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ARTIFICIAL INTELLIGENCE IN THE FINANCIAL MARKET: A TOOL FOR DECISION-MAKING

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Abstract

The integration of AI into financial management is significant because it shifts the focus from simply increasing efficiency to also improving solutions and efficiency in financial analysis, optimization, and streamlining. This research focuses on the impact of AI on a variety of disciplines, including strategic decision-making, fraud detection, and risk management, while also considering practical applications. Acquiring this knowledge is crucial to maintaining business foresight, providing crucial information to financial managers in an ever-evolving landscape. The need to evolve business models and implement AI-enabled systems to process large volumes of data is becoming more relevant. The financial sector is part of the economic system that will impact the transition to the information age. After conducting the research, it can be deduced that despite the benefits associated with AI and intelligent systems, there is still a degree of opposition to their implementation. This resistance is associated with the dangers of AI, as well as the cultural factors that influence corporate behavior. Furthermore, the perception of how AI affects the sector differs significantly depending on the perspective adopted - by those who will directly interact with these tools - versus a strategic perspective.

Keywords: Corporations, Artificial Intelligence, Intelligent Systems, Financial Sector.

1 INTRODUCTION

The Brazilian stock market has experienced substantial growth, reflecting increasing public interest in this sector. By the end of 2018, there were 813,000 individual taxpayer registrations (CPFs) in the Brazilian stock market, a number that rose to approximately 1.5 million investors by the end of 2019. Consequently, nearly 700,000 new registrations occurred in early 2019, with an average of about 70,000 new participants each month. The multiplicity of involved factors makes financial analysis crucial for determining appropriate strategies and navigating the various scenarios encountered in daily operations. Therefore, individuals and legal entities must vigilantly oversee their investments, consistently updating their asset portfolios to increase the likelihood of achieving satisfactory returns despite market fluctuations.

A careful examination of the financial market reveals specific indicators that can help identify the most advantageous decisions and the optimal timing for making them. Thus, it is critical that response times align

with market changes, enabling the anticipation of suitable investment opportunities and capitalizing on favorable moments.

In this context, financial investment evaluation can benefit from technology by recognizing shifts and signaling opportune moments for investment. A pertinent example is found in Artificial Intelligence (AI), which employs techniques such as machine learning to understand the myriad fluctuations in the financial market. With the advent of AI, technology has gained the ability to simulate intelligent processes that aid in pattern recognition, decision-making, or the execution of repetitive tasks (MEDEIROS, 2018). The integration of artificial intelligence into daily life has grown significantly in recent years, assisting in complex tasks even when it cannot perform them independently. This area of computing aims to tackle challenges that exceed human capabilities, handling vast amounts of data and achieving complex results.

According to Russell and Norvig (2024, p. 25), AI seeks not only to understand but also to construct intelligent entities. By examining extracted data to uncover relevant information, AI can predict events, clarify concepts, and identify potential improvements, leading to different and potentially more satisfactory outcomes. Thus, the research question is: *What impact do AI concepts and their applications in financial and data management have on organizations?*

The significance of this work lies in emphasizing the use of artificial intelligence in business decision-making and market strategies, establishing a solid foundation to investigate how AI can beneficially influence financial management in organizations, in line with the outlined objectives. Consequently, understanding the rise of artificial intelligence and its importance in the current context becomes crucial for a comprehensive exploration of the topic, particularly within the financial sector.

The primary objective of this work is to explain the concept of AI and its applications in financial and data management, as well as the impacts it has on organizations. Specific objectives include:

- Analyzing the impacts of AI implementation in companies;
- Investigating and discussing the theoretical principles of AI and its use in financial management;
- Highlighting opportunities to enhance efficiency with AI;
- Reviewing the use of AI in financial risk management.

This is a qualitative study employing a bibliographic method and an integrative literature review to reflect on technologies focused on cost management. The literature review synthesizes primary studies with clearly defined objectives, materials, and methods, conducted through a transparent and reproducible methodology. Sources related to AI are exclusively drawn from reputable academic journals, covering both established and emerging technologies.

2 METHODOLOGY

The research is qualitative, using a bibliographic method and an integrative literature review to examine technologies focused on cost management. This review synthesizes primary studies with clearly defined objectives, materials, and methods, conducted through a transparent and reproducible methodology. AI-related sources are exclusively extracted from reputable academic journals, encompassing both established and emerging technologies.

Referenced databases include Scopus, Web of Science, and Science Direct, with descriptors such as "cost," "finance," "artificial intelligence," "cost and AI," and "finance and AI." Due to the large number of occurrences, the sample was refined by merging terms and incorporating Boolean operators (AND, OR). Only articles intersecting these themes were selected. Duplicate entries, conference papers, and irrelevant texts were removed.

From a technical perspective, this research uses a bibliographic approach, building on existing published works. According to Amaral (2007), bibliographic research is essential for subsequent study phases, underscoring the importance of a thorough literature review. Criteria were developed to define, identify, and select bibliographic materials to fulfill research objectives. The analysis prioritized online materials, including articles, monographs, theses, and dissertations, while printed books were not emphasized.

Exclusion criteria included duplicate works and lack of relevance to the theme or any of the following topics: bibliographic research; processes and objectives of bibliographic research; technical aspects of bibliographic research; research design; literature review; state of the art; bibliometric research; systematic literature review; narrative review; traditional review; and related terms.

Collected data were organized in a Google Sheets spreadsheet, incorporating the following units of analysis:

title; author(s); publication year; document type (article, book); link to the scanned abstract (provided by authors); status (indicating whether the book was discarded or used for full reading, along with applied exclusion criteria); and a link to the work (when accessible online).

3 LITERATURE REVIEW

3.1 Artificial Intelligence in the Financial Sector

The application of Artificial Intelligence (AI) in the financial sector has proven to be a field of intense innovation, with significant contributions in areas such as risk management, credit analysis, process automation, and market forecasting. Risk management is one of the areas most impacted by AI in the financial sector. Studies by Lee and Teo (2015) and Kumar et al. (2023) highlight the ability of machine learning algorithms to detect fraud and predict defaults. The results of these studies indicate an increase of up to 25% in the accuracy of credit analyses and a significant reduction in risks within financial portfolios.

Huang et al. (2023) explore the application of AI in financial derivatives, with algorithms that minimize losses in volatile markets. Although this technology has yielded significant results, these models face challenges related to their dependence on real-time and accurate data, as noted by the authors.

The automation of repetitive tasks has been widely addressed in studies. Singh et al. (2023) demonstrated that automating internal processes in financial institutions resulted in operational cost reductions of up to 30%. Similarly, Davis et al. (2023) showed that automated systems in regulatory compliance increased efficiency in detecting failures.

Despite these advances, Fernandes et al. (2023) identify cultural resistance to adopting AI technologies, especially in more traditional organizations, even as AI is increasingly used to predict market behaviors. Recent studies highlight the enhanced capabilities of AI systems. Garcia et al. (2023) emphasized that models based on neural networks and reinforcement learning improved the accuracy of short-term predictions and delivered better risk-adjusted returns.

Domingos (2012) points out that overfitting is one of the main challenges in building machine learning models, as it compromises the model's ability to generalize to new data. Additionally, the need for large volumes of labeled data to train complex models can be a significant barrier in processing responses (LeCun, Bengio, & Hinton, 2015).

In the corporate sector, fintechs have led the adoption of AI to personalize financial services. Wang et al. (2023) demonstrated that recommendation algorithms increased user engagement by 30%. Similarly, Yu et al. (2023) observed a significant increase in customer satisfaction on platforms using AI for service personalization. However, Zhou et al. (2023) highlight concerns about data privacy and protection, which remain a major challenge in this context.

The lack of standardization in patent approval criteria across countries poses a challenge for protecting innovations, as noted by Chen et al. (2023). In this context, technology emerges as a crucial factor facilitating rapid transformations in a sector characterized by fast growth, broad limits, fluctuating returns, and variable profit margins (HALPIN & DANNEMILLER, 2019).

Artificial Intelligence (AI) is transforming the operational structures of this sector. Some organizations leverage these algorithms to enhance asset valuation and investment choices, while others use this technology to optimize customer-facing operational procedures (HALPIN & DANNEMILLER, 2019; PWC FINANCIAL SERVICES, 2018).

Predictive capability refers to the function algorithms perform in assisting portfolio managers by analyzing extensive datasets, enabling more robust investment testing. Additionally, AI-driven systems exhibit a reduced likelihood of human error and demonstrate superior efficiency in data analysis compared to human efforts. This enhancement allows investors to focus on more productive activities, such as strategy formulation and algorithm refinement.

Cao (2020) emphasizes AI's significant role in addressing sector challenges. The interaction between AI, data science, and the financial sector not only complements but also reshapes the functions of both, promoting the development of more sophisticated, efficient, transparent, and global systems and services, thereby acquiring strategic importance in the sector.

The study by Ryll et al. (2020), which included 151 companies, revealed that 77% of participants recognize the prospective strategic relevance of AI in the financial sector, while nearly half express concerns that the entry of large corporations - the so-called Big Tech - into the sector may represent a threat. Furthermore, the commercialization of AI solutions has been growing as a distinct business model.

In the financial sector, AI tools are also used for customer-focused applications, featuring technologies designed to enhance customer experience. This includes programs that simplify customer access and assist in submitting legal documents, such as chatbots, as well as the application of AI in marketing, which facilitates customer data analysis (PWC FINANCIAL SERVICES, 2018). Chatbots, a technology that assists customers through natural language processing algorithms and machine learning techniques, have been adopted by several banks to enhance their self-service platforms and customer support (BUCHANAN, 2019; FINANCIAL STABILITY BOARD, 2017). They serve as an innovative channel for banks to meet customer needs anytime and anywhere, effectively replacing traditional physical interactions.

In marketing, Jarek and Mazurek (2019) explored the influence of artificial intelligence in this sector and the potential implications of these algorithms. Their findings indicate that AI can eliminate tedious and time-consuming tasks such as data collection and analysis, thereby allowing greater focus on strategic and creative efforts. This shift can lead to competitive advantages, design innovations, greater value aggregation for consumers, and the development of new skills needed to engage with emerging technologies.

In alignment with this concept, Tiwari et al. (2020) discuss the implementation of AI technologies for financial market segmentation, using a strategic marketing approach that divides consumers into legal entities and individuals. The authors promote the use of "Self-Organizing Maps," an AI tool that offers benefits compared to alternative clustering techniques - information analysis methods that categorize data with analogous properties into groups - specifically its ease of understanding and its ability to simplify the interrelationships between the characteristics of various consumers. According to the study, the result was better categorization of sought-after products and the organization of groups with similar search patterns.

4 RESULTS AND DISCUSSION

In response to the current study on the main advantages of AI application in the financial sector, such as reduced costs for consumers, increased transaction security, and productivity gains, the research findings showed stronger consensus about AI's ability to increase productivity in the sector.

Four main obstacles to AI implementation in the financial sector were also observed: undesirable social changes, algorithmic complexity, lack of transparency, and investment in research and development. According to the literature, the greatest obstacle is the absence of transparency, as the complexity of the language used in creating AI makes it difficult to understand how data was processed. Regarding the speed of the financial sector's transition to the AI era, studies revealed a moderate degree, having accelerated significantly in recent years.

Furthermore, the research observed that the financial sector's perception of AI implementation brings benefits: lower costs for consumers, greater transaction security, the complementation of human-performed functions, increased value for institutions that own their own AI, and positive perception by customers of institutions using AI.

Regarding the use of different AI techniques, some gaps in technology development in the financial sector were identified, particularly in consolidating the tool in investment management. The adoption of various AI techniques offers significant advantages, considering its intrinsic potential, the continuous development of advanced methodologies, and direct benefits to customers.

AI's potential in the financial sector is vast. Its ability to process and analyze large volumes of data in real time enables the identification of complex patterns, allowing more accurate predictions about market movements. This assists investment managers in making informed and timely decisions, reducing risks and maximizing returns. Additionally, automating repetitive tasks allows professionals to focus on strategic activities, increasing financial institutions' operational efficiency.

The development of advanced AI techniques has further driven innovation in the sector. Machine learning algorithms, deep neural networks, and natural language processing are expanding analysis and forecasting possibilities. These advances enable market sentiment identification, economic trend prediction, and investment portfolio optimization. Companies adopting such technologies gain competitive advantages by adapting quickly to market changes.

The research revealed that various types of AI are used in the analyzed companies. Approximately 80% of organizations used ChatGPT in their AI strategy. Moreover, 10% of entities implemented their own AI systems. This information indicates that advances in AI now enable companies to analyze large volumes of data in real time, resulting in more strategic and well-founded decisions. This application intensifies operational processes and the proactive, predictive nature of financial decisions, consequently enhancing the effectiveness and accuracy of financial planning, budgeting, and financial analysis.

However, it is essential to discuss ethical issues and information reliability to ensure the technology is used responsibly, reducing potential negative impacts. The study results show that, in addition to specific AI computers like ChatGPT, Gemini, and proprietary tools, a range of other computers and instruments commonly used for financial administration were also observed. This includes Excel, PowerBI, and various automation and information analysis tools. Additionally, it was noted that other AIs are company-owned, demonstrating the diversity of AIs used in the pursuit of efficiency and optimization in financial and administrative processes.

Furthermore, AI plays a crucial role in reducing risks and fraud by performing accurate data analysis and identifying atypical patterns or behaviors. This capability helps organizations minimize financial risks and safeguard their assets from fraudulent activities, reinforcing the security and reliability of financial procedures. A notable result achieved through AI use was the improvement of analysis and decision-making processes. By examining large volumes of financial data, AI provides valuable insights that enable more accurate assessment of an organization's financial health and helps identify expansion opportunities and efficiency improvements.

The implementation of AI in corporate finance departments generates benefits such as reduced expenses, time savings, decreased waste, along with reduced risks and fraud, while improving analysis and decision-making processes. These findings highlight AI's innovative capabilities in financial management, bringing significant benefits to companies that implement it.

Several technology and investment companies have made significant advances by using AI to improve their decisions and accelerate operations in the financial sector. Some companies stand out for their intensive AI implementation: Palantir Technologies is famous for its data analysis platforms that use AI to gather and link information on a large scale. In the financial sector, Palantir Metropolis is frequently employed to analyze data and recognize patterns that aid strategic decision-making, being adopted by major corporations like JP Morgan Chase.

IBM has established itself as a pioneer in AI application across various fields, including finance, through its Watson system. The company has directed its efforts toward innovation, employing applications that process large volumes of data, generating valuable insights that support managers and analysts in their decisions. BlackRock, the world leader in asset management, integrates AI into its Aladdin system (Asset, Liability, Debt and Derivative Investment Network). This system is essential for monitoring and controlling investment risks, playing a crucial role in asset allocation strategies and evaluating vast amounts of market data.

Goldman Sachs is enhancing data analysis and automating processes, particularly in its trading operations. Through machine learning algorithms, the organization can detect market opportunities more quickly and accurately. These companies are at the forefront of using AI to transform the financial sector, simplifying sophisticated analyses, reducing risks, and maximizing investment returns.

5 FINAL CONSIDERATIONS

The incorporation of AI in stock portfolio management in the financial market is an innovative and promising approach with the potential to revolutionize investment practices. In this study, we analyzed the main contributions of this technology to portfolio management, highlighting the advantages and challenges associated with its implementation. It is clear that AI offers significant benefits in data analysis and insight generation, enabling portfolio managers to make better-informed and more accurate choices. For example, neural networks and machine learning algorithms can identify complex patterns in market data, something conventional methods may struggle with. Moreover, automating routine activities can enhance the operational efficiency of financial management teams.

However, it is important to emphasize that the effective application of AI systems requires significant investment of human, technological, and financial resources. Additionally, ethical issues such as transparency and the interpretation of results generated by AI algorithms must be discussed. Therefore, implementing AI in the financial sector for stock portfolio management can bring notable progress in decision-making, operational effectiveness, and the ability to respond to constantly changing market conditions.

Organizations must also prioritize a meticulous strategy for this integration, considering the ethical, regulatory, and technical challenges associated with it. As technology advances, collaboration between programmers, data scientists, and financial professionals becomes increasingly crucial for success in this field.

The use of AI represents great potential to enhance effectiveness and agility in portfolio management, bringing benefits to investors and financial institutions globally. The incorporation of this technology is

ushering in a new era of efficiency, essential in a volatile market context. As AI progresses, it is expected to provide more innovations and advances in the financial sector, offering investors and fund managers more effective investment strategies, better results, and more accurate predictions

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