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FINANCIAL DYNAMICS AND TIME SERIES: A BIBLIOMETRIC AND SYSTEMATIC STUDY OF ACADEMIC PRODUCTION

DINÂMICA FINANCEIRA E SÉRIES TEMPORAIS: UM ESTUDO BIBLIOMÉTRICO E SISTEMÁTICO DA PRODUÇÃO ACADÊMICA

DINÁMICA FINANCIERA Y SERIES DE TIEMPO: UN ESTUDIO BIBLIOMÉTRICO Y SISTEMÁTICO DE LA PRODUCCIÓN ACADÉMICA

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ABSTRACT

This article presents a systematic bibliometric study on the application of time series models in the analysis of corporate finance over the period 2010–2025. Through the examination of 84 scientific articles indexed in academic databases, five main thematic axes are identified and synthesized: theoretical evolution of the models, methodological approaches, application areas, emerging trends, and the integration of artificial intelligence. The results demonstrate a shift from classical univariate models, such as ARIMA and SARIMA, to more robust and complex hybrid architectures, including LSTM-ARFIMA, which combines deep learning with traditional econometric techniques. These methodologies are applied in diverse contexts, including bankruptcy prediction, financial risk management, public policy design, and corporate performance evaluation. Furthermore, a growing relevance of artificial intelligence and machine learning is observed as complementary tools to address financial problems with high levels of volatility and nonlinearity. This methodological and thematic overview identifies research gaps and potential synergies between related disciplines. The study concludes by highlighting the need to develop more integrated and adaptive models that can improve the accuracy of financial projections and strengthen strategic decision-making in dynamic and uncertain environments. The theoretical and practical implications of the analysis are relevant to both academics and financial professionals interested in advanced methodologies for understanding current corporate dynamics.

Keywords: Bibliometric Analysis. Corporate Finance. Time Series. Hybrid Models. Artificial Intelligence.

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RESUMO
Este artigo apresenta um estudo bibliométrico sistemático sobre a aplicação de modelos de séries temporais na análise das finanças corporativas no período de 2010 a 2025. Por meio do exame de 84 artigos científicos indexados em bases de dados acadêmicas, são identificados e sintetizados cinco eixos temáticos principais: evolução teórica dos modelos, abordagens metodológicas, áreas de aplicação, tendências emergentes e integração da inteligência artificial. Os resultados demonstram uma transição dos modelos univariados clássicos, como ARIMA e SARIMA, para arquiteturas híbridas mais robustas e complexas, como LSTM-ARFIMA, que combinam aprendizado profundo com técnicas econométricas tradicionais. Essas metodologias são aplicadas em contextos diversos, incluindo previsão de falências, gestão de risco financeiro, formulação de políticas públicas e avaliação de desempenho corporativo. Além disso, observa-se uma crescente relevância da inteligência artificial e do aprendizado de máquina como ferramentas complementares para lidar com problemas financeiros caracterizados por altos níveis de volatilidade e não linearidade. Esse panorama metodológico e temático permite identificar lacunas de pesquisa e potenciais sinergias entre disciplinas correlatas. O estudo conclui destacando a necessidade de desenvolver modelos mais integrados e adaptativos, capazes de aprimorar a precisão das projeções financeiras e fortalecer a tomada de decisões estratégicas em ambientes dinâmicos e incertos. As implicações teóricas e práticas da análise são relevantes tanto para acadêmicos quanto para profissionais da área financeira interessados em metodologias avançadas para compreender as dinâmicas corporativas contemporâneas.

Palavras-chave: Análise Bibliométrica. Finanças Corporativas. Séries Temporais. Modelos Híbridos. Inteligência Artificial.

RESUMEN
Este artículo presenta un estudio bibliométrico y sistemático sobre la aplicación de modelos de series temporales en el análisis de las finanzas corporativas durante el periodo 2010–2025. A través del examen de 84 artículos científicos indexados en bases de datos académicas, se identifican y sintetizan cinco ejes temáticos principales: evolución teórica de los modelos, enfoques metodológicos, áreas de aplicación, tendencias emergentes y la integración de inteligencia artificial. Los resultados evidencian un tránsito desde los modelos clásicos univariantes, como ARIMA y SARIMA, hacia arquitecturas híbridas más robustas y complejas, tales como LSTM-ARFIMA, que combinan el aprendizaje profundo con técnicas econométricas tradicionales. Estas metodologías se aplican en diversos contextos, incluyendo la predicción de quiebras, la gestión del riesgo financiero, el diseño de políticas públicas, y la evaluación del desempeño de empresas. Además, se observa una creciente relevancia de la inteligencia artificial y el machine learning como herramientas complementarias para abordar problemas financieros con altos niveles de volatilidad y no linealidad. Este panorama metodológico y temático permite identificar lagunas de investigación y posibles sinergias entre disciplinas afines. El estudio concluye destacando la necesidad de desarrollar modelos más integrados y adaptativos, que permitan mejorar la precisión en las proyecciones financieras y fortalecer la toma de decisiones estratégicas en entornos dinámicos e inciertos. Las implicaciones teóricas y prácticas del análisis resultan relevantes tanto para académicos como para profesionales del área financiera, interesados en metodologías avanzadas para la comprensión de las dinámicas corporativas actuales.

Palabras clave: Análisis Bibliométrico. Finanzas Corporativas. Series Temporales. Modelos Híbridos. Inteligencia Artificial.

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1 INTRODUCTION

Time series analysis is an essential tool in the study of the dynamic behavior of financial and corporate variables. Its application in corporate finance has made it possible to model, predict, and understand complex patterns in key indicators such as cash flow, profitability, debt, and asset prices (Lorek & Willinger , 2011; Kenton, 2020; Scott, 2022). Between 2010 and 2025, this field has shown sustained growth, driven by advances in computing, data availability, and the development of new methodologies (Donthu et al., 2021; Mikhaylov & Bhatti , 2025). This evolution has expanded the scope of financial forecasting to include fields such as bankruptcy prediction, stock market volatility assessment, and corporate risk management optimization (Cheng & Zhang, 2022; Bhaduri , 2014).

Multiple empirical studies have examined the relationship between organizational decisions and financial performance, highlighting the usefulness of time series techniques to analyze these interactions over time (Garcia & Guerreiro, 2016; Abdullah & Zaby, 2021). These dynamics enable the identification of economic cycles, the assessment of managerial decision impacts, and the understanding of macroeconomic variables' influence on organizational behavior (Barros & Nunes, 2010; Yang et al., 2024). In this context, commonly analyzed variables include key financial indicators such as return on assets (ROA), return on equity (ROE), debt ratio, current ratio, free cash flow, and stock price volatility (Mafruhah, 2024; Lightwood & Glantz, 2011), which provide a quantitative basis for modeling and forecasting corporate financial performance.

The evolution of academic literature in this area has been marked by a methodological transition from classical statistical models such as ARIMA, VAR, and GARCH to artificial intelligence models such as neural networks, deep learning, and hybrid structures. These new approaches make it possible to address nonlinearities, high frequencies, and noise in the data, providing greater accuracy to projections (Saâdaoui & Rabbouch , 2024; Dhar et al., 2019). The integration of techniques such as LSTM, ARFIMA, and convolutional networks has been shown to significantly improve financial prediction results, especially under conditions of extreme uncertainty (Wang, 2024; Huang et al., 2024). Furthermore, there is a trend towards the adoption of associative memory models and algorithms inspired by swarm intelligence (Cheng & Zhang, 2022; Liu, 2020).

However, despite the growing volume of publications, challenges persist related to conceptual fragmentation, poor replicability of models, and the absence of robust comparative studies that integrate traditional and modern approaches (Bontempi & Golinelli,

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2012; Angus et al., 2012). This dispersion limits the development of a unified taxonomy that guides researchers and practitioners in the area in the most appropriate methodological selection for specific contexts. Therefore, it is pertinent to conduct a systematic and bibliometric review that allows mapping historical development and emerging trends, as well as recognizing research gaps that have not yet been explored (Dlouhy , 2011; Mikhaylov & Bhatti , 2025).

Faced with this problem, this article aims to carry out a systematic and bibliometric review that integrates the theoretical, methodological and applied evolution of time series analysis in the field of corporate finance, highlighting the main trends, approaches and research gaps. The study is structured around five axes: (i) bibliometric analysis of academic production, (ii) theoretical foundations of time series models, (iii) methodologies and algorithms used, (iv) practical applications in real financial scenarios, and (v) emerging trends and future opportunities. The aim is to offer an integrative and updated vision that contributes to the strengthening of scientific knowledge in this key area of financial sciences (Chou et al., 2025; Migliaccio & Tucci, 2019; Cheung et al., 2011).

2 METHODOLOGY

2.1 EMERGING THEORETICAL FRAMEWORKS IN FINANCE AND ARTIFICIAL INTELLIGENCE

Data collection was conducted using a bibliometric search strategy in the Scopus and Web of Science databases, recognized for their coverage of high-impact scientific research. The search equation used was: (“ financial analysis ” OR “ financial management ” OR “ corporate finance ”) AND (“time series” OR “time-series analysis ”), applied to the title, abstract and keywords of the documents. The query was restricted to the period between 2010 and 2025, focusing exclusively on peer-reviewed academic articles in the areas of economics, finance, administration and social sciences, in accordance with the guidelines established by Mafruhah and Istiqomah (2024).

2.2. STUDY SELECTION CRITERIA

The corpus of documents was refined using rigorous inclusion criteria. Only studies published in indexed, peer-reviewed journals that explicitly addressed the use of time series in the analysis of financial variables in corporate contexts were selected. Theoretical works without empirical application, duplicate articles, or articles with little methodological relevance

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were excluded. As a result, the final corpus consisted of 84 scientific articles relevant to the study.

2.3 EVALUATION OF METHODOLOGICAL QUALITY

Each article underwent a qualitative evaluation process based on four dimensions: (i) indexing level and journal impact factor, (ii) methodological soundness and statistical validity, (iii) thematic relevance to time series financial analysis, and (iv) clarity in the implementation of predictive and/or explanatory models. This stage ensured the consistency and reliability of the material analyzed in the following sections of the study.

2.4 SYNTHESIS AND THEMATIC CATEGORIZATION

Based on the selected corpus, the review was structured into five analytical axes that allowed for the systematic organization of the information: (1) bibliometric analysis of academic production, (2) theoretical foundations of time series analysis, (3) applied approaches and methodologies, (4) practical applications in corporate and financial environments, and (5) emerging trends in research. This categorization facilitated a cross-sectional reading of the studies, allowing for the identification of gaps, convergences, and relevant patterns in the field.

3 RESULTS

Bibliometric analysis of the scientific literature on the use of time series in the fields of financial analysis , financial management and corporate Finance during 2010-2025 reveals a field in transformation, marked by technological advancement and the growing need for predictive models in finance. This review, based on 84 articles extracted from international academic databases, presents a systematic understanding of the development of research and emerging lines in financial analysis over time. The application of bibliometric techniques such as co-citation analysis, keyword co- occurrence , and collaboration networks allowed us to identify patterns, key actors, and thematic trends of interest.

From a definitional perspective, time series have traditionally been conceived as chronological sequences of financial observations to model corporate dynamics, but in recent years their interpretation has been expanded with the use of technologies such as deep learning. learning , especially in contexts of high uncertainty such as the COVID-19 pandemic. This evolution reflects a transition from linear models to non-linear approaches

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based on artificial intelligence, framing a debate between the interpretability of econometric models and the high—albeit opaque—precision of techniques such as neural networks. This tension poses a relevant epistemological limitation in regulated sectors, where explainability is critical. In response, the incorporation of explainable artificial intelligence (XAI) techniques or hybrid models that integrate the best of both approaches: predictive accuracy and analytical transparency is promoted.

The analysis also revealed a structural limitation related to the dispersion of topics and sources: of the 84 articles reviewed, these were distributed across 67 different journals, but only four contained more than two publications, revealing a fragmentation of knowledge. This heterogeneous distribution hinders the formation of stable academic communities and the continuity of research lines in the field. As a mitigation strategy, we suggest promoting more robust collaborative networks and organizing special issues in leading journals to facilitate thematic concentration, research coordination, and the generation of sustained synergies.

In institutional and geographical terms, scientific output is dominated by the US and China, with notable contributions from universities such as the School of Computer Science and Engineering , the University of Chinese Academy of Sciences and King Saud University , suggesting a correlation between research capacity and leadership in financial innovation. However, this concentration reduces cultural and contextual diversity, so it is recommended to promote multi-regional studies , support research in underrepresented countries, and strengthen open access. Furthermore, the analysis reveals how context influences the evolution of the field: the emergence of COVID-19 as a keyword and its link to financial health issues reflect a thematic sensitivity to global crises, demonstrating the adaptability of time series analysis to new domains such as public health and sustainability.

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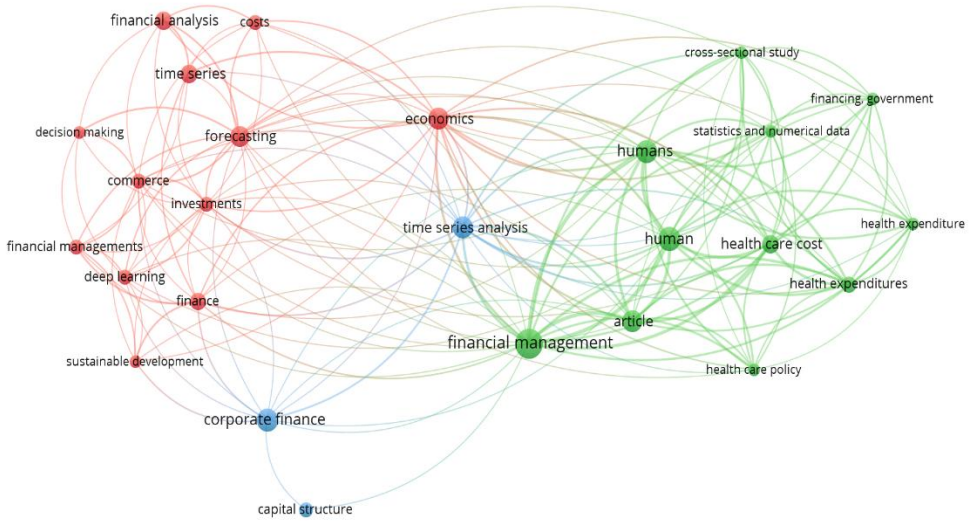
Figure 1

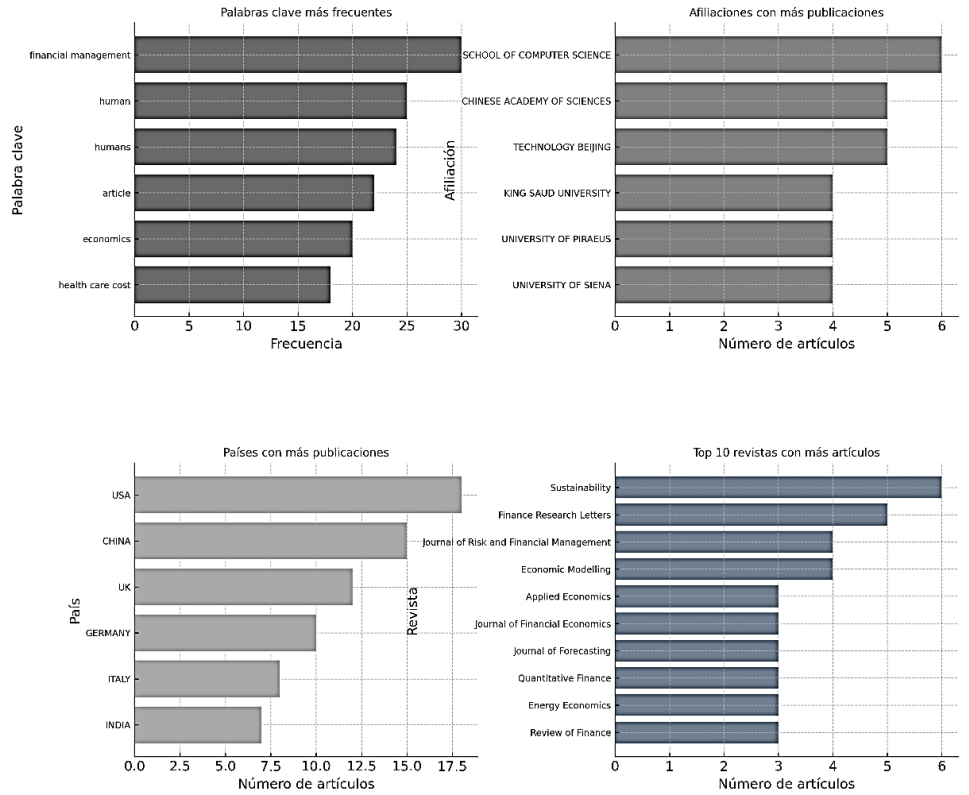
Co-occurrence of keywords



Source: Scopus database, developed with Vos viewer

Figure 2

Results of the bibliometric analysis of time series in finance: 2010-2025



Source: Scopus database

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3.1 EMERGING THEORETICAL FRAMEWORKS IN FINANCE AND ARTIFICIAL INTELLIGENCE

As part of recent financial dynamics, the intersection between financial analytics and artificial intelligence (AI) has been the subject of growing academic interest, revealing a plurality of theoretical frameworks that allow addressing the inherent complexity of modern financial systems. The permanent income hypothesis (LC-PIH) has been used to understand how consumption and investment decisions are conditioned by the life cycle and income predictability, particularly in the context of migrant remittances (Mafruhah , 2024). Likewise, the rational expectations theory has been taken up to explain the persistence of predictable patterns in financial asset prices, even under assumptions of relative market efficiency (Yang et al., 2024).

In financial risk management, copula theory has represented a relevant methodological advance by capturing non-linear correlations between assets and extreme conditions, overcoming the limitations of traditional models such as ARIMA (Vaz de Melo Mendes & Aíube , 2011; Marcelino-Aranda et al., 2022). However, due to its mathematical complexity and calibration requirements, hybrid solutions have been proposed by combining copulas with machine learning algorithms, such as neural networks or LSTM-ARFIMA models, capable of dynamically adapting to changing financial environments (Saâdaoui & Rabbouch , 2024; Huang et al., 2024). In this way, the predictive and explanatory capacity of the models is expanded in highly volatile or disruptive scenarios (Dhar , Sun & Batra , 2019). From an institutional perspective, corporate governance has been consistently associated with improved financial performance, albeit mediated by structural and contextual factors such as local regulation and corporate culture (Cheung et al., 2011; Abdullah & Zaby , 2021). Studies conducted in Europe and Asia highlight that these relationships should be analyzed within frameworks such as institutional theory, incorporating exogenous variables that modulate the impact of the regulatory environment on financial decisions (Barros & Nunes, 2010; Garcia & Guerreiro, 2016). Furthermore, theories such as net present value (NPV) and return on investment (ROI) have been applied in the context of public policy and the evaluation of social interventions, although their effectiveness is limited by the assumption of full rationality among agents (Jimbo-Sotomayor et al., 2022; Lightwood & Glantz, 2011).

On the other hand, complementary theories were identified that support the analysis of sectoral financial performance. In the field of agro-industrial cooperatives, approaches linked to economic-financial competitiveness were used (Ilha , Piacenti & Leismann , 2018), while the postulates of trade -off theory and pecking were taken up to explain the capital

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structure. order , incorporating dynamic models that avoid parameter homogeneity (Bontempi & Golinelli , 2012; Singh & Kumar, 2012). The " resource curse" theory has also been used to analyze fiscal sustainability in countries dependent on mineral rents, particularly in the presence of green taxes and fiscal restrictions (Rashid Khan et al., 2019). Finally, in the contemporary context of technological disruptions, the theory of disruptive innovation has gained strength, highlighting how AI and financial sentiment analysis reconfigure organizational decisions and the logics of value creation (Lee, Beh & Lem , 2020a; Wang, 2024). Finally, overall, the integration of diverse theoretical frameworks in AI-powered financial analysis allows for a richer understanding of the phenomenon, although each approach has limitations that must be addressed through methodological combinations and a critical reading of the institutional, social, and technological context in which they are applied.

Table 1

Summary of theories and approaches used in time series studies and finance

Theory or Approach	Contribution to the Study	Author(s)	Applications
Permanent Income Hypothesis (LC-PIH)	Explains consumption and investment decisions, especially with remittances.	Mafruhah (2024)	Business Applications
Theory of Copulas	Models nonlinear dependencies and extreme risks; recommended for combination with AI.	Vaz de Melo Mendes & Aíube (2011)	Business Applications
Corporate Governance	It is associated with better financial performance, influenced by macroeconomic and local governance variables.	Cheung et al. (2011)	Business Applications
Contextual Approach to Corporate Governance	Regulatory context and corporate culture modulate the impact of corporate governance.	Barros & Nunes (2010); Abdullah & Zaby (2021)	Enterprise Applications; Regional Applications
Institutional Theory	Incorporates institutional and social variables into predictive models.	Garcia & Guerreiro (2016)	Enterprise Applications; Regional Applications
Net Present Value (NPV) and Return on Investment (ROI)	Evaluation of public policies; assumes rationality.	Jimbo-Sotomayor et al. (2022); Lightwood & Glantz (2011)	Public Policies
Rational Expectations Theory	It relativizes the efficiency of markets in changing contexts.	Yang et al. (2024)	Business Applications
Modern Portfolio Theory (MPT)	Optimizes diversification; rigidity in the face of abrupt events.	Singh & Kumar (2012)	Business Applications
Complex Network Theory	Anticipates systemic risks; requires large volumes of interrelated data.	Singh & Kumar (2012)	Business Applications

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Theory of Disruptive Innovation	Explains how AI transforms traditional financial structures.	Lee et al. (2020a)	Business Applications
Financial Sentiment Analysis with AI	Improves accuracy and alters financial decision logic.	Lee et al. (2020a)	Business Applications
Theory of Financial Competitiveness	Performance analysis in sectoral contexts (cooperatives).	Ilha et al. (2018)	Business Applications
Relationship between Fiscal Deficit and Growth	Studies on economic development in emerging contexts.	Nguluwe & Mayamiko Dunga (2024)	Public Policies
Trade -off and Pecking Theory Order	Dynamic models of corporate capital without homogeneity assumptions.	Bontempi & Golinelli (2012)	Business Applications
Resource Curse Theory	Low fiscal sustainability in mineral-revenue-dependent countries under fiscal restrictions.	Rashid Khan et al. (2019)	Public Policies; Regional Applications
Agency Theory	Capital structure decisions in emerging economies.	Abdullah & Zaby (2021a)	Enterprise Applications; Regional Applications
Institutional Theory Applied to AI	Regulatory structures and AI adoption in emerging markets.	Dlouhy (2011a); Mohammed Al-Matari (2025)	Business Applications; Regional Applications; Public Policies

Note: This table summarizes the main theories and approaches used in time series and finance studies, along with their respective authors, their contributions to the analysis, and their applications in research.

3.2 METHODOLOGICAL INNOVATIONS IN FINANCE

Recent research in applied finance shows a preference for quantitative approaches based on econometric models such as ARIMA, GARCH and VAR, used to analyze volatility, serial dependence and causal relationships in macroeconomic and market variables (Vaz de Melo Mendes & Aíube , 2011). However, their limitations with non-linear data have motivated the use of error correction and cointegration models (Cheng & Zhang, 2022). In response, the use of artificial intelligence (AI), with neural networks (ANN, CNN), support vector machines (SVM), random forests (RF) and boosting , has intensified for tasks such as price prediction and fraud detection (Lee et al., 2020a; Dhar et al., 2019). However, the low explainability of these models has driven the development of explainable AI (XAI). In a complementary manner, text mining and sentiment analysis techniques supported by natural language processing (NLP) allow the integration of unstructured data such as news and financial reports (Mafruhah , 2024; Lee et al., 2020a), while mixed approaches, such as MACTOR analysis combined with stochastic and ROI simulations, allow addressing complex financial phenomena from an interdisciplinary perspective (Jimbo-Sotomayor et al., 2022).

Finally, substantial progress has been observed in the formulation of hybrid and nonparametric models. Combinations such as LSTM with ARFIMA have shown high accuracy in both stable and volatile environments (Saâdaoui & Rabbouch , 2024), while techniques

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such as kernel Regressions with GPCC coefficients have improved the assessment of practical significance in financial models (Vinod , 2022). In the foreign exchange field, self-organizing GMDH networks optimized through random pruning and coefficient rounding have increased hedging efficiency (Taušer & Buryan , 2011). Traditional models, such as the Brown -Rozeff ARIMA, have also been rescued for multistage cash flow projections with superior results compared to multivariate approaches (Lorek & Willinger , 2011). Additionally, advanced models such as ABC- Attention -GRU, which integrate attention mechanisms and algorithms inspired by bee colonies, have improved financial risk prediction (Huang et al., 2024), while the variational approach to sequential Bayesian analysis has enhanced accuracy in high-variability contexts (Ling & Stone, 2016).

Table 2

Summary of methodologies developed in time series and financial studies

Methodology	Contribution to the Study	Author(s)	Methodological Subcategory
ARIMA, GARCH and VAR models	Financial time series analysis: volatility, serial dependence, and macroeconomic relationships	Vaz de Melo Mendes & Aíube (2011)	Classic Econometric Models
ECM models and Johansen cointegration	Modeling long-term relationships without strict stationarity	Cheng & Zhang (2022)	Advanced Econometric Models
Neural Networks (ANN), SVM, RF, Boosting	Price prediction, risk classification and fraud detection	Lee et al. (2020a)	Machine Learning
CNN (Convolutional Neural Networks)	Transforming series into images for advanced prediction	Lee et al. (2020a)	Machine Learning (Computer Vision)
Explainable AI (XAI)	Interpretability of complex AI models	Lee et al. (2020a)	Machine Learning (Explainability)
Text mining and sentiment analysis with NLP	Incorporating unstructured data into financial analysis	Mafruhah (2024); Lee et al. (2020a)	Natural Language Processing (NLP)
MACTOR + regression + ROI with stochastic simulations	Mixed approaches that integrate qualitative and quantitative methods	Jimbo-Sotomayor et al. (2022)	Hybrid Models
Monte Carlo, PCA, DEA, AHP, TOPSIS	Sustainability analysis, benchmarking and multi-criteria evaluation	Singh & Kumar (2012); Dorfleitner & Rößle (2018); Abdullah & Zaby (2021b)	Multi-criteria Simulation and Analysis Methods
Input-output matrices with structural analysis	Assessment of sectoral impacts on financial sustainability	Huang et al. (2024)	Impact and Sustainability Analysis
Hybrid LSTM + ARFIMA models	They address nonlinearities and non-Gaussian distributions with high accuracy	Saâdaoui & Rabbouch (2024)	Hybrid Models
Kernel regression with GPCCs	Assessment of practical significance in financial models	Vinod (2022)	Nonparametric Methods

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Self-organizing GMDH with random pruning	Efficient exchange rate estimation with more accurate hedging decisions	Taušer & Buryan (2011)	Neural Network Models (Optimization)
-Rozeff ARIMA Model	Multi-stage cash flow projection, superior to multivariate methods	Lorek & Willinger (2011)	Classical Econometric Models (improvements)
ABC- Attention -GRU	Financial risk prediction using bio-inspired AI	Huang et al. (2024)	Machine Learning (Bio-inspired AI)
Visual representation with CNN	Detecting regime changes in stock markets	Dhar et al. (2019)	Machine Learning (Computer Vision)
Sequential Bayesian variational approximation	More robust and accurate dynamic predictions than the Kalman model	Ling & Stone (2016)	Bayesian Methods

Note: This table summarizes the main methodologies used in time series and finance studies, along with their respective authors, their contributions to the analysis, and their methodological subcategory.

3.3 BUSINESS, REGIONAL APPLICATIONS AND EMERGING RESEARCH TRENDS

Financial analysis using time series has become established as a fundamental tool for interpreting market dynamics and supporting strategic decisions. Models such as ARIMA, SARIMA, VAR, and VECM have been widely used to project prices, cash flows, and macro-financial relationships (Vaz de Melo Mendes & Aíube , 2011; Lorek & Pagach , 2012; Cheng & Zhang, 2022), although their effectiveness has been limited by their assumed linearity and stationarity. In response, structural models such as SVAR, which delve deeper into economic causality under rigorous validations (Liu, 2020), have been incorporated, as well as Bayesian approaches and Monte Carlo simulations, which are useful for highly uncertain scenarios.

At the same time, the adoption of artificial intelligence in finance enabled significant advances: LSTM networks and hybrid fuzzy logic models facilitated the recognition of nonlinear patterns and long-term relationships (Wang, 2024), although their lack of explainability drove the development of explainable AI (XAI) and its contrast with classical models. These innovations were particularly relevant during critical contexts such as the COVID-19 pandemic, where they were applied to assess the financial resilience of SMEs and simulate prolonged economic effects (Cheng & Zhang, 2022; Jimbo-Sotomayor et al., 2022).

Furthermore, the empirical application of time series models has allowed for the evaluation of public policies and sectoral behaviors with concrete results. In Spain, ARIMA models were used to measure the impact of pharmaceutical co-payments, revealing a sharp decrease in drug consumption (Puig- Junoy et al., 2014). Similarly, comparative analyses were applied to mental health systems to optimize resource allocation (Dlouhy , 2011). In the Italian wine sector, structural financial imbalances following the economic crisis were identified, highlighting the urgent need for recapitalization strategies to reduce external dependence (Migliaccio & Tucci, 2019). Similarly, in the United Kingdom, the use of linear

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regression demonstrated a strong correlation between the price of crude oil and the values of recycled materials, especially plastics (Angus et al., 2012). Finally, in the area of public health, cointegration models were applied to evaluate the return on investment in anti-smoking programs, demonstrating economic and health benefits significantly higher than the initial investment (Lightwood & Glantz, 2011).

Table 3

Summary of applications or trends in time series studies and finance

Application or Trend	Specific Contribution	Author(s)	Applications
ARIMA and SARIMA models	Price and cash flow projections for financial planning	Vaz de Melo Mendes & Aíube (2011); Lorek & Pagach (2012)	Business Applications
VAR and VECM models	Analysis of dynamic relationships between financial and macroeconomic variables	Cheng & Zhang (2022)	Business Applications
SVAR models	Deepening of structural causal relationships with an economic basis	Liu (2020)	Business Applications
Bayesian approaches and Monte Carlo simulations	Scenario validation under uncertainty in volatile conditions	Cheng & Zhang (2022)	Business Applications; Public Policies
LSTM neural networks and fuzzy logic	Nonlinear pattern detection and long-term memory	Wang (2024)	Business Applications
Explainable Artificial Intelligence (XAI)	Solution to the low interpretability of advanced AI models	Wang (2024)	Business Applications
Financial resilience analysis of SMEs in crisis	Assessing the impact of COVID-19 on business sustainability	Cheng & Zhang (2022); Jimbo-Sotomayor et al. (2022)	Business Applications; Public Policies
ARIMA estimate for pharmaceutical policy in Spain	Reduction in medication consumption after implementation of co-payment	Puig- Junoy et al. (2014)	Regional Applications (Europe); Public Policies
Mental health systems analysis	Strategic allocation of resources in national systems	Dlouhy (2011)	Business Applications (Health Sector); Public Policies
Italian wine sector post-crisis	Detection of financial imbalances and the need for recapitalization	Migliaccio & Tucci (2019)	Regional Applications (Europe)
Linear regression for recycling prices	Correlation between oil price and value of recycled plastics in the United Kingdom	Angus et al. (2012)	Enterprise Applications; Regional Applications (Europe)
Cointegration models for public policies	Return on investment in tobacco control programs with high fiscal and health benefits	Lightwood & Glantz (2011)	Public Policies

Note: This table summarizes the main applications or trends in time series and financial studies, along with their respective authors, their contributions to the analysis, and their applications.

The convergence of artificial intelligence (AI) and financial analytics has profoundly transformed traditional prediction, diagnostic, and optimization methodologies, facilitating the

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efficient processing of large volumes of financial data (Lee et al., 2020a). This synergy has increased the accuracy of predictive models and introduced new dimensions, such as sentiment analysis through natural language processing techniques, with applications in time series and market behavior. However, its adoption in highly regulated sectors, such as auditing and compliance, has generated debates about the need to balance automation with transparency, ethics, and accountability (Chou et al., 2025a). In response, regulatory frameworks incorporating explainable AI principles and algorithmic certification processes have been proposed. The limited technological infrastructure in developing countries represents another major challenge, which has motivated the promotion of strategies focused on institutional strengthening and international cooperation.

For its part, the approach to financial sustainability, measured using ESG criteria, has gained relevance in response to growing social, environmental, and governance pressures (Cheng & Zhang, 2022; Basse et al., 2023). Organizational resilience to disruptions such as the COVID-19 pandemic has stimulated the development of hybrid models and adaptive approaches in public policies (Jimbo-Sotomayor et al., 2022). These models integrate classical techniques with machine learning to improve risk management in volatile environments. In this context, AI has also been applied to portfolio management in highly unstable markets, such as the Russian market, combining fuzzy logic with traditional statistical methods (Mikhaylov & Bhatti , 2025). Likewise, the IMITATE-WAVELET model was developed as an efficient alternative to ARIMA, achieving predictive accuracy with lower computational complexity (Lee et al., 2020). In the environmental field, corporate biodiversity risk indices were constructed through text analysis of annual reports, revealing greater exposures in Chinese companies compared to their US peers (He et al., 2024). Finally, the ChatGPT-4o tool demonstrated capabilities comparable to traditional statistical software in financial analysis, broadening the prospects for its practical use in professional settings (Chou et al., 2025).

Table 4

Summary of emerging trends in time series studies and finance

Emerging Trend	Specific Contribution	Author(s)	Subcategory
Convergence of AI and financial analysis	Improving prediction, diagnosis, and sentiment analysis in time series	Lee et al. (2020)	AI Integration in Finance
AI in financial auditing and regulatory compliance	Debate on ethics, transparency, and algorithmic accountability; proposal for regulatory frameworks with explainable AI	Chou et al. (2025)	Regulation and Ethics in Financial AI

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Limitations of AI in developing countries	Technical difficulties due to low technological capacity; institutional training and international cooperation are proposed.	Chou et al. (2025)	Implementing AI in specific contexts
Focus on financial sustainability (ESG criteria)	Responding to social, environmental and governance pressures in financial analysis models	Cheng & Zhang (2022); Basse et al. (2023)	Sustainability and Responsible Investment
Organizational resilience and hybrid models post-COVID-19	Combining classical approaches with machine learning for risk management and adaptive public policies	Jimbo-Sotomayor et al. (2022)	Hybrid Models and Risk Management
AI for portfolio management in volatile markets	Application of fuzzy logic combined with classical statistics in the Russian market	Mikhaylov & Bhatti (2025)	Specific applications of AI in financial markets
IMITATE-WAVELET model	Alternative to ARIMA with lower computational complexity and similar predictive accuracy	Lee et al. (2020)	Alternative Models and Optimization
Corporate biodiversity risk indices	Text analysis in annual reports: comparison between China and the US	He et al. (2024)	Environmental and Social Risk Analysis
Using ChatGPT-4o in financial analysis	Accuracy comparable to traditional statistical software; opens up new practical possibilities	Chou et al. (2025)	Generative AI Applications in Finance

Note: This table summarizes the major emerging trends in time series and finance studies, along with their respective authors, their contributions to the analysis, and their trend subcategories.

4 DISCUSSION

The findings of this review reveal a profound methodological evolution in the application of time series models to corporate finance, characterized by a progressive transition from classical statistical frameworks—such as ARIMA, GARCH, and VAR—to advanced artificial intelligence (AI) and machine learning (ML) techniques. This shift, as illustrated by Vaz de Melo Mendes and Aíube (2011) and Lorek and Pagach (2012), responds to the increasing complexity, volatility, and non-linearity of modern financial environments. Cheng and Zhang (2022) emphasize that traditional models, although robust in stable contexts, lack the flexibility to capture dynamic behaviors under abrupt structural changes, a limitation that AI-based models are better positioned to address.

In particular, hybrid models like LSTM-ARFIMA, fuzzy logic integrated with financial forecasting, and ensemble methods (Wang, 2024; Jimbo-Sotomayor et al., 2022) have outperformed classical models in terms of predictive accuracy, especially in turbulent periods such as financial crises or post-pandemic recoveries. However, their reduced interpretability has raised concerns among researchers and practitioners. The emergence of Explainable Artificial Intelligence (XAI) aims to mitigate this gap, offering transparency mechanisms such as SHAP values or counterfactual explanations (Chou et al., 2025a). In this regard, Donthu et al. (2021) explore the epistemological tension between statistical validation and algorithmic

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opacity, exposing a dichotomy that challenges the equilibrium between theoretical rigor and practical utility (Dorfleitner & Rößle, 2018).

Beyond methodological insights, this study documents a rich landscape of empirical applications, ranging from macroeconomic forecasting for public policy in Spain (Puig-Junoy et al., 2014), fiscal sustainability modeling in Italy (Migliaccio & Tucci, 2019), to real-time pricing dynamics in the United Kingdom (Angus et al., 2012). These contributions underscore the global utility of time series analysis; yet, they also reveal a clear technological asymmetry: developing economies exhibit limited adoption and adaptation of cutting-edge tools (Mikhaylov & Bhatti, 2025). This disparity is further compounded by a bibliometric concentration in global North countries (USA, China), as well as thematic dispersion that inhibits the emergence of cohesive research programs (Donthu et al., 2021).

To address these limitations, innovative approaches such as IMITATE-WAVELET (Lee et al., 2020), visual series modeling for structural break detection (Dhar et al., 2019), and the incorporation of generative AI like ChatGPT-4o for financial decision support (Chou et al., 2025b) have been proposed. Nevertheless, a key deficiency persists: the lack of a unifying theoretical architecture. Current implementations tend to be method-driven rather than theory-driven, which undermines the consolidation of explanatory models. Therefore, it is imperative to articulate these methodologies through integrative frameworks such as stakeholder theory, game theory, or the theory of disruptive innovation. These frameworks not only enable the alignment of technical outputs with institutional dynamics but also foster the development of resilient, adaptable models capable of informing strategic financial decisions in diverse and uncertain environments.

In sum, this discussion highlights the need to transition from fragmented experimentation to structured synthesis. Only by bridging methodological sophistication with theoretical grounding can the field advance toward a coherent paradigm of financial analysis based on time series, equipped to respond to the multifaceted challenges of the contemporary economic landscape.

5 CONCLUSIONS

Time series analysis has emerged as a strategic tool in corporate finance, providing a robust methodological foundation for forecasting, risk management, and decision-making in environments characterized by high volatility and complexity. The transition from traditional econometric models, such as ARIMA, GARCH, and VAR, to hybrid approaches with artificial

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intelligence, such as LSTM-ARFIMA and attention-based architectures, reflects a necessary methodological evolution in response to the challenges of the contemporary digital financial environment.

This advancement has broadened the range of applications for time series models, transcending the scope of business management to also encompass public policy evaluation, financial resilience analysis in crisis contexts, and the study of economic sentiment using natural language processing techniques. This versatility reaffirms their practical relevance in understanding complex financial phenomena.

Furthermore, the findings of the bibliometric analysis reveal a significant thematic and geographic dispersion in academic production, which hinders the consolidation of cohesive scientific communities. This fragmentation, coupled with the concentration of research in countries such as the United States and China, highlights the need to foster greater contextual diversity. In this regard, the importance of promoting inter-institutional collaboration networks, encouraging multinational calls for proposals, and ensuring open access to data and results is highlighted, in order to enrich the field and strengthen its global epistemological foundation.

5.1 LIMITATIONS

Among the main limitations of this study is its exclusive reliance on databases such as Scopus and Web of Science, which could have excluded relevant literature indexed elsewhere. Furthermore, although rigorous inclusion criteria were applied, some studies may have been excluded due to issues with thematic labeling or classification in related areas. Another limitation is the descriptive and cross-sectional methodological approach, which prevents a more robust assessment of the causal evolution of the techniques over time

Finally, future research should focus on the effective integration of unstructured data (such as texts, news, or social media), the empirical validation of models in real-world application contexts, and the construction of integrative theoretical frameworks that reduce the current fragmentation of the field. Only in this way will it be possible to advance toward more precise, explainable financial analysis that is adapted to the demands of an increasingly digital, complex, and globalized economic environment.

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