



AI AND FINANCE

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ABSTRACT:

Over the past two decades, artificial intelligence (AI) has undergone significant advancements, finding applications across various sectors, including finance. Simultaneously, an expanding and diverse body of literature has explored AI's integration into financial activities. This study aims to offer a comprehensive overview of existing research in this domain and identify future research directions requiring further exploration. Using bibliometric and content analysis, we reviewed numerous articles published between 1992 and March 2021. Our findings reveal that literature on AI in finance has grown substantially since the early 21st century, encompassing diverse geographical contexts and a wide range of applications. Key AI applications include predictive/forecasting systems, classification/detection/early warning systems, and big data analytics, such as data mining and text mining. Additionally, the reviewed articles are categorized into ten primary research streams, namely: stock market analysis, trading models, volatility forecasting, portfolio management, performance evaluation, risk and default analysis, cryptocurrencies, derivatives, credit risk in banking, investor sentiment analysis, and foreign exchange management. Future research should focus on addressing open research questions and deepening our understanding of how recent disruptive technological advancements influence the financial landscape.

Keywords: Artificial Intelligence in Finance, Machine Learning Applications in Finance, Bibliometric Analysis in Financial Studies, AI-Powered Financial Trading Systems, Predictive Analytics in Finance.

INTRODUCTION:

The term “**Artificial Intelligence**” (AI) was first coined by John McCarthy in 1956 during a conference at Dartmouth College to describe “**thinking machines**” (Buchanan 2019). Despite its promise, the development of AI was hindered by limited storage capacity and computing power until the early 2000s. These constraints led to periods of stagnation, known as “**AI winters**”, marked by funding shortages between 1974–1980 and 1987–1993, as governments and investors lost interest.

Today, AI solutions are transforming every major sector of the economy, with the **financial sector** at the forefront of this technological revolution. Financial institutions, reliant on **Big Data** and process automation, are uniquely positioned to adopt AI. This adoption brings significant benefits, including:

1. **Enhanced efficiency and productivity** through the automation of processes.
2. **Accurate and unbiased predictive analytics** and trading strategies, as machines eliminate human errors and psychological biases.
3. **Business model innovation** and improved customer relationships, driven by customised digital finance solutions.
4. **Cost savings** through streamlined operations and better service delivery.

Moreover, AI has significant implications for financial conduct and prudential supervision. It enables supervisors to identify potential violations and anticipate the effects of regulatory changes. Complex AI and machine learning algorithms also empower FinTech lenders to make rapid and accurate credit decisions, benefiting both lenders and consumers.

Applications of AI in finance are diverse, encompassing fraud detection, algorithmic and high-frequency trading, portfolio management, credit scoring, bankruptcy prediction, risk management, behavioural analyses (e.g., sentiment analysis), and regulatory compliance.

Despite its growing adoption, the scholarly literature on AI in finance remains broad and heterogeneous, addressing diverse research questions, geographic contexts, industries, and

methods. This diversity complicates the synthesis of robust conclusions and the identification of underexplored areas.

In this context, we conduct an extensive review of existing research to:

1. Provide a comprehensive overview of the current state of AI applications in finance.
2. Highlight gaps and propose research questions that warrant further investigation.

This review aims to serve as a roadmap for researchers unfamiliar with the field, offering a clear starting point for future empirical contributions while identifying critical issues that merit deeper exploration.

METHODOLOGY:

To conduct a rigorous review of the literature on the selected topic, we employed two well-established methodologies: **bibliometric analysis** and **content analysis**.

Bibliometric Analysis

Bibliometric analysis is a widely recognized method for systematically exploring and analyzing large volumes of scientific data. This approach enables us to uncover the **evolutionary dynamics** of a specific research field while identifying **emerging trends** and **research gaps**.

In this study, we utilized **HistCite**, a popular bibliometric software package designed to support researchers in organizing and visualizing the results of literature searches conducted on the Web of Science platform. Specifically, we used HistCite to:

1. **Track publication trends:** Analyze the annual number of publications to observe temporal trends in research activity.
2. **Identify influential contributions:** Measure forward citations to determine the most impactful journals and articles in the field.

3. **Map co-citation networks:** Analyze the network of citations exchanged between journals within the domain. This mapping provides insights into the major research streams and their interconnections.

Content Analysis

Complementing the bibliometric approach, content analysis was employed to qualitatively examine and interpret the identified research contributions. This method allowed us to delve deeper into the thematic aspects of the literature, ensuring a comprehensive understanding of the **conceptual and methodological underpinnings** of the studies reviewed.

By combining these methodologies, we ensured a robust framework for exploring the body of literature on the use of AI in finance, enabling us to draw meaningful insights and highlight key areas for future investigation.

LITERATURE ON AI IN FINANCE:

This section delves into the existing body of literature on Artificial Intelligence (AI) in Finance, aiming to provide a concise yet comprehensive overview of the current state of research. To achieve this, we employ bibliometric analysis to uncover key patterns and trends in relevant publications, highlighting critical bibliographic characteristics. Subsequently, we perform a preliminary content analysis on a selected subset of studies to identify the primary applications of AI within the financial domain. Lastly, we outline and briefly discuss ten major research streams that have emerged from this analysis.

OBJECTIVES:

1. To explore the diverse applications of Artificial Intelligence within the financial sector, providing a concise yet comprehensive introduction to its role and potential.
2. To evaluate the challenges and impacts associated with the adoption of AI in the financial sector, discussing both its advantages and disadvantages.
3. To investigate the future prospects of Artificial Intelligence in India's financial landscape and provide actionable recommendations for its effective implementation.

AI APPLICATIONS IN THE FINANCIAL SERVICES INDUSTRY:

The financial services industry, second only to the technology sector, is one of the largest spenders on AI services and has seen rapid growth in this area (Citi, 2018). While hedge funds and high-frequency trading (HFT) firms were historically the primary adopters of AI in finance, the technology's applications have expanded across the sector. Banks, regulators, fintech firms, and insurance companies are now utilizing AI in a variety of ways.

Within the financial services industry, AI is applied in areas such as algorithmic trading, portfolio optimization, model validation, backtesting, robo-advising, virtual customer assistants, market impact analysis, regulatory compliance, and stress testing. This section discusses three key areas where AI is currently transforming the financial services landscape:

1. **Fraud Detection and Compliance:** AI is increasingly being used to detect fraudulent activities and ensure compliance with financial regulations. Machine learning algorithms can analyze vast amounts of data to identify suspicious transactions and patterns that might indicate fraud, as well as help in automating compliance reporting and monitoring.
2. **Banking Chatbots and Robo-Advisory Services:** In the retail banking sector, AI-driven chatbots provide instant customer support, handling inquiries, transactions, and routine tasks. Additionally, robo-advisors are transforming wealth management by offering personalized investment advice and portfolio management services based on data analytics and customer preferences.
3. **Algorithmic Trading:** AI is playing a critical role in algorithmic trading, where it can process large datasets at high speed to execute trades based on predefined conditions. AI-driven algorithms can detect patterns and trends in financial markets, leading to more efficient trading strategies and reduced human error.
4. **Other Applications of AI:** AI is also applied in areas like credit scoring, risk management, and financial forecasting, enabling companies to make better-informed decisions and improve operational efficiency.

5. **Audit & Compliance:** AI tools can streamline audits by automatically reviewing financial statements, detecting discrepancies, and ensuring regulatory adherence. This not only enhances efficiency but also reduces human errors in auditing processes.
6. **Customer Service:** Beyond chatbots, AI is revolutionizing customer service in finance by enabling virtual assistants to understand and respond to customer needs, providing personalized services and solutions in real time, enhancing customer satisfaction, and operational efficiency.
7. **Other Applications of AI:** Artificial Intelligence has become a cornerstone in various facets of the financial ecosystem, including loan approval, asset management, and risk assessment. One of the most significant sectors impacted by AI is the global real estate industry, which is valued at over \$200 trillion (Barnes, 2016). The rapid adoption of AI and related technologies is transforming real estate markets, with new business models emerging around these innovations.

The term **PropTech** refers to the technology-driven changes in the real estate industry, disrupting traditional practices. AI is playing a pivotal role in shaping these transformations, including:

1. **Property Valuation and Investment Analysis:** AI algorithms analyze vast amounts of market data, historical trends, and property features to offer more accurate property valuations and predict investment returns.
2. **Risk Assessment and Management:** By utilizing machine learning models, financial institutions can assess the risk of real estate investments more effectively, factoring in market fluctuations, tenant histories, and location-based risks.
3. **Real Estate Pricing and Market Trends:** AI models track supply-demand dynamics, economic conditions, and consumer behavior to predict market trends and optimize pricing strategies for real estate assets.
4. **Property Management:** AI is also enhancing property management through automation of tasks like maintenance scheduling, lease management, and customer service, improving efficiency and tenant satisfaction.

BENEFITS OF AI IN THE FINANCIAL SECTOR:

The ability to gather and process large datasets using Artificial Intelligence (AI) and Machine Learning (ML) is dramatically transforming the financial sector. AI is enhancing the capacity to predict economic, financial, and risk events, reshaping financial markets, improving risk management and compliance, and providing central banks with new tools to achieve their monetary and macro-prudential goals.

1. Forecasting

AI systems in the financial sector are used to forecast macroeconomic and financial variables, assess customer demands, evaluate payment capacity, and monitor business conditions. Unlike traditional statistical and econometric models, AI models offer greater flexibility, helping to uncover complex, often hidden relationships between variables. Evidence suggests that AI techniques frequently outperform linear regression models in terms of forecast accuracy and robustness (Bolhuis and Rayner, 2020). While AI-driven forecasting presents significant benefits, it also introduces challenges, particularly when using non-traditional data (such as social media, browsing history, and location data) to uncover new relationships between variables.

2. Investment and Banking Services

AI has had a profound impact on the investment management industry in recent years. While technology has long been used in trading, client services, and back-office operations, AI is revolutionizing the sector by introducing new market participants (e.g., product customization), improving client interfaces (e.g., chatbots), and enhancing analytics and decision-making processes. Additionally, AI-driven automation is helping reduce costs, improving operational efficiency, and transforming client engagement strategies.

3. Risk and Compliance Management

Recent advances in AI are reshaping risk and compliance management in the financial sector. Regulatory technology has gained prominence due to the tightening of

regulations and rising compliance costs following the 2008 global financial crisis. Historically, technology was used to digitize compliance and reporting processes (Arner, Barberis, and Buckley, 2017). However, AI now enables real-time analysis of broad data sets, automating compliance decisions and improving the quality of compliance while reducing costs.

4. Prudential Supervision

AI is enhancing financial supervision, primarily in data collection and analytics. Supervisory authorities, particularly those in Financial Stability Board member countries, are increasingly using Machine Learning (ML) and Natural Language Processing (NLP) tools for data analysis, processing, validation, and plausibility checking. AI allows supervisors to uncover insights that might be overlooked by humans, enabling more informed, data-driven decision-making. It also allows for more agile supervision by flagging anomalies in real time, and AI-based predictive tools can improve the overall quality of supervision. However, AI should complement, not replace, human judgment, and the effectiveness of supervision remains dependent on the organization's risk culture.

5. Central Banking

While central banks have been slow to fully embrace AI, its potential for improving operations is substantial. AI/ML systems can enhance central banks' understanding of economic and financial trends, optimize monetary and macroprudential policies, and improve operational efficiency. AI also offers better tools for systemic risk monitoring, potentially enabling earlier detection of systemic risks and more rapid crisis response. Additionally, AI can improve internal control and resource allocation within central banks, and experiments have focused on improving forecasting accuracy and monitoring market sentiment to inform policy decisions. Some central banks are even developing AI-based applications to streamline internal operations, such as cash management.

MAIN RESULTS OF THE BIBLIOMETRIC ANALYSIS:

Using HistCite, we analyzed a sample of 892 studies related to "AI in Finance" and calculated, for each year, the number of publications on this topic. The resulting publication trend is illustrated in **Fig. 1**, which shows both the annual absolute number of sampled papers (represented by the blue bar graph) and the ratio between these publications and the overall number of publications in the finance domain (indexed in Scopus), indicated by the orange line graph.

To ensure that the trend observed in our sample is not simply due to a general increase in finance-related publications, we also computed relative numbers. This helps determine whether the growth in AI-related finance studies is part of a broader "common trend" in financial research.

The graphs clearly show a strong upward trajectory from 2015 onward. This period marks a significant acceleration in the adoption of AI in finance, reflected by a notable increase in research articles dedicated to the topic. Over the past few years, the pace of growth in both AI-related publications and AI adoption in the financial sector has become even more pronounced, signaling a shift towards AI as a critical area of study within finance.

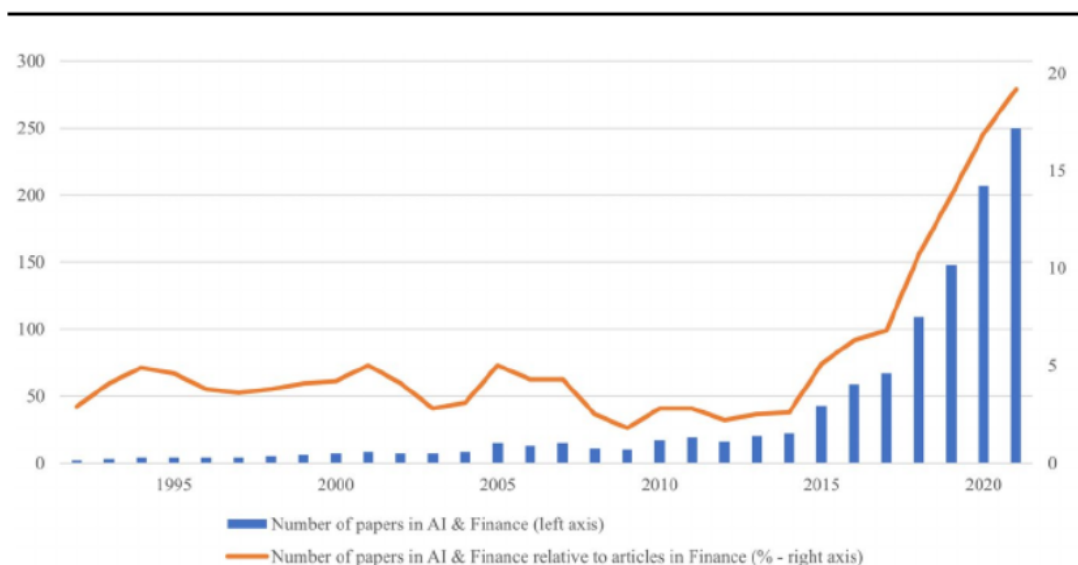


Fig. 1 Publication Trend, 1992–2021



CONCLUSION:

Artificial Intelligence (AI), though a relatively recent development, has already transformed the financial system, driven by breakthroughs in computer science, Big Data analytics, and the continuous flow of data from consumers, businesses, investors, and government activities. This transformation has sparked an increasing body of literature exploring the diverse uses, benefits, and potentials of AI in finance.

This paper provides a comprehensive review of the current state of AI in finance, offering valuable insights for both practitioners and researchers. By analyzing a wide array of articles from journals indexed in the Web of Science (WoS), and employing both bibliometric and content analysis methods, we identified key trends in AI applications across the finance sector. Specifically, we pinpointed ten major research streams and examined the most prominent AI-driven innovations.

Our findings suggest that AI serves as an effective market predictor, helping stabilize markets by minimizing information asymmetry and volatility. This leads to improved investment strategies and more accurate performance evaluations. Additionally, in the area of risk management, AI plays a crucial role in predicting bankruptcy and credit risks for both corporate and financial institutions. These contributions illustrate the immense potential of AI to enhance financial stability, efficiency, and profitability.

This paper aims to be a valuable starting point for future research, providing a roadmap for further exploration into AI's expanding role in finance.

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