

Comparative Analysis of Futures Option Characteristics in Spot and Futures Markets Between Asia and Europe: Validation of Put-Call Parity and the Role of Market Volatility

Thomas Nadeak¹, Toni Heryana², Wahyudayanto Utama³, H. Nugraha⁴, Maya Sari⁵

¹ Universitas Buana Perjuangan Karawang
^{2,3,4,5} Universitas Pendidikan Indonesia Bandung

Article Info	ABSTRACT
<p>Article history:</p> <p>Received Jan, 2025 Revised Jan, 2025 Accepted Jan, 2025</p> <hr/> <p>Keywords:</p> <p>Futures Options Bibliometrics Implied Volatility Stochastic Volatility Price Dynamics Sustainability Climate Change Hedging Strategies Derivatives Markets Network Visualization</p>	<p>This study aims to analyze the development of research related to “futures options” using a bibliometric approach based on Scopus data with the keyword “futures options,” covering 280 journal articles for the period 1973-2024. The analysis was conducted using Biblioshiny in R-Studio for bibliometrics and VOSviewer for keyword network visualization. Results showed that dominant themes included implied volatility, stochastic volatility, and price dynamics with a focus on hedging strategies, risk, and derivatives market dynamics. The network visualization revealed modern themes such as sustainability and climate change, indicating the potential integration of these financial instruments with global sustainability issues. Inter-author collaboration was high, averaging 2.22 authors per document, with 22.5% of documents involving international authors. The study also noted high relevance with the average citations per document reaching 24.81 and an annual growth rate of 2.76%. Temporal analysis showed a significant increase since the 1980s, a peak in 2010-2020, and a decline in 2020-2024, influenced by shifts in research focus or the impact of the COVID-19 pandemic. Visualization through VOSviewer identified five main clusters, with implied volatility having strong connections to hedging and stochastic volatility, while new themes such as sustainability are still in the early stages of exploration. The study concludes that while the futures options theme is mature, there are opportunities for exploration in lesser explored topics such as the integration of sustainability issues and cross-regional analysis, providing a comprehensive picture of the research landscape and future directions.</p> <p><i>This is an open access article under the CC BY-SA license.</i></p> <div></div>
<p>Corresponding Author:</p> <p>Name: Thomas Nadeak Institution: Universitas Buana Perjuangan Karawang Email: thomasnadeak@ubpkarawang.ac.id</p>	

1. INTRODUCTION

The dynamic and complex nature of financial markets has prompted ongoing

research into derivative instruments, particularly futures options. Since their inception, futures options have evolved into an important tool for managing market risk

and optimizing investment strategies [1], [2]. They offer flexibility in hedging and speculation, making them indispensable in modern finance. Despite their long-standing use, the development and integration of futures options into emerging global issues, such as sustainability and climate change, remains largely unexplored [3], [4].

This study uses a bibliometric approach to analyze trends, themes and networks in futures options research from 1973 to 2024, using data sourced from Scopus. Bibliometric analysis provides a systematic and quantitative evaluation of scientific publications, allowing researchers to identify key themes, influential authors and emerging trends. Tools such as Biblioshiny in R-Studio and VOSviewer facilitate visualization and clustering, highlighting the relationship between keywords and research domains [5].

The findings of this study revealed dominant themes such as implied volatility, stochastic volatility, and price dynamics. These themes emphasize the technical aspects of futures options, including risk management and market dynamics. However, newer themes such as sustainability and climate change are gradually gaining attention, signaling the potential to integrate futures options into the global sustainability agenda. Temporal analysis shows a significant increase in publications during 2010-2020, followed by a decrease in 2020-2024, potentially influenced by the shift in research focus and the impact of the COVID-19 pandemic.

Through this research, we aim to provide a comprehensive understanding of the current landscape of futures options studies while identifying gaps and opportunities for future exploration. By focusing on both established and emerging themes, this research seeks to contribute to the growing discourse on derivatives and their role in addressing global challenges.

2. LITERATURE REVIEW

2.1 Framework

The study of futures options has been a pivotal focus within financial research since the seminal work by [6], which introduced a groundbreaking model for option pricing. Their theoretical foundation has influenced numerous studies exploring the mechanics of derivatives, including implied volatility, stochastic processes, and market dynamics. [7] comprehensive analysis of derivatives has further solidified the understanding of risk management strategies and their application in financial markets. Early research primarily revolved around the technical aspects of pricing models and market efficiency, as highlighted by [8], [9], who emphasized the role of stochastic volatility in understanding market behavior. Empirical analyses, including [10], validated constructs like the put-call parity across different market settings, enhancing the applicability of futures options globally.

In recent decades, the scope of futures options research has expanded to include intersections with macroeconomic and global issues such as sustainability, climate change, and corporate social responsibility. Bibliometric studies using tools like VOSviewer reveal dominant themes, such as implied volatility and its connections to hedging strategies, while newer themes like sustainability remain underexplored. Contributions from developed nations, particularly the United States, the United Kingdom, and Australia, dominate publication outputs, but emerging markets

like China, India, and Southeast Asia are showing growing interest. Despite the substantial literature, gaps persist in integrating technical themes with global challenges, highlighting the need for research that bridges traditional financial paradigms with broader socio-economic objectives to meet the demands of a rapidly evolving global landscape.

3. METHODS

3.1 Design

This study uses a bibliometric approach to analyze trends and developments in research related to futures options based on data obtained from Scopus. Bibliometrics is a quantitative method that enables the systematic evaluation of scientific publications through the analysis of metadata, including the number of documents, keywords, citations, and inter-author collaboration [11]. The research data included 280 journal articles published between 1973 and 2024, which were collected using the keyword “futures options” in the Scopus database. Articles included in the analysis came from a variety of journals, books and conferences, reflecting variations in research coverage and themes.

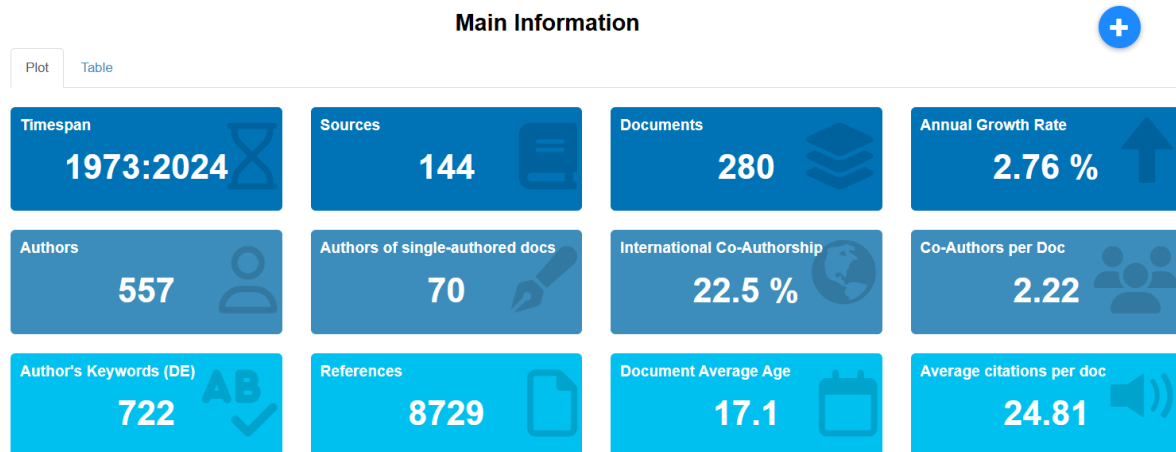


Figure 1. Data Source

There are 280 documents on futures options from 144 sources spanning 1973-2024, with an average of 2.22 authors per document and 22.5% involving international collaboration, reflecting global attention. The average age of the documents is 17.1 years, indicating a strong historical foundation, yet it continues to grow with an annual growth of 2.76% and an average of 24.81 citations per document. With 722 keywords, the topic covers a diverse range of subthemes relevant for further bibliometric analysis.

3.2 Analysis Tools

There are 280 documents on futures options from 144 sources spanning 1973-2024, reflecting the wide variation in coverage of

journals, books and conferences. With an average of 2.22 authors per document and 22.5% involving international collaboration, the theme shows significant global attention. The documents have an average age of 17.1 years, signaling a strong historical foundation, yet continue to grow at an annual growth rate of 2.76%. The average citations per document reached 24.81, demonstrating the high relevance of the research that has been conducted. With 722 keywords, the topic covers many subthemes, making it a rich theme for further bibliometric analysis.

4. RESULTS AND DISCUSSION

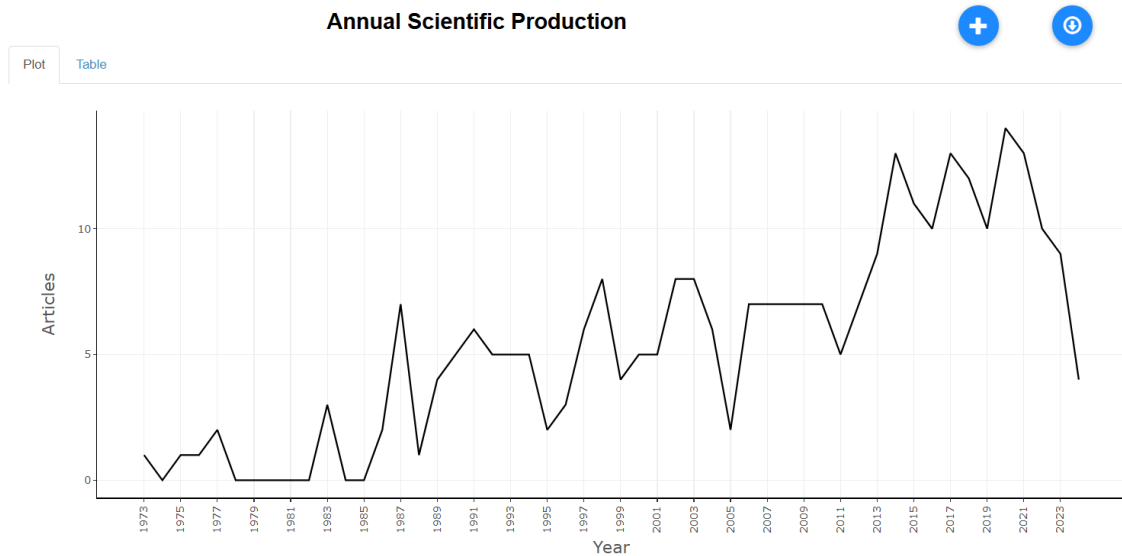


Figure 2. Trend Annual Scientific Production

The Annual Scientific Production chart shows the dynamics of futures options research from 1973 to 2024. Early publications (1973-1980) were very limited, reflecting low academic interest. The period 1980-2000 shows a gradual increase with significant fluctuations, driven by the development of the derivatives market. Research peaked in 2010-2020, with an average of more than 10

articles per year, but declined in 2020-2024 due to a shift in focus, the impact of the pandemic or lack of innovation. This graph reflects the significant development of this topic, although it may now be entering a phase of stagnation, opening up opportunities for exploration of new areas.

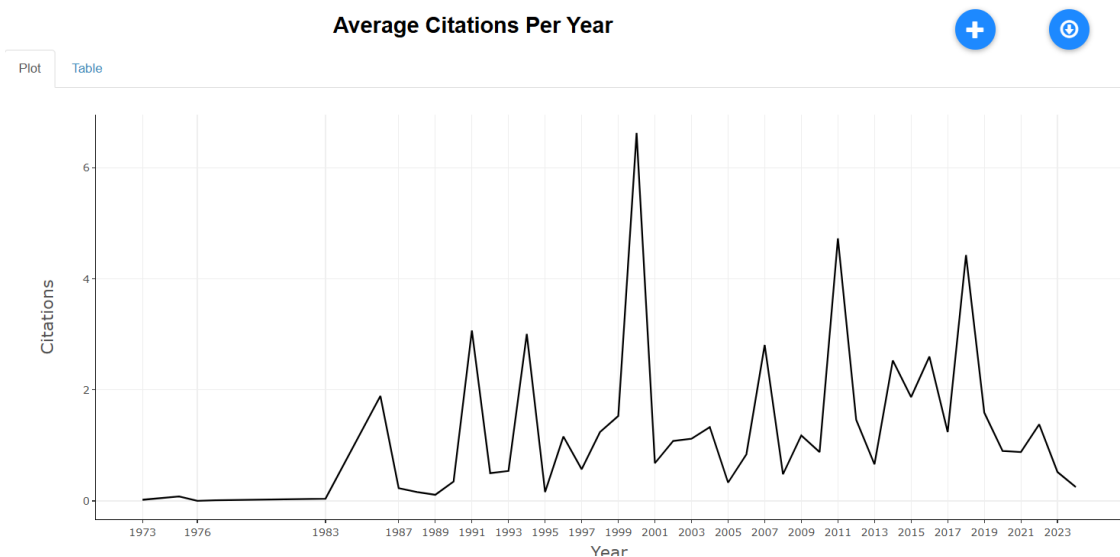


Figure 3. Average Citation Per Years

The Average Citations Per Year graph shows the average citations of scientific articles related to "futures options" from 1973 to 2024, reflecting the dynamics of the scientific community's attention to this topic.

Initially, the average citations were very low (1980-1990s), reflecting the novelty of the topic. An increase occurred in the 1980s to 1990s, with a peak in citations around 1997-2001 due to the publication of frequently

referenced fundamental articles. Thereafter, the period 2002-2020 shows fluctuations in citations, influenced by variations in article quality and competition with other derivative topics. In recent years (2021-2024), the average citations have decreased, possibly due to a lack of significant new research or a shift in focus to financial technology. This graph reflects the once significant but now declining influence of “futures options”, opening up opportunities for new contributions that could revive research interest in this area.

Table 1. Countries' Scientific Production

Country	Frequency
USA	205
CHINA	51
UK	45
AUSTRALIA	38
CANADA	26
NETHERLANDS	23
SINGAPORE	22
GERMANY	18
INDIA	16
MALAYSIA	13

The Countries' Scientific Production table shows countries' contributions to futures options research, with the United States

dominating with 205 publications, reflecting its position as a global financial research center supported by market infrastructure such as the Chicago Mercantile Exchange (CME) and leading academic institutions. China comes in second with 51 publications, reflecting the rapid growth of its domestic derivatives market, while the UK with 45 publications reinforces its role as a global financial center through exchanges such as LIFFE. Other countries such as Australia (38 publications), Canada (26 publications) and the Netherlands (23 publications) show significant contributions, supported by active academic communities. In Southeast Asia, Singapore (22 publications) reinforces its position as an Asian financial center, while Malaysia (13 publications) reflects a growing interest in derivatives research. Overall, this table highlights the dominance of developed economies such as the United States, the United Kingdom and Australia in futures options research, while pointing to the promising diversification potential of emerging economies such as China, India and Malaysia for future cross-regional studies.

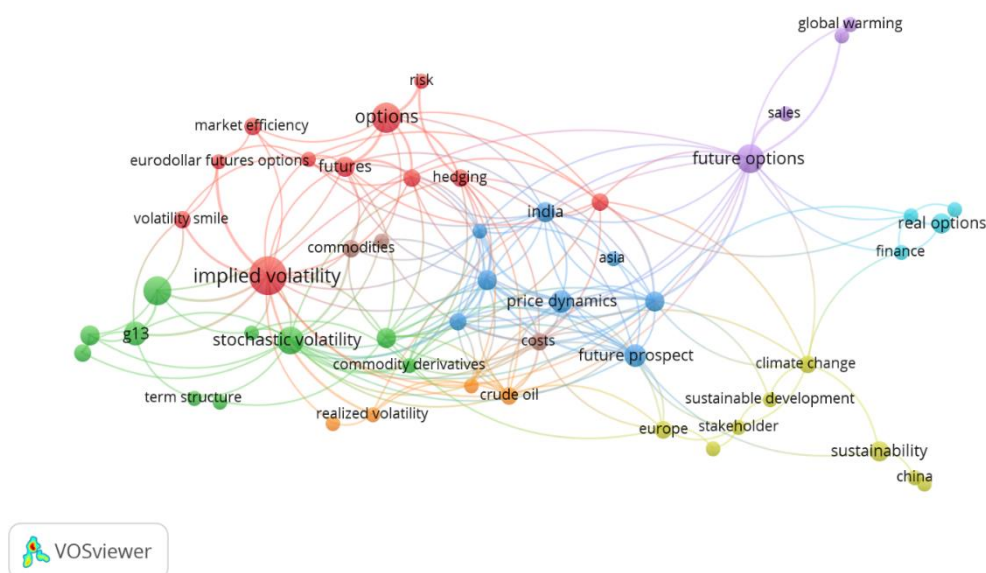


Figure 4. Vosviewers visualization

The network visualization of VOSviewer shows the relationships between keywords in the research “futures options,” divided into clusters of themes. The red cluster (Implied Volatility, Options, Futures, Hedging) focuses on technical aspects such as volatility, while the green cluster (Stochastic Volatility, Term Structure) highlights mathematical analysis. The blue cluster (Price Dynamics, Asia) describes regional market dynamics, while the purple cluster (Future Options, Climate Change) links futures options to sustainability issues. The yellow

cluster (Sustainability, Europe) emphasizes aspects of sustainability in Europe. The size of the nodes reflects the frequency of keywords, with strong connections such as between “implied volatility” and “hedging,” and “future options” and “sustainability.” The cross-regional focus and modern themes such as “climate change” demonstrate the broadening of futures options applications, opening up opportunities for exploration at the intersection of technical themes and global issues.

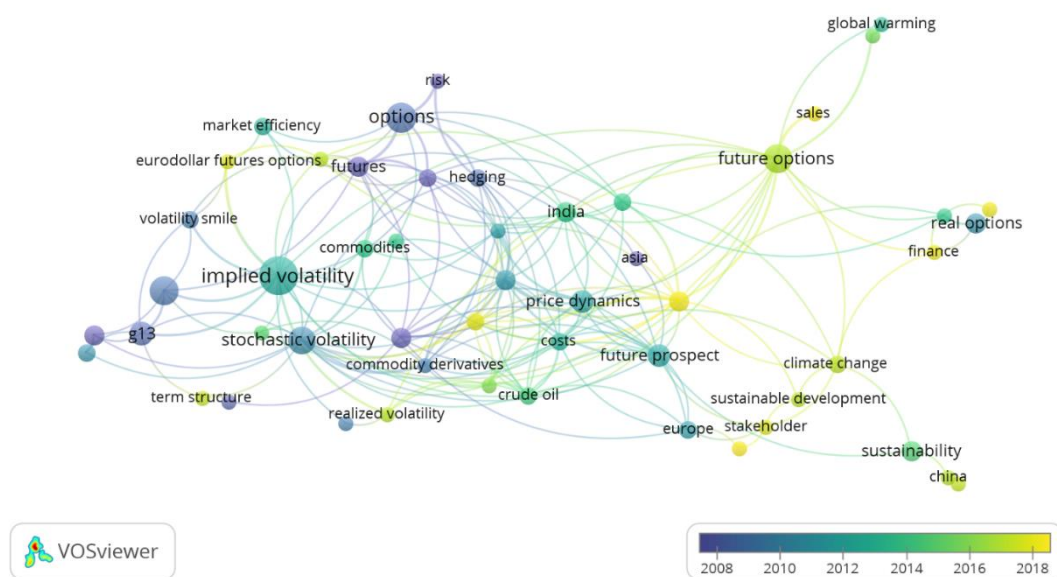


Figure 5. Vosviewers Trend

The overlay visualization in VOSviewer shows the relationship between keywords and temporal information by color, illustrating the development of the research theme “futures options” over time. Blue indicates keywords that were dominant at the beginning of the research (2008-2012), such as “implied volatility,” “stochastic volatility,” and “volatility smile,” which focused on volatility analysis and market efficiency. The green color (2012-2016) shows a shift in focus to market dynamics and hedging strategies with keywords such as “price dynamics,” “hedging,” and “commodities,” as well as interest in regional studies such as in Asia and India. The yellow color (2016-2018) reflects

new trends, including the integration of global issues such as “sustainability,” “climate change,” and “sustainable development,” as well as the development of applications such as “real options.” Keywords such as “implied volatility” remain front and center with many connections to other themes, while new themes such as “sustainability” show the integration of financial instruments with global sustainability issues. This visualization highlights the evolution of research from a technical focus to modern issues, opening up new exploration opportunities at the intersection of sustainability and derivatives markets.

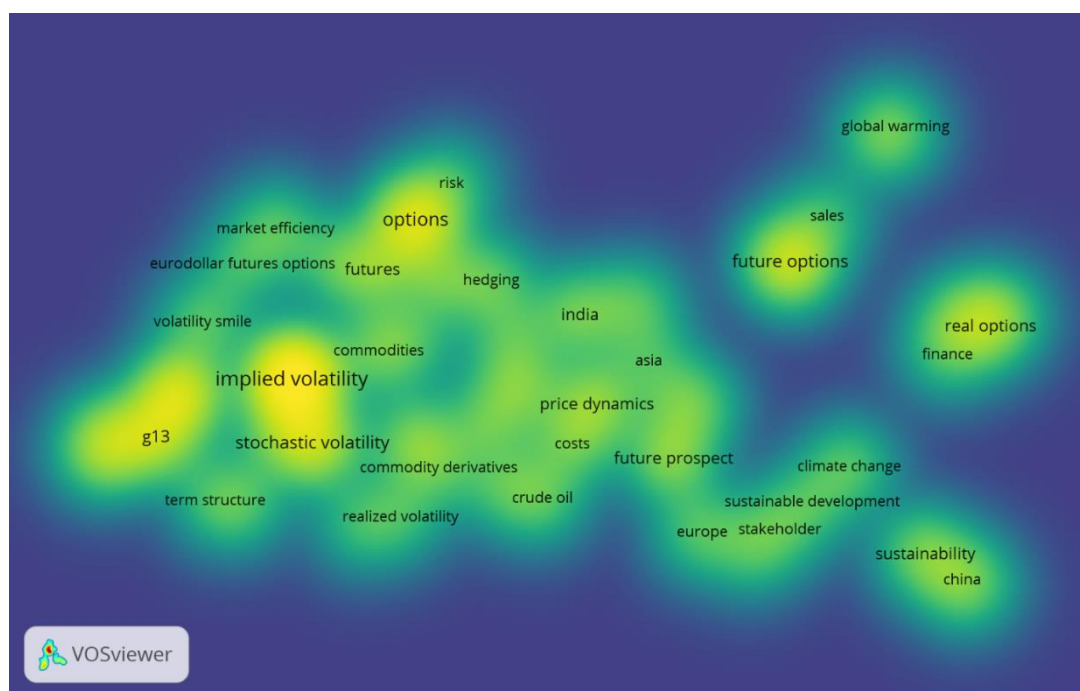


Figure 6. Density Identify

Density visualization from VOSviewer shows the density of keywords in the research “futures options,” where yellow indicates high concentration and blue indicates low concentration. Keywords such as “implied volatility” dominate the highest density areas, reflecting the main themes of the research that focus on implied volatility, risk, hedging strategies and price dynamics. Medium-density themes, such as “real options,” “future options,” and “commodities,” show moderate relevance, while “Asia” and “India” reflect the growing interest in the Asian region. In the low-density area, keywords such as “sustainability,” “climate change,” and “global warming” indicate that sustainability issues in the context of futures options are still in the early stages of exploration. The close relationship between major keywords, such as “implied volatility” with “stochastic volatility” and “options,” indicates a strong technical focus, while modern themes such as sustainability are more isolated, opening up opportunities for further integration with global issues. This visualization highlights the dominance of technical research and indicates potential developments in linking futures options with sustainability and other global issues.

Discussion

1. Futures Options Research Trends

The bibliometric analysis shows significant developments in futures options research from 1973 to 2024. Early publications were relatively few, but increased sharply in the 1980-2020 period, reflecting the growing interest in derivative instruments. Peak productivity was recorded in the 2010-2020 decade, with more than 10 publications per year. However, this trend declined in the period 2020-2024, possibly due to a shift in research focus to other topics or the impact of the COVID-19 pandemic.

2. Dominance of Volatility and Risk Themes

The findings show that implied volatility, stochastic volatility, and price dynamics are the dominant themes in futures options research. The main focus of this research is on technical analysis related to hedging strategies, risk management, and derivatives market dynamics. The dominance of these themes reflects the need for academics and practitioners to understand

market volatility as a basis for making investment decisions [12]–[14].

3. Potential Sustainability Themes

Although the themes of sustainability and climate change have only emerged in recent years, the results of the keyword network visualization show early connections between futures options and these global issues. Themes such as “sustainability” and “climate change” have great potential for growth, especially in the context of integrating financial instruments with global sustainability goals. However, the density of these themes is still low, suggesting the need for further exploration.

4. International and Regional Collaboration

Analysis of inter-author collaboration revealed that 22.5% of documents involved international authors, reflecting the global attention to the topic of futures options. The United States dominated the research contributions with 205 publications, followed by China (51 publications) and the United Kingdom (45 publications). Emerging countries such as Malaysia and Singapore showed increasing interest, providing opportunities for more cross-regional research.

5. Future Research Opportunities

This research shows that while the futures options theme is mature in technical aspects, there is room for exploration on lesser-explored topics, such as:

- a) Linking futures options with climate change and sustainable development issues.
- b) Enhancing research in developing countries to enrich the global perspective.
- c) Utilize technologies such as big data and machine learning for futures options analysis.

Through this approach, futures options research can continue to evolve, address global challenges, and make broader contributions to financial science and practice

5. CONCLUSION

This research provides a comprehensive overview of the development and trends of futures options research over the period 1973–2024. The analysis shows that dominant themes such as implied volatility, stochastic volatility, and price dynamics remain the main focus, reflecting the importance of technical aspects in understanding derivatives markets. However, the emergence of new issues such as sustainability and climate change shows the potential integration of futures options with the global sustainability agenda. Although publication trends have shown a decline in recent years, opportunities for further exploration, particularly on sustainability themes and cross-regional research, are promising. This research not only reinforces the position of futures options as an important instrument in risk management and market dynamics, but also paves the way for innovation and collaboration to address future global financial challenges.

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