Market Microstructure, which is a highly detailed study of the behavior and structure of financial markets. Stock market indices are assumed to include aggregate chaos, market microstructure noise (Sinha, 2019). It is now widely recognized that the availability of high-frequency data has resulted in a more accurate picture of financial markets (Clinet & Potiron, 2021).

Market microstructure is related to the fields of finance, investment, corporate finance and operations research. Each of these fields of study has a model for determining the price of return on assets. Market microstructure as one aspect of finance is concerned with analyzing all aspects of the securities trading process (Sunday Oseiweh Ogbeide1 & Eem Edet Umana, 2022). Through a deep understanding of

market microstructure, market participants can make better investment decisions, manage risk more effectively, and devise smarter trading strategies. As such, market microstructure is a key element in the complex financial ecosystem, directly impacting the way financial markets operate and asset prices are determined. Obtaining invariant relationships for dynamic infinite horizon market microstructure models with risk-neutral information trading, noise trading, market formation, and endogenous information production (A. (Pete) S. Kyle & Obizhaeva, 2019).

Big Data refers to the volume, velocity, diversity, and complexity of data that far exceeds the capability of traditional systems to manage it. This data spans a variety of sources, including historical data, transaction data, social data, and more. The ability to collect, store and analyze Big Data has opened up new opportunities to deeply understand financial markets and optimize investment and trading decisions. Over the past few years, there has been a lot of attention focused on the importance of big data analytics in guiding corporate decision-making. More and more companies are accelerating the implementation of their big data analytics initiatives with the aim of developing important insights that can ultimately give them a competitive advantage (Mikalef, Krogstie, Pappas, & Pavlou, 2020).

This research uses the literature review method to explain the role of Big Data in improving the efficiency of Market Microstructure. With the aim to explain how Big Data enables more sophisticated market monitoring, more detailed data analysis, and the development of more accurate predictive models. However, the use of Big Data also presents a number of challenges, including data privacy issues and the management of very large and diverse data. Prior research indicates that a well-designed market microstructure may successfully eliminate investor uncertainty, boost participation to sustain high liquidity and high evaluation, and decrease the cost of capital to draw in new listings and investors (He, Huang, & Zhang, 2022). With a deep understanding of the role of Big Data in Market Microstructure, we can identify opportunities and constraints that arise in the future. Along with technological developments and market changes, this research aims to provide useful insights for stakeholders in the financial world to understand the impact of Big Data and how it can be effectively used to improve the efficiency of Market Microstructure.

2. METHODS

The method used in this literature review study involves analyzing various literature sources relevant to the role of Big Data in improving Market Microstructure efficiency. The first stage involved searching literature sources through academic databases, such as scientific journals, conferences and official publications. Next, the literature was selected and filtered based on relevance to the research topic, including articles that discuss the concept of Big Data, Market Microstructure, and the use of Big Data in the context of Market Microstructure. Key data and information from the literature were mapped and categorized to identify key findings, trends, and issues that emerged in the studyEvery literature source was critically analyzed during the literature review process in order to pinpoint the advantages and disadvantages of the approaches and conclusions made by earlier researchers. In addition, there is an attempt to map recent developments and trends in this research and synthesize relevant research results. This literature review method aims to develop a comprehensive understanding of the role of Big Data in improving the efficiency of Market Microstructure by summarizing and evaluating various views, findings, and contributions of previous research. As such, this method provides a strong knowledge base for formulating conclusions and implications in this study.

3. DISCUSSION

Big Data has become a new game in the world of Market Microstructure, which is the study of the behavior and structure of financial markets in great detail. In this literature review method, we have identified some important aspects of Big Data's role in improving the efficiency of Market Microstructure. Market microstructure is considered the purest form of financial intermediation. Trading markets work between investors to investors where they deal with financial assets. Market microstructure is a field of study in finance where the subject is making exploratory costs of securities trading and the impact of trading costs on financial markets. The cost of trading depends on the associated measurement and agreement with the commission (Almahirah, Vijayalakshmi, Jahan, Sharma, & Kumar, 2021).

More sophisticated and real-time market monitoring. With Big Data, market participants can access larger and faster market data. This allows them to monitor price movements, liquidity and market activity in real-time. In this regard, Big Data enables more sophisticated and accurate market monitoring, which in turn can enable better and faster decision-making and will become increasingly important in the Big Data era (Martin & Nagel, 2022). The difference in influence suggests the possibility of dynamic diversification strategies and beneficial market microstructure policies that have not yet been fully identified or exploited (Shi, Broussard, & Booth, 2022).

Analysis of larger and more complex market data. Big Data enables the analysis of larger and more complex market data, including large historical data and massive transaction data. With advanced data analysis tools, such as machine learning and data mining, Big Data can help reveal patterns and trends that were previously difficult to discover. This can help market analysts and researchers better understand market behavior. As with the term "Big Data", it is impossible to avoid references to size. This feature means that the data is large in an absolute or relative sense. A natural example of absolute size is transaction-level market microstructure data (Goldstein, Spatt, & Ye, 2021). A key challenge in managing and utilizing big data is the ability to store, access, observe, analyze, and make decisions based on it. Technologies such as scalable database systems, cloud computing infrastructure, advanced analytics tools, and artificial intelligence are key in extracting value from this massive data. Therefore, a deep understanding of data size, both in absolute and relative terms, is key to understanding the roles and challenges associated with Big Data in various business and scientific contexts. Advanced data analysis techniques can be used to transform big data into smart data for the purpose of gaining important information about large data sets (Hariri, Fredericks, & Bowers, 2019).

Development of better predictive models. Big Data also supports the development of better predictive models. With access to larger and more diverse data, researchers and analysts can develop more accurate predictive models to forecast price movements and market liquidity. This can help market participants make smarter investment decisions. Previous findings show that big data analysis management capabilities have a strong and significant influence on innovative green product development and sustainable supply chain outcomes (Bag, Wood, Xu, Dhamija, & Kayikci, 2020). Malware identification has developed a big data problem in the threat environment. Big data analysis has gained significant consideration from technology analysts and practitioners in recent times. The main goal is to reduce reaction time and improve performance using artificial learning, data analysis, big data, and decision-making strategies by improving the human interface in detecting zero daily threats to malware (Niveditha, Ananthan, Amudha, Sam, & Srinidhi, 2020).

There are several challenges that need to be addressed in the use of Big Data in market microstructure. One of them is the issue of data privacy and security. Financial market data often contains sensitive information, and data protection is important to avoid misuse or privacy breaches. Moreover, managing and analyzing huge and diverse data can be a complex task and requires a robust infrastructure. Machine learning and big data analysis for economic research, as well as machine learning for market microstructure and market stability and price prediction during periods of stress (Levin, 2022). In the field of market microstructure, machine learning can be used to analyze financial market dynamics, including price movements, trading volumes, and liquidity levels. Machine learning models can help in understanding how factors such as orders, transactions, and market volatility affect market stability. This can help in identifying potential periods of stress (e.g., market crashes) and developing strategies to manage risk in dynamic financial markets. According to Aït-Sahalia and Xiu (2019), market microstructure noise usually intensifies and lowers the signal to noise ratio in the data to the point where the RV estimator limitations alter to reflect noise present more so than actual price volatility.

The use of Big Data in Market Microstructure must also consider ethical and regulatory aspects. This relates to how data is obtained, used and shared, and how the use of Big Data affects the transparency and integrity of financial markets. Market microstructure invariance relates to time and leverage in a simple and internally consistent way that incorporates It is noteworthy that the use of high frequency financial data presents additional statistical challenges in the presence of price measurement mistakes or disruptions in the market microstructure. Even though financial data has been subjected to multivariate statistical analysis using principal components and factor models, these statistical techniques may not

always yield the right response when dealing with market microstructure noise in high-frequency data (Kunitomo & Kurisu, 2021).

Big Data has great potential in improving the efficiency of Market Microstructure by providing better insights, smarter decision making, and the development of more accurate predictive models. However, it is worth noting the challenges and issues associated with the use of Big Data, as well as ethical and regulatory concerns. When used intelligently, big data may yield substantial improvements in financial market efficiency and comprehension. When the data frequency is very high, real applications encounter the well-known issue of bias brought on by market microstructure noise (Hinese & Arket, 2021). The emergence of big data and the spread of automated trading have led to a significant growth in the complexity of trading strategies, beyond the capabilities of basic microstructure models. Comparably, in the high-frequency realm of cross-market trading, empirical metrics that make up micro "toolboxes" may no longer be valid due to their reliance on basic in-market interactions (Easley, Ló, Prado, Hara, & Zhang, 2019).

4. CONCLUSION

In conclusion, it can be concluded that the role of Big Data in improving the efficiency of Market Microstructure is a very significant phenomenon. Big Data has provided new opportunities for more sophisticated market monitoring, more in-depth data analysis, and the development of more accurate predictive models. It has enabled market participants to make better decisions and improved the efficiency of financial markets. However, the use of Big Data also presents challenges related to privacy, data security and the complexity of the data being managed. Therefore, while Big Data opens the door for innovation in Market Microstructure, there needs to be careful attention to ethics and regulation in its use. With the right approach, Big Data has great potential to continue to improve the efficiency of financial markets in the future.

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