FINANCIAL DERIVATIVES IN RISK MANAGEMENT: A BIBLIOMETRIC ANALYSIS OF THE SCIENTIFIC LITERATURE (2000–2025)

SPULBAR CRISTI
PROF. PHD, UNIVERSITY OF CRAIOVA
e-mail: cristi.spulbar@edu.ucv.ro

FULGA ELENA CARMEN NICULA
PHD STUDENT, UNIVERSITY OF CRAIOVA
e-mail: nicula.elena.m8z@student.ucv.ro

Abstract

This bibliometric study examines the evolution of academic research on the use of financial derivatives as risk management instruments in a financial environment increasingly characterized by uncertainty and structural transformation. Drawing on publications indexed in the Web of Science Core Collection over the 2000–2025 period, the analysis provides a systematic mapping of the field, highlighting publication dynamics, influential journals and authors, collaboration patterns, and the thematic structure of the literature. The findings reveal a sustained growth in scholarly interest, with pronounced intensifications during periods of financial and economic stress, alongside a progressive diversification of research themes toward energy markets, climate-related risks, digital assets, and behavioral dimensions of risk. By offering a comprehensive and reproducible overview of the literature, the study contributes to a clearer understanding of the intellectual structure and evolution of this research domain and outlines relevant directions for future investigations in financial risk management.

Keywords: *financial derivatives; risk management; bibliometric analysis; modern financial markets; Bibliometrix*

Clasificare JEL: *G13, G32, C80*

1. Introduction

The turbulence that has affected the global financial environment over the past two decades has led to a substantial increase in academic interest in financial derivative instruments, which are increasingly employed as sophisticated mechanisms for risk management. Financial market volatility, macroeconomic uncertainty, and geopolitical fluctuations require a rigorous and theoretically grounded approach to financial risk management (Spulbar and Cinciulescu, 2025). In this context, major financial crises—such as the 2008 global financial crisis and the economic impact of the COVID-19 pandemic—have amplified the need for effective hedging strategies and have reinforced the role of derivative instruments in both financial practice and academic research.

Financial derivatives play a central role in the architecture of modern financial markets, having entered global financial practice in the late twentieth century and rapidly establishing themselves as key mechanisms for risk control and risk transfer (Spulbar, 2006). Recent financial turbulence, including the 2008 global financial crisis and the COVID-19 pandemic, as well as current geopolitical tensions, has prompted a reorientation of research toward financial protection strategies, within which derivative instruments occupy a pivotal position.

Against the background of the rapidly growing volume of academic publications in this area, bibliometric evaluation of the specialized literature has become a valuable tool for understanding how research on financial derivatives and risk management has evolved over time. Bibliometric analysis enables the identification of dominant research themes, influential actors, relevant channels of academic dissemination, and emerging research directions, providing a systematic and quantifiable perspective on the development of scientific knowledge.

Although bibliometric methods are widely applied in economic and financial research, existing studies typically address financial derivatives only indirectly, within broader analyses of financial innovation, global markets, or systemic risk. A bibliometric approach explicitly focused

on the relationship between financial derivative instruments and risk management remains limited and fragmented in the literature, revealing a clearly identifiable methodological gap.

The purpose of this study is to provide a systematic mapping of the scientific production dedicated to the relationship between financial derivatives and risk management over the period 2000–2025, using the Web of Science Core Collection database and the Bibliometrix analytical package. Through the application of a rigorous methodological framework, the analysis aims to highlight publication dynamics, scholarly impact, thematic trends, and the main research directions in this field.

By offering this perspective, the study contributes to the clarification and systematization of a complex and extensive research domain, while also providing a reference framework for future investigations. The results are relevant both for the academic community—by identifying theoretical and methodological gaps—and for financial practitioners, by deepening the understanding of how financial derivative instruments are addressed in the specialized literature.

2. Literature Review

Bibliometric analysis has become, over recent decades, an increasingly used methodological tool in scientific research for assessing the evolution, structure, and emerging directions of various fields of study. This approach enables the quantification and visualization of scientific production, facilitating an improved understanding of the relationships among authors, institutions, concepts, and academic journals (Donthu et al., 2021). In the field of financial sciences, bibliometric approaches have proven particularly useful in examining the consolidation of research areas such as systemic risk, fintech, and capital markets (Moral-Muñoz et al., 2020; Aria and Cuccurullo, 2017).

Web of Science (WoS) is one of the most widely used databases in bibliometric studies and is recognized for its high indexing standards and the accuracy of the metadata it provides. The selection of this data source is supported by the specialized literature, which considers it suitable for conducting rigorous bibliometric analyses, particularly in the economic and social sciences (Mongeon and Paul-Hus, 2016).

With regard to the use of the Bibliometrix software package and its graphical interface, Biblioshiny, the literature recognizes these tools as appropriate for the processing and advanced analysis of bibliographic metadata, offering a wide range of relevant scientific indicators and visualizations (Aria and Cuccurullo, 2017). These tools enable the analysis of academic productivity, co-citation and collaboration networks, as well as thematic evolution, thereby ensuring a systematic and reproducible approach to the investigation of research fields.

The methodology adopted in the present study is aligned with best practices validated in the literature and relies on tools and data sources that are widely acknowledged for their scientific validity. This approach ensures not only the relevance of the results obtained, but also their comparability with similar international studies.

Regarding the field of financial derivatives, the specialized literature comprises a substantial body of theoretical and empirical research examining their role in financial markets, risk modeling, and hedging strategies. However, bibliometric analyses explicitly dedicated to the relationship between financial derivative instruments and risk management remain relatively limited and fragmented, as such topics are often embedded within broader studies addressing financial innovation, global markets, or systemic risk.

In this context, the present study contributes to the existing literature by conducting a systematic bibliometric analysis focused on the intersection between financial derivative instruments and risk management. Through a clear delineation of this thematic field and the application of a rigorous methodological framework, the research provides a structured perspective on the scientific dynamics of the domain, complementing the existing literature and offering a useful reference framework for future investigations.

3. Research Methodology

The bibliometric methodology employed in this study aims to delineate the structure, dynamics, and evolutionary trends of the scientific literature devoted to financial derivative instruments as mechanisms for risk management. The methodological approach is grounded in clear and systematic criteria, ensuring the validity and reproducibility of the results.

To construct a relevant and coherent corpus of literature, the Web of Science Core Collection database was used, given its high indexing standards and the accuracy of the metadata provided. The selection of publications was based on a search query designed to capture both general concepts associated with financial derivatives (such as *financial derivatives* and *derivative instruments*) and specific instruments with strong academic and practical relevance (including *options*, *futures*, *swaps*, and *credit default swaps*), combined with representative terms related to risk management (such as *risk management*, *hedging strategies*, and *risk control*).

The search strategy was implemented using logical operators to identify publications that simultaneously address financial derivative instruments and risk management mechanisms, thereby ensuring the thematic relevance of the articles included in the analysis. This approach enabled a rigorous selection of the literature, avoiding both excessive restrictiveness and the inclusion of studies with only marginal relevance to the research topic.

The analysis covers the time period 2000–2025, which captures both the intensification of derivative instrument usage in the context of financial globalization and the impact of major events—such as the 2008 global financial crisis and the COVID-19 pandemic—on research related to financial risk management.

Bibliographic data were exported and processed using the Bibliometrix software package through its graphical interface, Biblioshiny, which allows for a systematic and reproducible analysis of bibliographic metadata. The bibliometric indicators examined were selected to provide a comprehensive overview of the investigated literature and include: the dynamics of scientific production, scholarly impact assessed through citation analysis, the structure of journals and publication sources, author profiles and collaboration networks, as well as the geographical distribution of research output.

In addition, semantic and thematic analyses were conducted using term frequency analysis (*Keywords Plus*), WordCloud visualizations, thematic TreeMaps, and Trend Topics analysis. These tools enable the identification of dominant research themes, emerging subfields, and the conceptual evolution of the literature over time. Co-occurrence and co-citation analyses were further employed to highlight the relational structure of the field and the dominant scientific traditions within the analyzed domain.

By integrating these tools and indicators, the applied methodology provides a robust and coherent foundation for interpreting the results and for understanding the evolution of the academic literature on the use of financial derivative instruments in risk management.

4. Results of the Bibliometric Analysis

This section presents the results of the bibliometric analysis conducted on the literature addressing the use of financial derivative instruments in risk management. The findings are organized according to the main bibliometric indicators, focusing on the dynamics of scientific production, academic impact, source structure, geographical distribution of research, and the thematic evolution of the field.

The analyzed period (2000–2025) comprises 4,750 documents published across 2,141 sources, including academic journals and conference proceedings. The annual growth rate of publications is 6.44%, indicating an upward trend in the volume of scientific output over the analyzed period (Figure 1). Regarding scientific collaboration, the corpus reveals an average of 3.45 co-authors per document, while 26.95% of the publications involve international co-authorship. At the same

time, 688 single-authored works are identified. Overall, the analysis includes 13,593 authors and 11,799 unique keywords, suggesting a high degree of thematic diversity.

Scientific impact, measured through citation analysis, shows an average of 18.64 citations per document, while the average age of the documents is 9.23 years, reflecting the presence of a corpus that includes a substantial share of well-established and frequently cited contributions.

Figure 1. General indicators of scientific production on financial derivative instruments in the context of risk management (2000–2025).

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The annual evolution of scientific production (Figure 2) reveals a clear upward trajectory, from a relatively low number of publications in the early years of the period to a substantial volume in the last decade. During the 2000–2005 interval, the annual number of articles remains below 100, followed by a noticeable increase starting in 2006. After 2012, the number of publications stabilizes at more than 200 articles per year, with a moderate and steady growth pattern. The highest levels of scientific output are observed during the 2020–2023 period. The decline recorded in 2025 should be interpreted in light of the fact that the analyzed year is incomplete, and a portion of the publications may not yet be indexed in the database used.

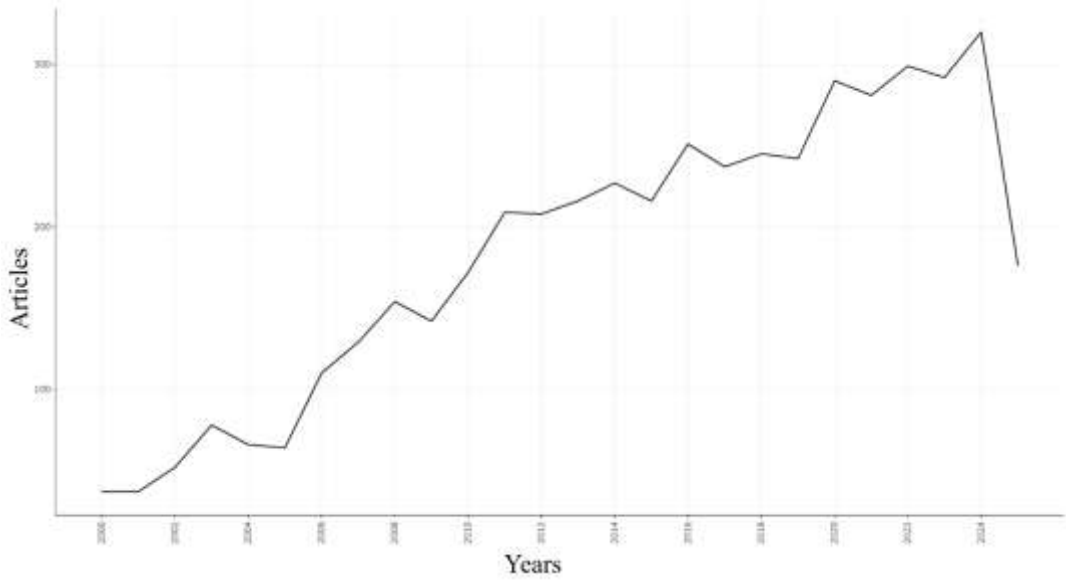

Figure 2. Annual dynamics of scientific production on financial derivative instruments in the context of risk management (2000–2025).

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The temporal distribution of scientific impact, measured by the annual average number of citations per article (Figure 3), indicates relatively high citation levels during the 2001–2003

period, with a peak in 2002 (exceeding three citations per article). Between 2004 and 2018, the average number of citations remains relatively stable, at approximately 1.5–2 citations per article per year. Beginning in 2019, an upward trend in average citations can be observed, culminating in a peak in 2020 (3.31 citations per article). The low values recorded in 2024 and 2025 (0.51 in 2025) should be interpreted in light of the citation lag effect, which is characteristic of recent publications that have not yet had sufficient time to accumulate a comparable number of citations.

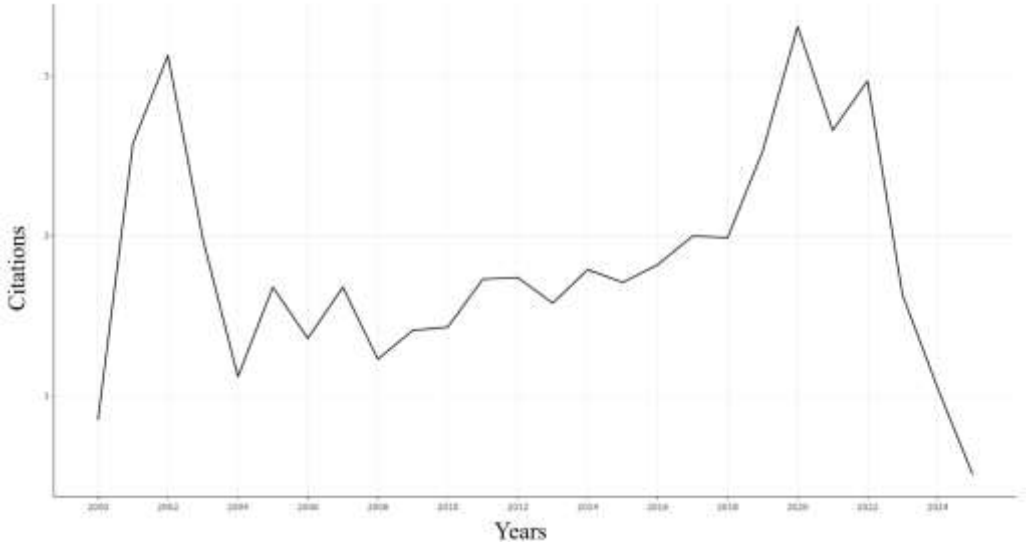

Figure 3. Evolution of the annual average citations per article for publications on financial derivative instruments in the context of risk management (2000–2025).

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The analysis of the most prolific publication sources (Figure 4) identifies *Energy Economics* as the leading journal, with a total of 83 articles, followed by the *Journal of Futures Markets* (68 articles) and the *EFSA Journal* (67 articles). These are followed by *Quantitative Finance* (50 articles), along with other prominent sources such as *Sustainability* and *Risk Analysis*. The list of leading publication outlets also includes journals with a strong financial and econometric focus, such as the *Journal of Banking & Finance* and *Insurance Mathematics & Economics*, as well as an operations-oriented outlet, the *European Journal of Operational Research*, alongside *Resources Policy*.

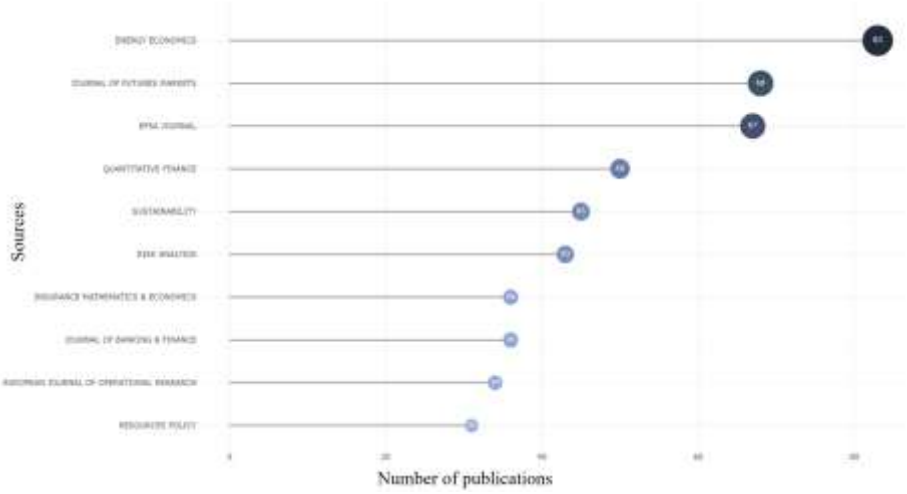

Figure 4. Journals with the highest publication frequency in the field of financial derivative instruments and risk management.

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The evolution of scientific production for the main contributing countries (the United States, China, the United Kingdom, Germany, and Australia) is presented in Figure 5. The data indicate a substantial increase in research output across all five countries over the analyzed period, with noticeable accelerations in specific intervals. In the United States, scientific production rises from 405 articles in 2007 to 630 articles in 2010. The United Kingdom records an increase from 116 articles in 2007 to 204 articles in 2010. In China, growth accelerates after 2008, starting from 88 articles, while during the 2020–2022 period output increases from 859 articles in 2020 to 1,143 articles in 2022. By 2022, the United States reaches 1,980 articles, while the United Kingdom records 944 articles. During the 2023–2025 period, the United States maintains a dominant position, while China narrows the gap (2,359 versus 1,660 articles).

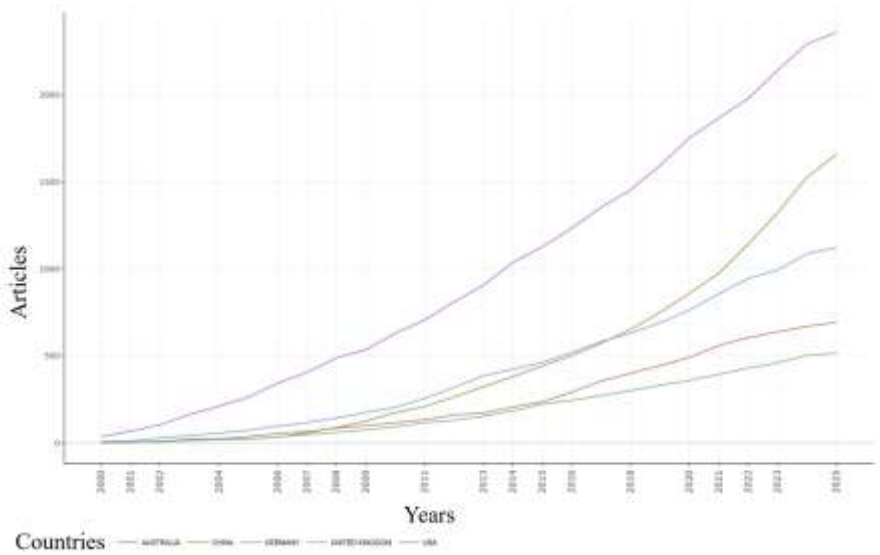

Figure 5. Evolution of scientific production in the field of financial derivative instruments and risk management across the main contributing countries (2000–2025).

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The most frequently cited works within the local corpus are presented in Figure 6. The publication with the highest local citation frequency is Graham and Rogers (2002), with 69 local citations, followed by Guay and Kothari (2003) with 58 citations, and Bartram et al. (2009) with 49 citations. These are followed by Chang et al. (2011), with 44 citations, and Benaroch (2002), with 35 citations. Other works included among the top cited publications record similar values, ranging between 28 and 33 local citations.

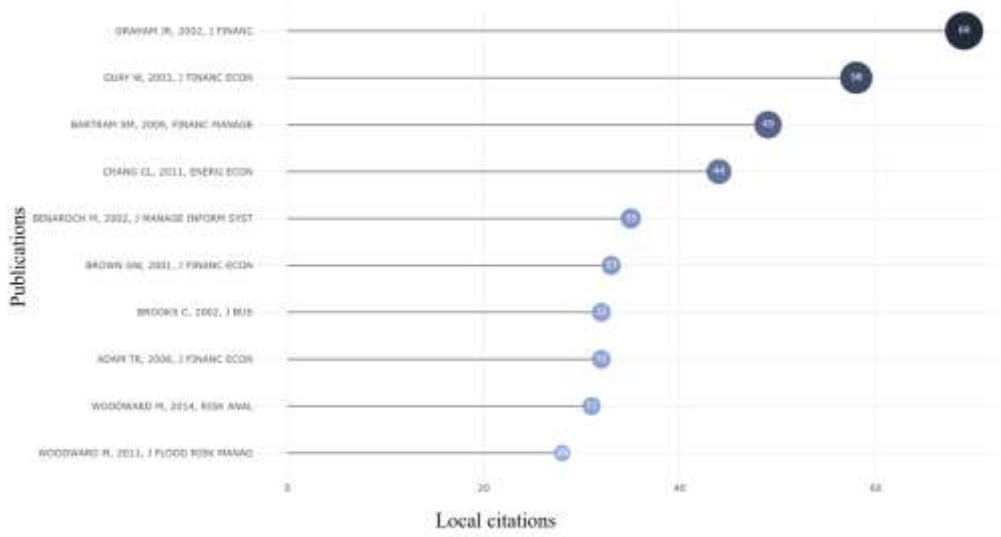

Figure 6. Most frequently cited works within the local corpus.

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The frequency of terms extracted through *Keywords Plus* (Figure 7) identifies the dominant terms as *options* (378 occurrences), *risk* (342), *model* (311), and *risk management* (302). Additional relevant terms include *volatility* (245), *futures* (226), *valuation* (212), *impact* (209), *management* (235), and *performance* (186).

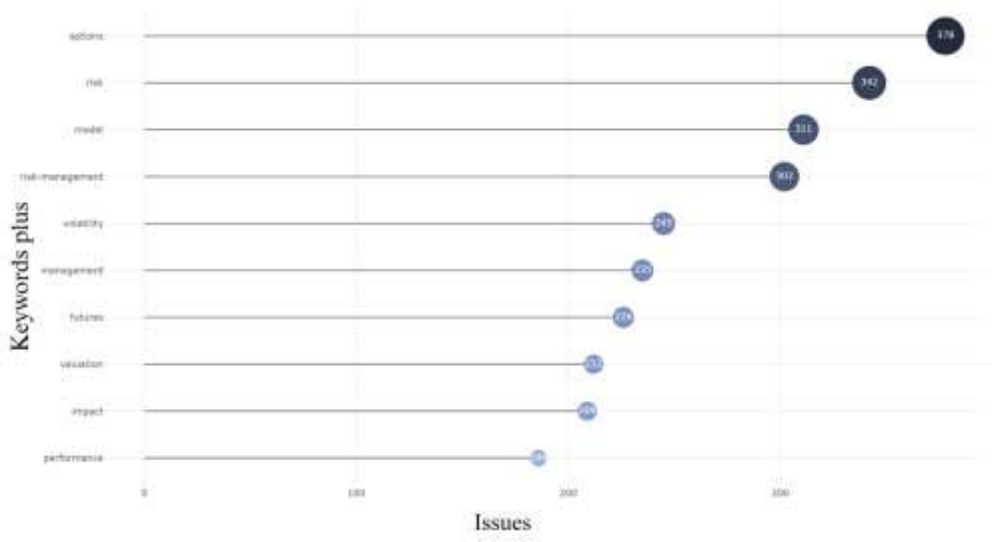

Figure 7. Term frequency analysis: representation of dominant themes through keywords (Keywords Plus).

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The WordCloud representation (Figure 8) confirms the prominence of the dominant terms and reflects a semantic concentration around the concepts of risk, volatility, valuation, and strategies. The thematic TreeMap (Figure 9) highlights high relative weights for *options* (14%), *risk* (13%), *model* (12%), and *risk management* (11%), followed by terms such as *futures*, *management*, *impact*, *valuation*, and performance.

Figure 8. Semantic analysis of the scientific field: interpretation of the WordCloud.

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

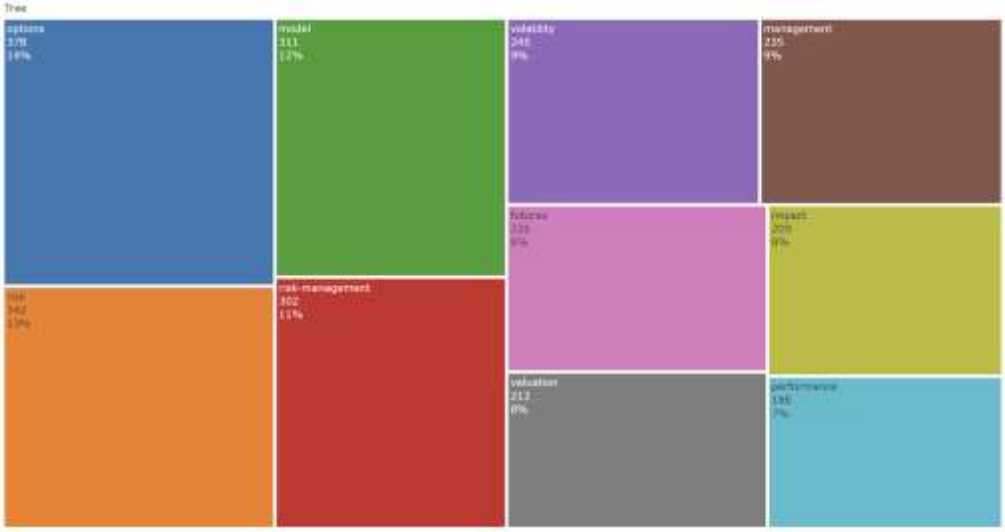

Figure 9. Thematic weight analysis: semantic interpretation of the TreeMap.

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

The Trend Topics analysis (Figure 10) highlights the temporal dynamics of key terms, with active themes during the 2002–2010 period, a consolidated core of topics between 2011 and 2018, and emerging terms in the 2019–2025 interval. In the most recent period, the analysis reveals the appearance of topics related to *bitcoin*, *investor sentiment*, *corporate social responsibility*, *spillovers*, as well as terms associated with energy markets and commodities.

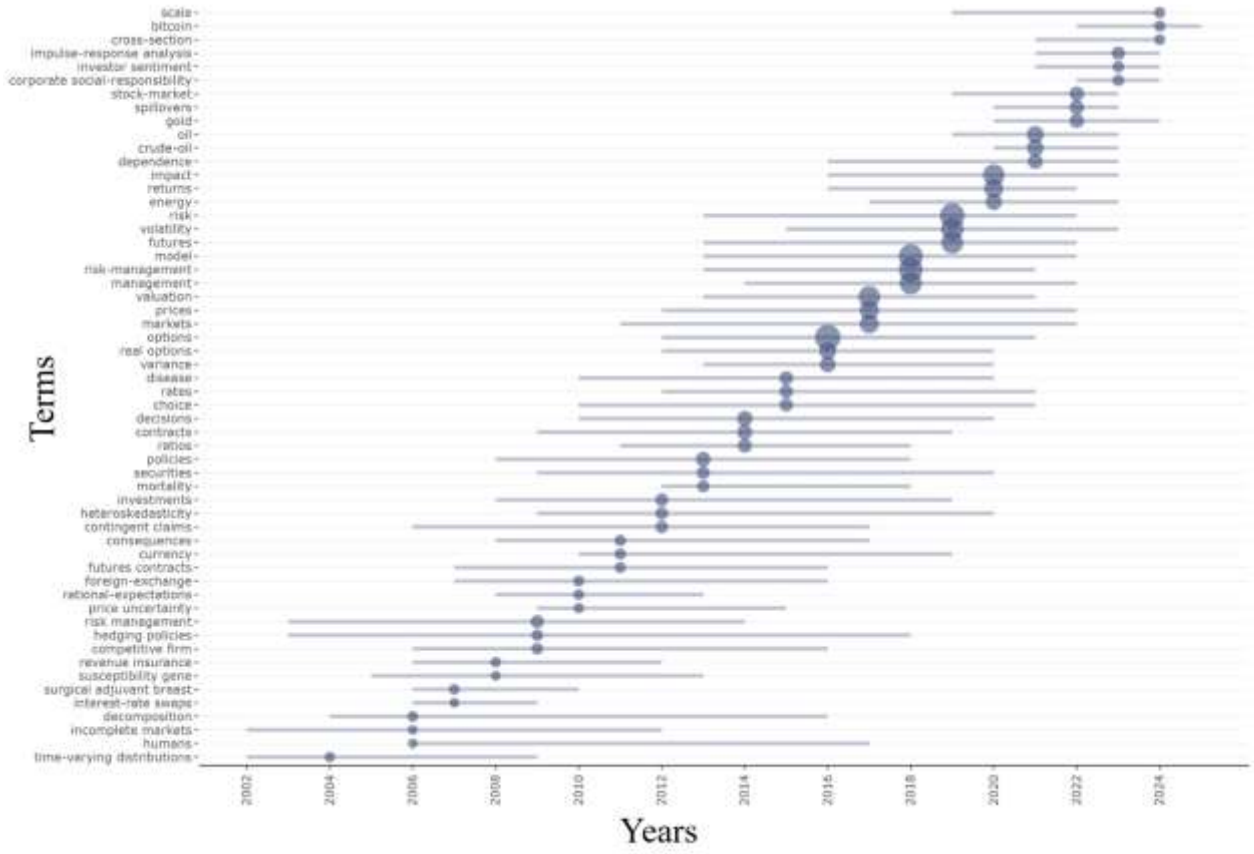

Figure 10. Evolution of research themes: Trend Topics analysis in the literature on financial derivatives and risk.

Source: authors' own elaboration based on data extracted from the Web of Science, processed using the Bibliometrix (R) package and the Biblioshiny application.

5. Discussion and Implications

The results reveal a sustained increase in scientific output related to the use of financial derivatives in risk management over the 2000–2025 period, with clearly identifiable accelerations around episodes of financial and economic stress. While bibliometric analysis does not allow for strict causal inference, the temporal overlap between publication surges and periods of heightened instability suggests that the research agenda in this field is highly responsive to systemic shocks. This pattern is consistent with the fundamental role of derivatives as instruments for risk transfer and hedging, which tend to attract intensified academic scrutiny in contexts characterized by elevated volatility and uncertainty.

In particular, the marked expansion of publications after 2008 can be interpreted as a scholarly response to the reassessment of the role of derivatives in both the propagation and mitigation of financial risk, including issues related to complex instruments and counterparty exposure. Similarly, the production peaks observed during the 2020–2023 period coincide with a global environment dominated by acute uncertainty, supporting the interpretation of a renewed academic focus on hedging mechanisms, derivative market behavior under extreme conditions, and the resilience of risk management strategies during systemic disruptions.

The decline observed for 2025 should be treated as a technical limitation related to incomplete database coverage and delayed indexing, rather than as an indication of a reversal in the underlying trend. From this perspective, the findings point toward a process of maturation and consolidation of the field, rather than an episodic or transient research cycle.

The evolution of average citations per article highlights two distinct periods of heightened impact: the early 2000s and the year 2020. The earlier peak likely reflects the presence of foundational contributions that shaped subsequent research on risk modeling and corporate derivative usage. In contrast, the elevated citation levels around 2020 suggest intensified scholarly attention to risk-related topics in the context of global uncertainty. Importantly, the decline in citation averages for 2024–2025 is consistent with a structural citation lag effect affecting recent publications, which have not yet had sufficient time to accumulate citations.

This observation carries important methodological implications. Citation-based indicators should be interpreted with caution when assessing very recent literature, as they may not fully capture the potential impact of new contributions. Accordingly, a more comprehensive evaluation of research influence benefits from combining citation metrics with complementary dimensions, such as thematic dynamics, publication outlets, and collaboration patterns—an approach facilitated by the multi-indicator framework employed in this study.

The ranking of the most productive journals reveals a combination of outlets specialized in derivative instruments and financial modeling and journals with a pronounced interdisciplinary orientation, particularly in areas related to energy, sustainability, and risk analysis. The leading position of energy-related journals suggests a convergence between financial risk research and commodity and energy market volatility, where derivatives are extensively used as price risk hedging instruments.

This publication structure indicates that research on derivatives in risk management extends beyond traditional corporate finance and capital market settings toward domains in which market risk is strongly influenced by exogenous factors, such as energy markets, natural resources, and global supply chains. At the same time, the presence of actuarial, banking, and operational research journals points to methodological bridges connecting risk modeling, optimization, econometrics, and managerial decision-making.

The analysis of scientific production across major contributing countries highlights consistent growth in the United States, China, the United Kingdom, Germany, and Australia, albeit with differences in intensity and timing. The sustained dominance of the United States is consistent with the scale of its academic and financial ecosystem and the centrality of derivative markets. Meanwhile, the accelerated growth observed in China—particularly after 2008 and more prominently during 2020–2022—suggests a rapid strengthening of research capacity and increasing integration into the global agenda on financial stability and risk management.

From an interpretative standpoint, these trajectories may reflect both institutional factors, such as research funding, market development, and regulatory frameworks, and international diffusion effects of dominant research themes. The post-2008 acceleration aligns with a broader reconfiguration of regulatory and supervisory environments, which stimulated academic interest in derivative effectiveness under new compliance regimes and in the management of counterparty and systemic risk.

Local citation analysis points to the existence of relatively stable intellectual reference points around which a substantial portion of the literature is structured. The prominence of highly cited works published in leading finance journals indicates that the conceptual core of the field remains grounded in foundational research on the motivations for derivative use, the scope of hedging activities, and their firm-level determinants. Complementarily, the presence of influential studies focused on energy market hedging reflects the growing relevance of applied research addressing commodity price volatility within risk management frameworks.

Taken together, these patterns support the existence of a dual intellectual structure: a relatively stable theoretical and empirical core rooted in corporate finance and risk modeling, alongside a set of applications that diversify in response to evolving economic conditions and emerging sources of risk.

Semantic analyses based on Keywords Plus, WordCloud, and TreeMap representations confirm that the literature remains concentrated around core concepts such as options, risk, modeling, risk management, volatility, and valuation. This concentration underscores the strongly methodological and quantitative orientation of research on derivatives, in which risk assessment and hedging strategy design are closely linked to econometric and stochastic modeling approaches.

At the same time, the Trend Topics analysis reveals a gradual diversification of the field in recent years. Emerging themes include digital assets and associated volatility (e.g., bitcoin), behavioral dimensions such as investor sentiment, shock transmission and interdependence (spillovers), the integration of ESG considerations and corporate social responsibility, as well as climate-related risks and energy transition dynamics. These developments suggest that the field has progressively moved beyond an exclusive focus on classical instruments to incorporate contemporary risks—climatic, geopolitical, and digital—and analytical approaches oriented toward interconnectedness and contagion.

From an interpretative perspective, these findings indicate a growing interdisciplinary integration, whereby derivative-based risk management is examined not only within traditional financial contexts but also in relation to the structural transformations of the global economy. Based on the identified thematic structure and trends, several avenues for future research emerge. These include more granular analyses of hedging effectiveness in digital asset markets and emerging economies, the development of conceptual frameworks linking financial risk management with climate transition and physical risks, and the application of network-based and contagion models to capture systemic spillovers under conditions of geopolitical stress. Finally, given the central role of modeling in this domain, recent advances in digitalization and emerging technologies may support the development of more sophisticated methodological approaches—such as data-driven techniques and machine learning—provided that transparency and interpretability remain central principles in financial risk research.

6. Conclusions

This study has provided a systematic bibliometric analysis of the scientific literature addressing the use of financial derivatives as risk management instruments, offering a structured and comprehensive overview of the field's academic evolution over the 2000–2025 period. By relying on a rigorous methodological framework and an internationally recognized data source—the Web of Science Core Collection—the research contributes to a clearer understanding of the intellectual structure, dynamics, and development trajectories of this domain.

The findings indicate a sustained growth in academic interest, with pronounced intensifications during periods marked by heightened financial and economic uncertainty. This pattern suggests that research on derivatives and risk management is closely aligned with episodes of systemic stress, during which the role, effectiveness, and limitations of hedging instruments become subjects of intensified scholarly scrutiny. The analysis of scientific impact further highlights the central role of theoretically and empirically grounded contributions, which have functioned as stable reference points shaping subsequent research agendas.

From the perspective of publication outlets and authorship patterns, the results reveal the presence of consolidated dissemination channels and active research networks characterized by a significant degree of international collaboration. At the same time, the diversity of leading journals underscores the interdisciplinary nature of the field, extending beyond traditional finance and capital markets toward areas such as energy economics, sustainability, actuarial science, and operational research.

The thematic analysis shows that, while the literature remains firmly anchored in classical concepts of derivatives theory and risk management—such as options, volatility, valuation, and modeling—it has progressively diversified toward emerging topics. These include climate-related risks, energy and commodity markets, digital assets, behavioral dimensions of risk, and systemic

interconnectedness. This evolution reflects the field's adaptability to contemporary economic and financial transformations and confirms its relevance in addressing increasingly complex and multidimensional sources of risk.

The primary contribution of this study lies in delivering a comprehensive, transparent, and reproducible mapping of the literature on financial derivatives as mechanisms of risk management. By integrating multiple bibliometric indicators and semantic analyses, the research offers a robust reference framework that can support future empirical investigations, meta-analyses, and systematic reviews. In addition, the results may assist early-career researchers in positioning their work within the existing body of knowledge and provide practitioners with a consolidated overview of dominant academic perspectives and emerging research directions.

Several limitations should be acknowledged. The analysis is restricted to publications indexed in the Web of Science Core Collection and relies on quantitative bibliometric indicators, which may exclude relevant contributions available in other databases or in the grey literature. Moreover, the bibliometric approach does not allow for a direct assessment of the substantive quality or detailed content of individual studies.

Building on these limitations, future research may extend the analysis to additional bibliographic databases, combine bibliometric techniques with qualitative content analysis, or further explore the emerging subfields identified in this study. In particular, deeper investigation into climate-related risks, financial digitalization, and systemic spillovers may contribute to the development of more robust theoretical and applied frameworks for risk management in an increasingly uncertain and interconnected global financial environment.

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