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Predictive Analytics in Finance: A Bibliometric Study

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ABSTRACT

Predictive analysis has become an essential component in modern financial research and practice, driven by the rapid advancement of data analytics, machine learning, and artificial intelligence. This study aims to systematically map the intellectual structure, research trends, and key contributions in the field of predictive analysis in finance through a bibliometric approach. Data were collected from the Scopus database covering publications from 2000 to 2026 and analyzed using VOSviewer to examine co-authorship networks, citation patterns, and keyword co-occurrence. The results reveal a significant growth in research output, particularly in recent years, reflecting the increasing importance of data-driven decision-making in finance. Co-authorship analysis indicates the presence of collaborative research clusters, although the field remains partially fragmented. Citation analysis highlights that the most influential studies are those integrating advanced computational methods with practical financial applications, such as credit scoring, bankruptcy prediction, and stock market forecasting. Furthermore, keyword analysis demonstrates a clear shift from traditional statistical techniques toward machine learning, artificial intelligence, and emerging technologies such as blockchain and decentralized finance. This study contributes by providing a comprehensive overview of the evolution and current state of predictive analysis in finance, identifying key research themes and gaps. The findings suggest that future research should focus on enhancing model interpretability, integrating sustainability considerations, and expanding applications in real-time financial decision-making. Overall, this study serves as a valuable reference for researchers and practitioners seeking to understand the trajectory and future direction of predictive analytics in the financial domain.

Keywords: *Predictive Analysis, Finance, Machine Learning, Artificial Intelligence, Bibliometric Analysis*

1. INTRODUCTION

The rapid digital transformation of the financial sector has fundamentally reshaped how data are generated, processed, and leveraged for decision-making. Financial institutions, investors, and regulators increasingly rely on data-driven approaches to anticipate market dynamics, manage risk, and optimize performance [1], [2]. Within this context, predictive analysis has emerged as a critical capability, enabling the extraction of actionable insights from both historical and real-time data to forecast future financial outcomes. The growing complexity of financial markets—characterized by heightened volatility, global interconnectedness, and high-frequency trading—necessitates analytical techniques that extend beyond traditional statistical frameworks toward more adaptive and scalable models [3], [4].

Traditionally, financial prediction has been grounded in econometric and time-series approaches such as autoregressive integrated moving average (ARIMA) and generalized autoregressive conditional heteroskedasticity (GARCH). While these models provide a strong theoretical foundation, their limitations in capturing non-linear relationships and handling large, high-dimensional datasets have become increasingly evident in modern financial environments [5], [6]. The proliferation of big data, coupled with advances in computational power, has accelerated the integration of machine learning (ML) and artificial intelligence (AI) into financial predictive analysis. Techniques such as neural networks, support vector machines, and ensemble learning have demonstrated superior performance in modeling complex patterns, thereby enhancing forecasting accuracy and decision-making efficiency [7], [8].

The expansion of predictive analytics is also closely aligned with the rapid growth of financial technology (FinTech), which has transformed key areas including algorithmic trading, credit risk assessment, fraud detection, and portfolio optimization [9], [10]. Predictive models are now embedded in automated trading systems capable of executing transactions in milliseconds, leveraging streaming data to identify arbitrage opportunities and market inefficiencies [11], [12]. Likewise, financial institutions employ predictive analytics to evaluate creditworthiness, detect anomalies, and personalize financial services. This widespread adoption underscores the strategic importance of predictive analysis in achieving competitive advantage and operational resilience in the financial industry.

Despite the increasing volume of scholarly output in this domain, the literature remains fragmented, often focusing on isolated applications or specific methodological advances rather than offering a comprehensive perspective of the field [12]–[14]. This fragmentation creates a critical gap in understanding the overall intellectual structure, research trajectories, and interconnections within predictive analysis in finance. Moreover, the rapid emergence of advanced technologies—such as deep learning, natural language processing, and explainable AI—has introduced new research frontiers that require systematic synthesis and evaluation.

To address this gap, bibliometric analysis offers a robust and systematic approach for mapping the evolution and structure of scientific knowledge. By examining publication trends, citation networks, and keyword co-occurrence patterns, bibliometric methods enable the identification of influential studies, dominant research themes, and collaborative networks across institutions and countries. Such insights are essential for advancing theoretical development and informing future research directions in predictive finance.

Accordingly, this study aims to conduct a comprehensive bibliometric analysis of predictive analysis in finance using data retrieved from the Scopus database. Specifically, this research seeks to: (1) analyze the growth and distribution of publications over time, (2) identify key authors, institutions, and countries contributing to the field, and (3) map the intellectual structure and emerging research trends through citation and keyword analyses. By providing an integrated overview of the research landscape, this study contributes to the literature by clarifying the evolution of predictive analytics in finance, identifying existing gaps, and proposing avenues for future inquiry.

Ultimately, this research is expected to serve as a valuable reference for academics, practitioners, and policymakers seeking to understand the trajectory and future potential of predictive analysis in finance. As financial systems continue to evolve in response to technological innovation, predictive analytics will play an increasingly central role in enabling informed, data-driven decision-making and fostering sustainable financial development.

2. METHODS

This study employed a bibliometric approach to systematically analyze the development of research on predictive analysis in finance. The research used a descriptive quantitative design to map publication trends, citation patterns, author collaboration, and thematic evolution in the field [15], [16]. This approach was considered appropriate because predictive analytics in finance is an interdisciplinary topic that continues to grow along with the development of big data, machine learning, artificial intelligence, and financial technology.

The data used in this study were obtained from the Scopus database because it provides broad coverage of peer-reviewed publications across finance, economics, computer science, and data

analytics. The search process was conducted using keywords related to predictive analysis and finance, such as "predictive analysis," "predictive analytics," "financial prediction," "finance," "financial markets," and "stock market." The search was limited to publications from 2000 to 2026 and focused on journal articles, conference papers, and review papers written in English. Publications that were not related to finance or predictive modeling, duplicate records, incomplete metadata, editorials, notes, and book reviews were excluded from the analysis.

After the data were collected, the records were exported in CSV and RIS formats, including information on authors, titles, abstracts, keywords, publication years, affiliations, and citation counts [17], [18]. Data cleaning was carried out by removing duplicates, standardizing author names and affiliations, and harmonizing similar keywords, such as "AI" and "Artificial Intelligence." The cleaned data were then analyzed using VOSviewer to generate bibliometric maps, including co-authorship analysis, citation analysis, co-citation analysis, and keyword co-occurrence analysis. The visualizations were interpreted to identify influential publications, collaborative networks, dominant research themes, and emerging trends in predictive analysis in finance.

3. RESULT AND DISCUSSION

3.1 Co Authors

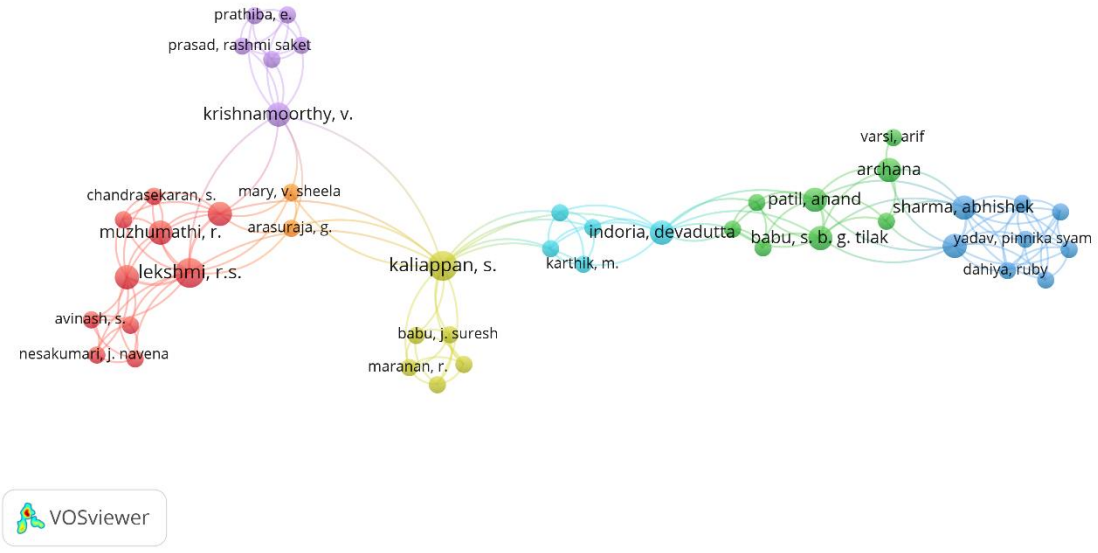

Figure 1. Co-Authors
Source: Data Analysis Result, 2026

Figure 1 illustrates the co-authorship network in the field of predictive analysis in finance, revealing a clustered yet interconnected structure of research collaboration. Several distinct clusters are visible, each representing groups of authors who frequently collaborate within the same research stream. Prominent nodes such as Kaliappan, S., Indoria, Devadutta, and Babu, S. B. G. Tilak act as bridging authors, connecting different clusters and indicating their central role in facilitating knowledge exchange across subfields. The network also shows that collaborations tend to be regionally or thematically concentrated, with tightly knit groups such as Muzhumathi, R., Lekshmi, R. S., and Chandrasekaran, S. forming dense local clusters. Meanwhile, the presence of multiple smaller clusters suggests that the field is still somewhat fragmented, with limited integration between research groups. Overall, this pattern highlights the importance of key collaborative hubs

while also indicating opportunities to strengthen broader, cross-cluster collaboration to enhance the development of predictive analytics research in finance.

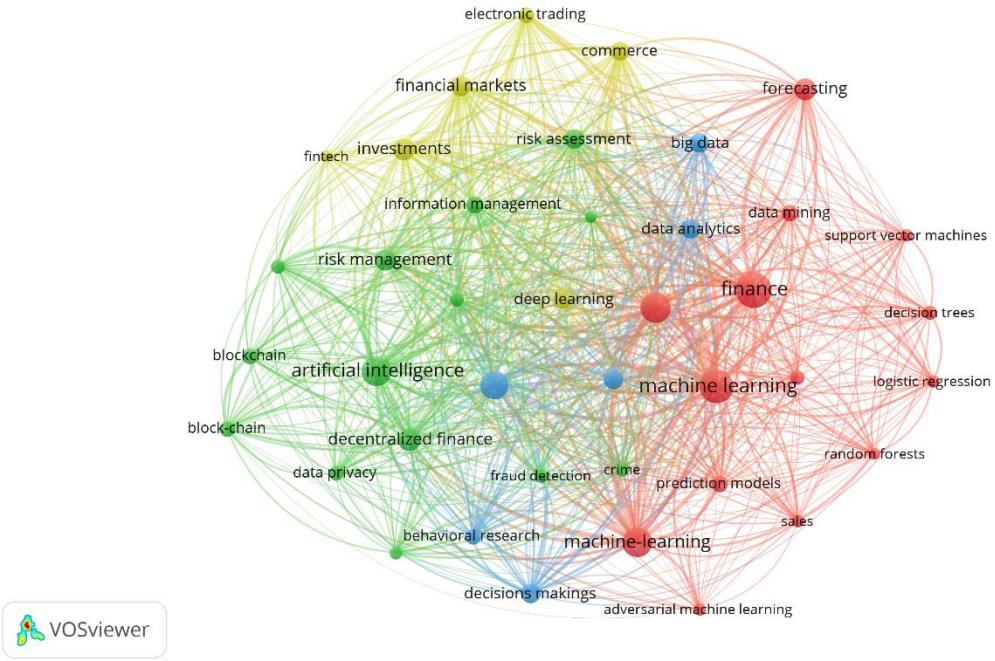

Figure 1. Network Visualization
Source: Data Analysis Result, 2026

Figure 2 presents the network visualization of keyword co-occurrence in predictive analysis in finance, highlighting the intellectual structure and major research themes within the field. The map reveals several interconnected clusters, with "finance" and "machine learning" emerging as central nodes, indicating their dominant role in the literature. The red cluster is primarily associated with core predictive modeling techniques such as data mining, forecasting, support vector machines, and logistic regression, reflecting the methodological backbone of financial prediction studies. The green cluster emphasizes technological advancements, including artificial intelligence, blockchain, decentralized finance, and data privacy, illustrating the integration of emerging digital innovations into financial analytics. Meanwhile, the blue cluster connects concepts such as decision-making, fraud detection, and deep learning, suggesting practical applications of predictive models in financial operations. The yellow cluster, which includes terms like financial markets, investments, and risk assessment, represents the traditional finance domain that underpins these analytical approaches. Overall, the dense interconnections among clusters indicate a highly interdisciplinary and evolving research landscape, where advanced computational methods are increasingly intertwined with financial theory and practice.

3.2 Overlay Visualization

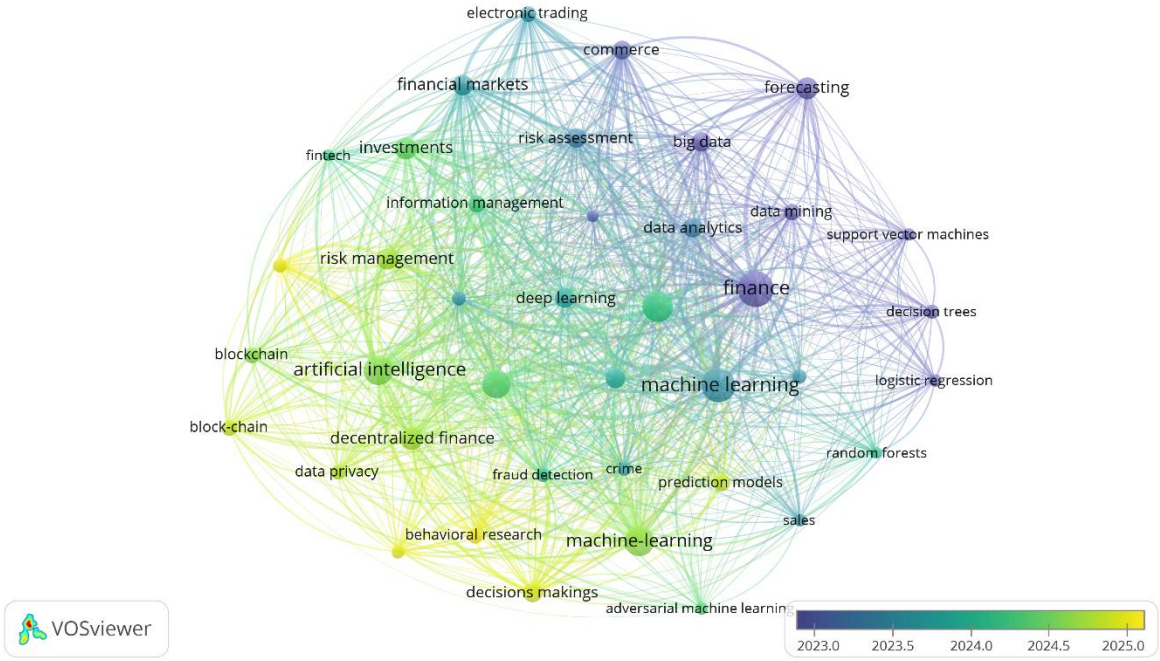

Figure 2. Overlay Visualization
Source: Data Analysis Result, 2026

Figure 2 presents the overlay visualization of keyword co-occurrence, illustrating the temporal evolution of research themes in predictive analysis in finance. The color gradient—from blue (earlier period) to yellow (more recent period)—indicates how the focus of research has shifted over time. Earlier studies (blue nodes) are concentrated around foundational topics such as finance, forecasting, data mining, and traditional machine learning methods like support vector machines and logistic regression. As the field evolves, more recent themes (green to yellow nodes) emerge, including artificial intelligence, blockchain, decentralized finance, data privacy, and behavioral research, reflecting the growing integration of advanced technologies and interdisciplinary approaches. Notably, keywords such as "machine learning," "deep learning," and "risk management" appear across multiple time phases, indicating their sustained importance and continuous development. Overall, this visualization highlights a clear transition from conventional predictive techniques toward more innovative, technology-driven, and application-oriented research directions in modern finance.

3.3 Citation Analysis

Table 1. The Most Impactful Literatures

Citations	Authors and year	Title
452	Baah, C.,Opoku-Agyeman, D.,Acquah, I.S.K.,... Faibil, D.,Abdoulaye, F.A.M. (2021)	Examining the correlations between stakeholder pressures, green production practices, firm reputation, environmental and financial performance: Evidence from manufacturing SMEs
339	Brayne, S. (2020)	Predict and surveil: Data, discretion, and the future of policing
318	Xing, F.Z.,Cambria,	Natural language based financial forecasting: a survey

Citations	Authors and year	Title
	E.,Welsch, R.E. (2018)	
273	Giuffrè, M.,Shung, D.L. (2023)	Harnessing the power of synthetic data in healthcare: innovation, application, and privacy
234	Zhang, Y.,Liu, R.,Heidari, A.A.,... Wang, M.,Chen, H. (2021)	Towards augmented kernel extreme learning models for bankruptcy prediction: Algorithmic behavior and comprehensive analysis
219	Kavitha, S.,Varuna, S.,Ramya, R. (2016)	A comparative analysis on linear regression and support vector regression
215	Aldoseri, A.,Al-Khalifa, K.N.,Hamouda, A.M. (2024)	AI-Powered Innovation in Digital Transformation: Key Pillars and Industry Impact
211	Moscato, V.,Picariello, A.,Sperlí, G. (2021)	A benchmark of machine learning approaches for credit score prediction
208	Zhang, D.,Lou, S. (2021)	The application research of neural network and BP algorithm in stock price pattern classification and prediction
192	Salas-Pilco, S.Z.,Yang, Y. (2022)	Artificial intelligence applications in Latin American higher education: a systematic review

Source: Scopus, 2026

Table 1 highlights the most impactful literatures in the field of predictive analysis, demonstrating the interdisciplinary breadth and evolving focus of research within finance and related domains. The most cited study by Baah et al. (2021) reflects the growing integration of sustainability and financial performance, indicating that predictive analytics is increasingly applied to evaluate environmental and strategic business outcomes. Highly cited works such as Brayne (2020) and Xing et al. (2018) further show that predictive analysis extends beyond finance into areas like surveillance and natural language processing, emphasizing the methodological convergence of data science and decision-making contexts. Studies by Zhang et al. (2021) and Moscato et al. (2021) highlight the prominence of machine learning techniques in financial prediction tasks such as bankruptcy and credit scoring, reinforcing the shift toward algorithm-driven models. Meanwhile, foundational comparisons of regression methods (Kavitha et al., 2016) remain relevant, illustrating the continuity between traditional and modern approaches. More recent contributions, such as Aldoseri et al. (2024), signal the increasing role of AI in digital transformation, while works on synthetic data and AI applications in education suggest expanding research frontiers. Overall, the table indicates that impactful research is not only methodologically innovative but also increasingly application-oriented, spanning finance, sustainability, technology, and cross-sectoral domains.

3.4 Density Visualization

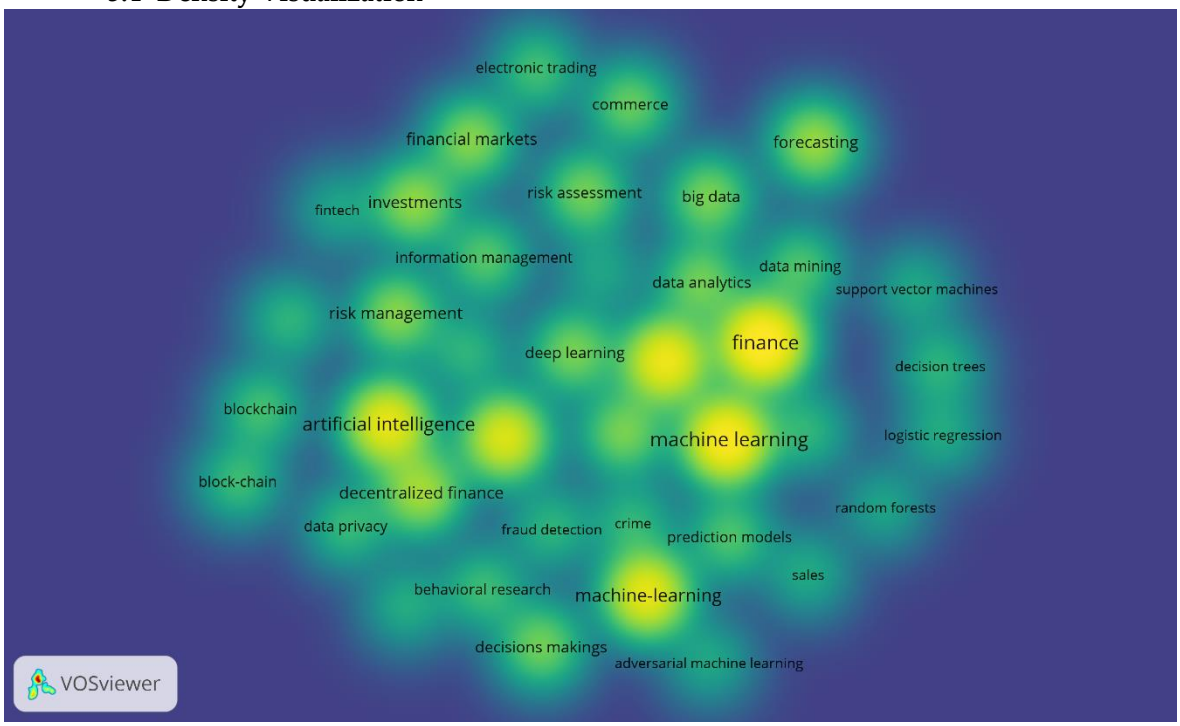

Figure 3. Density Visualization

Source: Data Analysis Result, 2026

Figure 3 presents the density visualization of keyword co-occurrence, highlighting the concentration and intensity of research topics within predictive analysis in finance. The bright yellow areas indicate the most frequently studied and highly connected themes, with "finance," "machine learning," and "artificial intelligence" emerging as the core hotspots of the field. Surrounding these central themes are moderately dense areas (green shades) such as "deep learning," "data analytics," "risk management," and "financial markets," reflecting their strong but slightly less dominant presence in the literature. Peripheral topics, shown in darker shades, include emerging or more specialized areas like "blockchain," "data privacy," "adversarial machine learning," and "behavioral research," suggesting growing but still developing research interest. The overall pattern indicates that while traditional finance concepts remain central, the field is increasingly driven by advanced computational techniques and digital innovation. This distribution underscores a mature yet evolving research landscape, where core analytical methods are being continuously expanded through interdisciplinary and technology-oriented approaches.

Discussion

The findings of this study confirm that predictive analysis in finance has evolved into a highly dynamic and interdisciplinary research domain, driven by the convergence of financial theory and advanced computational techniques. The bibliometric results—particularly from co-authorship, citation, and keyword analyses—demonstrate a strong shift from traditional econometric approaches toward machine learning and artificial intelligence-based models. This transformation reflects the increasing complexity of financial markets, where large-scale, high-frequency, and unstructured data require more adaptive and scalable analytical methods. As a result, predictive analytics is no longer limited to forecasting but has become a strategic tool for decision-making, risk mitigation, and value creation in financial systems [1], [2], [6].

Furthermore, the collaboration patterns identified in the co-authorship analysis suggest that while the field benefits from strong research clusters and key contributors, it remains partially fragmented. The presence of several disconnected or loosely connected clusters indicates that

knowledge exchange across regions and disciplines is still limited. This fragmentation may hinder the development of unified frameworks or standardized methodologies in predictive finance. Strengthening international collaboration and fostering interdisciplinary partnerships—particularly between finance experts and data scientists—could significantly enhance the robustness and applicability of predictive models across diverse financial contexts.

From a thematic perspective, the keyword co-occurrence, overlay, and density visualizations reveal that machine learning, artificial intelligence, and finance form the core of current research, with emerging topics such as blockchain, decentralized finance, and data privacy gaining increasing attention. This indicates a clear evolution toward technology-driven finance, often referred to as FinTech. Importantly, the emergence of themes like explainable AI and ethical considerations highlights a growing awareness of the limitations of black-box models [5], [19]. While predictive accuracy remains a key objective, there is an increasing demand for transparency, interpretability, and accountability, especially in regulated financial environments.

Finally, the citation analysis underscores that the most impactful studies are those that successfully integrate methodological innovation with practical application. Highly cited works often address real-world financial challenges such as credit scoring, bankruptcy prediction, and market forecasting using advanced analytical techniques. However, despite these advancements, several research gaps remain, including the need for real-time predictive systems, improved model generalizability across markets, and the integration of sustainability factors into financial prediction. Future research should focus on developing hybrid models, incorporating explainable AI frameworks, and exploring underrepresented regions and financial systems to create a more inclusive and comprehensive understanding of predictive analysis in finance.

CONCLUSION

This study provides a comprehensive bibliometric overview of predictive analysis in finance, highlighting its rapid evolution and growing significance in both academic research and practical applications. The findings indicate substantial growth in the field, driven by advancements in data availability, computational power, and analytical techniques. Predictive analysis has shifted from traditional econometric approaches toward more advanced machine learning and artificial intelligence models, enabling more accurate and efficient financial forecasting and decision-making. In addition, the identification of key authors, influential publications, and major research clusters offers important insights into the intellectual structure of the field, while the emergence of themes such as blockchain, decentralized finance, and data privacy reflects the expanding scope of predictive analytics in response to technological developments.

Despite these advancements, the study also reveals that the field remains partially fragmented, indicating the need for stronger collaboration and integration across research groups and disciplines. Several challenges persist, particularly regarding model interpretability, data quality, and ethical considerations. The increasing reliance on complex algorithms underscores the importance of developing transparent and explainable models to ensure trust and regulatory compliance. Furthermore, the integration of sustainability perspectives and real-time analytics presents promising directions for future research. Overall, predictive analysis in finance continues to evolve as a dynamic and interdisciplinary domain with significant potential to transform financial systems, and this study provides a foundational basis for advancing both theoretical and practical contributions in the field.

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