

# A Bibliometric Study of Emerging Trends in The Equity Options Segment

Tejinder Singh<sup>1\*</sup>, Rubeena Bajwa<sup>2</sup><sup>1,2</sup>Sri Guru Granth Sahib World University, Sri Fatehgarh Sahib, Punjab-India.**\*Corresponding Author:**

Tejinder Singh, Sri Guru Granth Sahib World University, Sri Fatehgarh Sahib, Punjab-India.

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*Index options and stock options are part of equity options segment in particular and the equity derivatives segment in general. This study examines the evolution of index options and stock options as modern financial instruments along with open interest. 759 studies were reviewed from 1982 to 2022. The equity options market informational content is particularly helpful in forecasting future prices. As a result, it is a favourite of traders and short-term investors, but this subject needs more research. The study used a bibliometric and network analysis tool to identify the most cited studies, leading journals, and authors. The thematic structure of research on equity options and open interest has been inferred using the bibliometric analyses in this review paper. With the help of the Scopus database, the results have been summarized, covering the broad topics of volatility, options and option prices, stochastic models, financial markets and stock markets, hedging, Granger causality, price determination, model test, information asymmetry, equity and the VIX index. During this review study, researchers found that day traders and short-term investors can use the information in open interest, index options, and stock options to predict future prices.*

**Keywords:** Index option • Stock option • Open Interest • Bibliometric analysis • Put-Call Ratio (PCR).  
JEL Classification G1 • G3 • G12 • G14**Introduction to Options and Open Interest**

Both open interest and option volumes provide guidance to traders and short-term investors in framing trading strategies. In a study based in India, with the help of volume-based predictors and open interest-based predictors, it was observed that the informational role in the derivatives market is important in predicting future prices [1]. Past studies have focused on the usage of this informational role in the underlying spot markets. However, the volume-based indicators are found to be insignificant in predicting future prices when applied in isolation [1]. Open interest refers to the open positions in the case of stock options and index options on a particular day for a particular expiry month. The impact of open interest on the trading volume has been used frequently in the past at the time of merger announcements [2]. Equity options are a part of the equity derivatives segment wherein the prices of calls and puts for different stocks and indexes are derived from the underlying securities. In a study focusing on the information content of equity derivatives under different market conditions and moneyness, it was found that informed traders prefer using at-the-money options in place of in-the-money or out-of-the-money options. A new variable named options trading value ratio (VR) was also used, which

uses volume and prices across series of both call and put traded daily [3]. Future stock market returns are significantly correlated with the expansion of index options open interest. The empirical results show that there is a strong link between the rise in open interest for out-of-the-money call options and the possible returns from the stock market [4]. PCR, a popular information ratio measured by volume and open interest, is used to forecast market return at various time scales [5].

The prices of individual stocks were predicted on the basis of the pattern of distribution of open interest [6]. Previous studies have indicated a decline in the open interest prior to the announcement of quarterly results due to increased volatility in the prices of underlying securities around the date of the announcement of the results [7]. The cumulative abnormal returns around credit rating change announcements are predicted by pre-event informed options trading. Before announcements of more significant and unexpected rating changes, there was a greater degree of predictability in the options market [8]. For retail investors who wish to use stock options as a rational investor or informed trader, at-the-money options may be suitable for hedging purposes [3]. The effect of

options markets is examined by analysing stock market reaction to earnings news and the impact before the earnings release is found to be bigger when options trading is available [9].

As a risk management tool, options are used for hedging positions by the financial experts [10]. At-the-money options are the options with a strike price nearest to the current market price of the underlying security. At the same time, ATM options show consistently useful results as a part of information-based trading, but at the same time, they should not be construed as being full proof or as a tool of guaranteed return and should not be used for aggressive trading purposes [3]. A few studies have explored the impact the derivatives on the financial markets. There has been an increase in the volatility of markets post the introduction of futures and options in DJIA index [11]. It is pertinent to mention here that on the event day on account of earnings announcements, corporate announcements or news on social media, the entire distribution of the stock prices gets disturbed [12]. The varying degree of open interest numbers across different strike prices in many underlying assets makes it difficult for a user to reach any meaningful conclusion (Muhammad & Scrimgeour, 2014) [13]. It is therefore not imperative from the point of view of policymakers that more choices for investors are always a better option. Although the stocks which are listed as single stock futures and the Index stocks witness higher spot price fluctuations in the last 30 minutes of expiry day of trading, there is comparatively greater volatility in case of single stock future stocks [14]. The relation between the trading activity in options and announcement of economic news is significant for the traders who can analyse the informed trading volume for the purpose of tweaking of their portfolios [9].

The options have a more accurate predicting power in comparison to the cash markets when it comes to the price dynamics of the underlying securities [15]. Options trading can also complement the short sellers who benefit the information in options and short selling can be mentioned as a substitute of short selling [16]. Detailed analysis of call and put options open interest is helpful for generating excess returns in the foreign exchange markets also [17]. With the help of the analysis of open interest, traders and rational investors make reviews of their investment portfolios on a short-term basis. The relevance of open interest assumes greater significance with the use of the Black Scholes pricing model for using options in a profitable manner. The Black Scholes concept that earned him the Noble Prize provides a model for calculating the theoretical prices of call options and put options. These options are index options and stock options. An informed trader by comparing the theoretical option prices produced by the Black Scholes model with current market prices of the exercised options initiates trades in the options markets. The Black-Scholes pricing model is the most sought after by option traders who find the opportunity to buy those options that are priced higher under this formula as compared to the actual market prices. However, the Black Scholes model helps in finding out the prices of only European options. European options can be exercised only on the expiration date. Previ-

ous studies have worked on testing the accuracy of the prices given by the Black Scholes model under normal circumstances, but few studies have studied the accuracy under stressful scenarios [18].

Under difficult market conditions [18]. Even though the effect of informed trading on open interest is less clear because most ways to trade options can either increase or decrease open interest, open interest has been used in a number of studies along with trading volume [19]. We examined the research papers in the equity option domain. The goal of this study is to find past research in this area, evaluate it, and analyse it by answering the most important research questions from 1982 to 2022. The contributing share of stock index option volumes has surpassed single stock option volumes, with Asia-Pacific outweighing America in 2022, revealing newer dimensions to be explored in this topic. Further, this review paper comprehends different variables used by the researcher in the past for the application of open interest and option volumes for market players. No previous studies, to the best of our knowledge, have been conducted so far in highlighting the utility of the equity options segment which can be availed by investors or traders. We fill that gap with this review paper.

- What are the most common keywords in the area of stock options and index options?
- Which are the most cited articles and their strategies?
- What are the publication trends in the equity options domain?
- Which are the leading source titles with country analyses and institution-wise analyses in the present study?

### Research Methodology

This study has used the systematic approach as suggested by Tran field for the coverage of literature in terms of objectivity as well as comprehensive coverage. Not only does a structured review help in mapping of present situation but also helps in outlining the potential research gaps in a specific area of study [20]. Bibliometric analysis has been used for this study which focuses on the information available areas as provided by bibliographic information. Following quantitative tools under bibliometric analyses have been used in this research. The tools of publication related metrics (total publications), total citation analyses, countries analysis, author analysis, source title analysis, authorship analysis, keyword analysis and co-occurrence analysis has been used [21, 22].

### Literature Retrieval and Selection

We have used electronic database covering the inclusion of major relevant studies. The present study uses a popular research tool i.e., Scopus bibliometric database with several academic resources on the topic of finance. In order to overcome the chances of omission of a relevant research study, we have determined the relevant keywords which is related to stock option, index option and open interest. For the purpose of selecting relevant research studies, the reviewer has used specific keywords related to the area of study in two groups under the titles, keywords, and abstracts of the documents from the Scopus website. Group 1 includes “index option”. Group 2 includes keyword “stock option”. Further, we have also

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highlighted the emerging trends and research areas regarding stock options, index options and open interest with the help of co-occurrence analyses, our results provide assessment of open interest in the research of equity derivatives. Below mentioned major clusters were found:

1. Volatility and options
2. Option prices, stochastic models
3. Financial markets, stock markets
4. Price determination, model test

Although there are many other types of financial services, including banking. But the subject of financial markets has been the sole focus of this study. Artificial intelligence has become more prevalent in the financial services industry. With the help of artificial intelligence, the bank can do its job more efficiently and make its customers happier [23]. This has enabled the banks in not only giving stiff competition to the fintech players but also collaborating with them [24]. India's fintech market has a bright future because the internet is getting better and more financial transactions are done online [25].

VOS's analysis paints a clear picture of the major four theme in the domain of equity options (Figure 3).

#### **Theme 1:** Volatility and options

The equity index options have greater volatility than the stock market, causing volatility skew. [26]. The starting point for a novice in the world of options trading is implied volatility. Based on the past data that is now accessible, it informs us of the likelihood of volatility in the future. However, it does not produce a precise forecast of the market's course. It is investigated whether trading activity generated by investors with varying information access and trading motivations has a positive or negative impact on index futures volatility. When time-to-maturity effects are taken into account, surprises in open interest are linked to more volatility near the end of a contract, which is the opposite of what is seen during normal times [27].

#### **Theme 2:** Option prices, stochastic models

Index option prices are determined in a multivariate framework. Stock option prices are generally determined in a univariate framework, which is not justifiable as the performance of the stock options depends on various market risk factors. A few studies have been conducted to analyse the relationship between actual option prices and the theoretical option values, with different conclusions depending on the sample. Contrary to well-known asset pricing models, the implied volatility of equity index options is higher than the actual volatility of the stock market. This is a pattern called the volatility skew [26].

#### **Theme 3:** Financial markets, stock markets

Stock exchanges are a part of the financial market where both major and secondary items are listed. The role of these exchanges in a nation's economy is becoming more and more important. Foreign institutional investors who make investments in publicly traded enterprises help a nation's economy thrive. The keywords employed in this study, especially stock options and index options, are understudied. From 2001 to 2021 duration, the United States leads all other nations with 86 publications, followed by the United Kingdom with 50, China with 43, Taiwan with 27, Australia, and Germany with 17 apiece. However, the keyword analysis shows that research on stock options and index options is extremely limited [22]. In a study, the role of technological progress in the Russian economy was shown through the use of FinTech and the development of human capital, the change of business processes based on modern financial technologies, the creation of new, promising opportunities, and the response to the challenges of Industry 4.0 [28].

#### **Theme 4:** Price determination, model test [22].

The futures price of any underlying asset derives its value from the price of the underlying. Future prices do not have any independent value of their own. Spot and futures prices are highly correlated. Hence, an increase in spot prices leads to an increase in future prices and vice-versa. Spot-Future Parity is the difference between the spot prices and future prices. There are a few factors resulting in this parity, such as market interest rates, dividend rates, and time to expiry. When inferred stock prices are compared to observed stock prices, it is clear that implied prices include information about equilibrium stock prices that is not fully reflected in observed stock prices [29].

### **Results**

The search strategy's method flows are depicted in Figure 1. The study was carried out on August 15, 2022. Initially, a search using the terms "index option," or "stock option" returned 1149 document results. Our parameters were further narrowed to the years 1982–2022, and we included only journal publications, conference papers and review articles because they had a greater level of trust in the study's subject. Some publications were left out because they were about the analysis of equity derivatives and had nothing to do with the topic of the study. After removing 390 entries, 759 results were finally considered for this study. Only the Scopus database was used. It is the largest database of peer-reviewed literature, including books, journals, and conference proceedings, is Scopus. Scopus provides a comprehensive overview of the study output produced throughout the world in the areas of science, technology, medicine, social sciences, and the arts and humanities. The database also uses sophisticated tools for tracking, analysing, and visualising research.

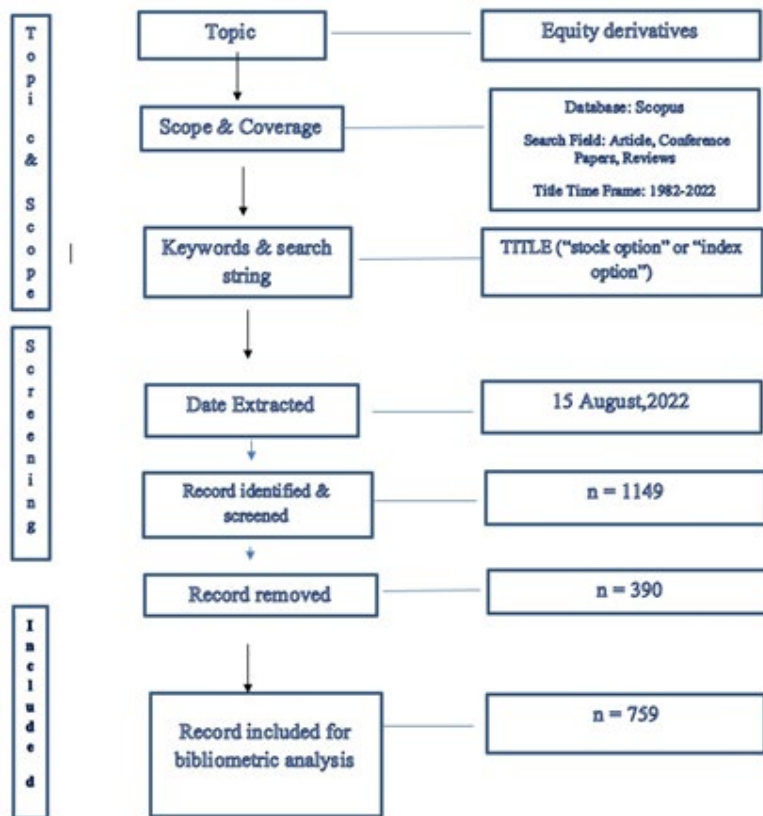
**Table 1: Volumes of Derivative Markets**

Single Stock Options	H2 2021	H1 2022	%Change H1'22 /H2'21
America	4,348,582,940	4,027,965,530	-8.29%
Asia Pacific (APAC)	476,127,892	504,004,689	42.07%
Europe, Middle East, Africa (EMEA)	166,532,712	177,047,694	-4.98%
Total	2,505,559,559	2,833,376,881	19.68%
Stock Index Options	H2 2021	H1 2022	%Change H1'22 /H2'21
America	420,140,039	496,286,567	44.37%
Asia Pacific (APAC)	9,299,339,407	14,283,048,191	146.07%
Europe, Middle East, Africa (EMEA)	218,658,381	261,296,610	19.31%
Total	9,938,137,827	15,040,631,368	136.22%

Source: World Federation of Exchanges

It is clear from Table 1 above that in the first half of 2022, the APAC region witnessed maximum growth with 42% in the single stock option segment, followed by -8.29% and -4.98% changes in the Americas and EMEA regions, respectively. It was due to the growth registered in the APAC region that there was around 20% growth in the single stock options segment globally. On the other

hand, there was a growth of 136% in stock index options globally, with major growth contributed by the APAC region. It implies that the contribution of the APAC region in the derivatives market is becoming crucial and sustainable globally while the other regions are going through market correction. The growth percentage is mentioned over the second half of 2021.



**Figure 1: Flow diagram of the search strategy**

**Source:** Shafie, M. F., & Yaacob, M. H. [22]. Global Financial Trading Strategies: A Bibliometric Analysis of the Indexed Publications in Scopus between 2001 – 2021. International Journal of Academic Research in Business and Social Sciences, 12(2), 165–181 [22].

## Publication Analysis

The annual performance of publications is seen in Table 2. It shows that even if publications and citations are increasing generally, the total number of publications and citations on the subject under research throughout the study period was, respectively, and. With

857 citations since 2002, "The Fine Structure of Asset Returns: An Empirical Investigation" is the most frequently mentioned article. Figure 2 shows a bar graph diagrammatic depiction of the below table

**Table 2: Top authors, institutions, and countries of options and open interest research in finance**

TC	Author	TP	TC	Institution	TP	TC	Country	TP
179	Bollerslev T., Gibson M., Zhou H.	2	192	College of Business, University of Central Florida	1	13563	United States	239
	Carr P., Wu L.	4	212	University of Chicago	1	427	Taiwan	58
192	Leigh W., Purvis R., Ragusa J.M.	1	222	University of Waterloo	1	1657	United Kingdom	61
212	Kelly B., Jiang H.	1	243	Banque de France	2	221	India	53
222	Hardy M.R.	1	246	Jones Graduate School of Management, Rice University	1	503	Australia	31
243	Jondeau E., Rockinger M.	1	257	Desautels Faculty of Management, McGill University	1	387	China	46
246	Fleming J.	2	257	Marshall School of Business, University of Southern California	1	872	Germany	43
257	Christoffersen P., Heston S., Jacobs K.	3	260	Columbia Business School and NBER	3	690	Hong Kong	37
257	Jones C.S.	1	280	University of California's School of Business, University of California	8	551	France	33
260	Bekaert G., Hoerova M.	1	293	University of North Carolina Athens	6	1	Saudi Arabia	1
280	Gârleanu N., Pedersen L.H., Poteshman A.M.	1	311	University of Manchester	4	98	Japan	11
293	Connolly R., Stivers C., Sun L.	3	312	Department of Econometrics, Free University Amsterdam	1	161	Portugal	6
311	Poon S.-H., Rockinger M., Tawn J.	1	329	University of Texas at Dallas	8	596	Switzerland	23
312	Koopman S.J., Jungbacker B., Hol E.	1	348	University of Maryland	14	66	Czech Republic	6
329	Day T.E., Lewis C.M.	1	361	School of Management, Cranfield University	1	526	South Korea	36
348	Bakshi G., Kapadia N.	5	388	Georgia Institute of Technology	2	991	Canada	29
361	Christopher M., Holweg M.	1	389	Owen Graduate School of Management, Vanderbilt University	2	758	Netherlands	16
388	Lee S.S., Mykland P.A.	3	497	Bloomberg LP and Courant Institute, New York University	1	224	Italy	21
389	Bollen N.P.B., Whaley R.E.	1	502	School of Economics and Management, University of Aarhus	3	188	Spain	22
509	Wiggins J.B.	1	509	Cornell University	1	87	Brazil	7

549	Brown L.D., Caylor M.L.	1	549	Georgia State University Carolina	2	114	Belgium	11
662	Bates D.S.	1	662	University of Iowa	7	1165	Denmark	11

Note(s): TC = total citations. TP = total publications. The research constituent (i.e., author, institution, country) appear according to total citations in this table.

### Countries Analysis

Table 2 also shows that the United States, with 239 publications, is the top country for producing articles on equity options and open interest, followed by the United Kingdom, with 61; Taiwan, with 58; and Australia, with 58; China, India, South Korea, France, Hong Kong, Australia, and Germany, each with more than 30 publications.

### Institutional Analysis

The most productive colleges with at least five publications are listed in Table 2. With fourteen publications, the University of Maryland leads the pack. It is followed by the Universities of California, Texas at Dallas, Iowa, and North Carolina at Athens, all

of which have more than five publications. Based on number of citations, Carr P, Geman H., Madan D.B., Vor M emerges as the most impactful and influential author in options and open interest research in finance with 857 citations, followed by Bates D.S with 662 citations. In terms of number-of-publication productivity, Bakshi G., Kapadia N.is the most productive author with five publications. Among institutions, based on collected citations, the University of Iowa is the most influential institution with 662 citations. Based on number of the publications, the University of Maryland is the most productive institution with fourteen publications. Among countries, the United States has the maximum no. of contributions in options and open interest research in finance (239 publications), with the highest number of citations of 13563.

**Table 3: Top articles on stock options and index options in finance.**

Author	Title	TC
Bollerslev T., Gibson M., Zhou H.	Dynamic estimation of volatility risk premia and investor risk aversion from option-implied and realized volatilities	179
Carr P., Wu L.	A tale of two indices	187
Leigh W., Purvis R., Ragusa J.M.	Forecasting the NYSE composite index with technical analysis, pattern recognizer, neural network, and genetic algorithm	192
Kelly B., Jiang H.	Tail risk and asset prices	212
Hardy M.R.	A Regime-Switching Model of Long-Term Stock Returns	222
Jondeau E., Rockinger M.	Conditional volatility, skewness, and kurtosis: Existence, persistence, and comovements	243
Fleming J.	The quality of market volatility forecasts implied by S&P 100 index option prices	246
Christoffersen P., Heston S., Jacobs K.	The shape and term structure of the index option smirk: Why multifactor stochastic volatility models work so well	257
Jones C.S.	The dynamics of stochastic volatility: Evidence from underlying and options markets	257
Bekaert G., Hoerova M.	The VIX, the variance premium and stock market volatility	260
Gârleanu N., Pedersen L.H., Poteshman A.M.	Demand-based option pricing	280
Connolly R., Stivers C., Sun L.	Stock market uncertainty and the stock-bond return relation	293
Poon S.-H., Rockinger M., Tawn J.	Extreme value dependence in financial markets: Diagnostics, models, and financial implications	311
Koopman S.J., Jungbacker B., Hol E.	Forecasting daily variability of the S&P 100 stock index using historical, realised and implied volatility measurements	312
Day T.E., Lewis C.M.	Stock market volatility and the information content of stock index options	329
Bakshi G., Kapadia N.	Delta-Hedged Gains and the Negative Market Volatility Risk Premium	348
Christopher M., Holweg M.	"Supply Chain 2.0": Managing supply chains in the era of turbulence	361

Lee S.S., Mykland P.A.	Jumps in financial markets: A new nonparametric test and jump dynamics	388
Bollen N.P.B., Whaley R.E.	Does Net Buying Pressure Affect the Shape of Implied Volatility Functions?	389
Carr P., Wu L.	Variance risk premiums	497
Christensen B.J., Prabhala N.R.	The relation between implied and realized volatility	502
Bakshi G., Kapadia N., Madan D.	Stock Return Characteristics, Skew Laws, and the Differential Pricing of Individual Equity Options	508
Wiggins J.B.	Option values under stochastic volatility: Theory and empirical estimates	509
Brown L.D., Caylor M.L.	Corporate governance and firm valuation	549
Bates D.S.	Post-'87 crash fears in the S&P 500 futures option market	662
Carr P., Geman H., Madan D.B., Vor M.	The Fine Structure of Asset Returns: An Empirical Investigation	857

Note(s): TC = total citations.

After identifying the top 26 research papers on the topic of index options and stock options (shown in Table 3), we find that Carr P is the most cited author with 857, 497 and 187 citations as first author. Each of the selected paper has more than 180 citations and he has contributed significantly in research in the area of derivatives.

**Table 4: Top journals for options and open interest research in finance**

Journal	TC	TP	1990-2000	2000-2010	2010-2020
Review of Financial Studies	2544	7		6	1
Management Science	257	1		1	
Journal of Economic Dynamics and Control	243	1		1	
Journal of Finance	389	1		1	
Journal of Empirical Finance	558	2	1	1	
Journal of Accounting and Public Policy	549	1		1	
Decision Support Systems	192	1		1	
Journal of Business	857	1		1	
Journal of Econometrics	1508	4	2	1	1
Journal of Financial and Quantitative Analysis	293	1		1	
Journal of Financial Economics	1011	2	2		
North American Actuarial Journal	222	1		1	

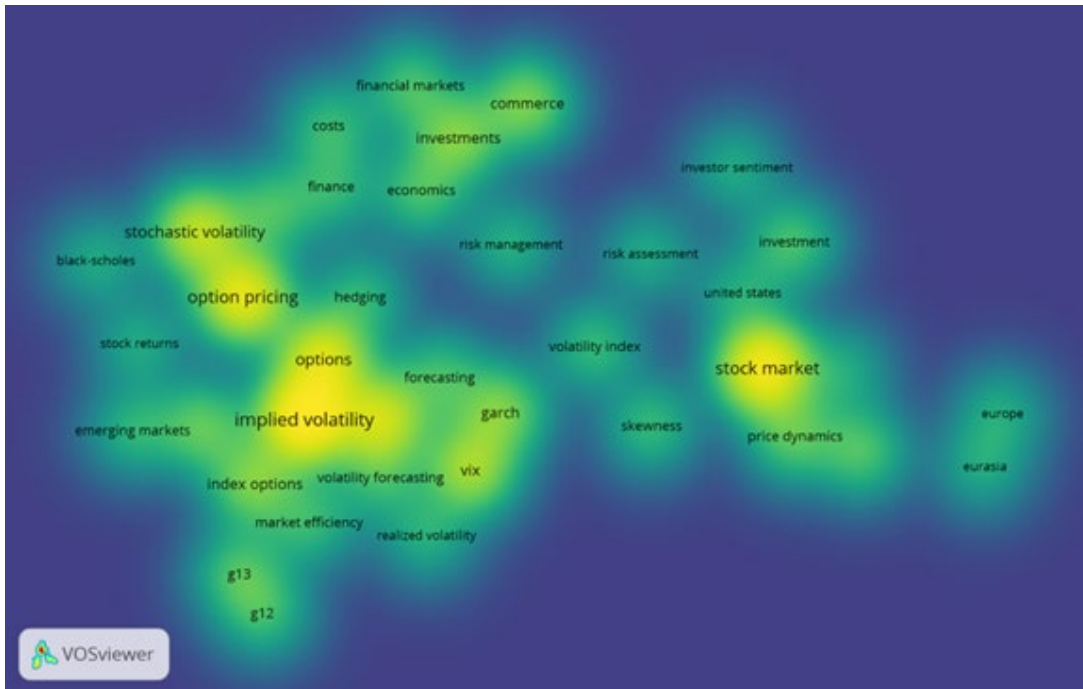
#### Source Title Analysis

Review of Financial Studies and Journal of Econometric are also the two most productive journals with 7 and 4 publications, respectively (Table 4). The overall publication trend in this area is declining. Except these two journals, there is no other journal with even a single publication in the area of options and open interest from 2010-2020. However, on analysing the research publication numbers in the mentioned topic from 1990-2000, it was observed that only Journal of Financial Economics and Journal of Econometrics with 2 publications each and Journal of Empirical Finance with 1 publication is found. However, in a decadal study, there were 16 cited publications in 2000-2010 period as compared to 5 and 2 in the time periods of 1990-2000 and 2010-2020 respectively. It is

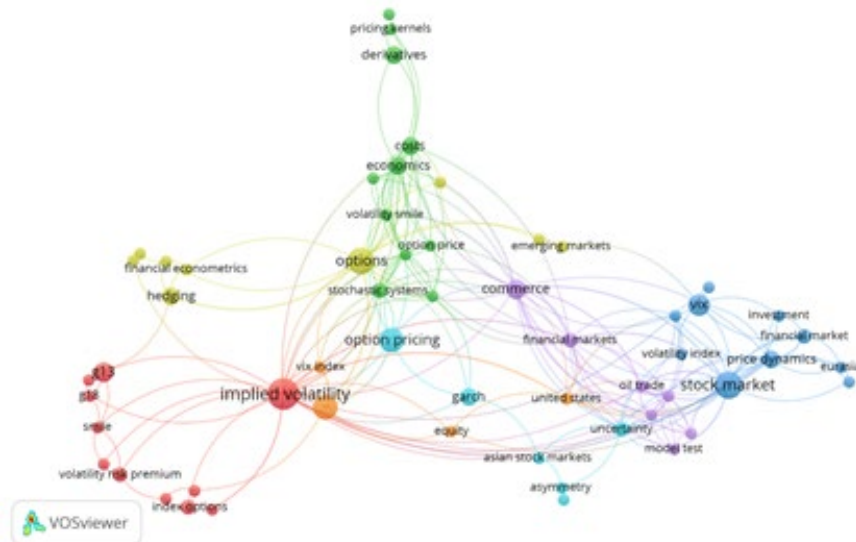
also clear from Table 4 as above, the top-cited Journals are Review of Financial Studies and Journal of Econometrics with 2544 and 1508 citations respectively. Review of Financial Studies Journal is leading with 7 publications and 2544 citations.

#### Keyword Analysis

Figure 2 makes it evident that the most used terms are option pricing, options, implied volatility, financial markets, risk management, price dynamics, Black Scholes, stochastic models, stock returns, stock market, garch, and VIX. The yellow tint, however, indicates the keyword used in the most recent publications. Implied volatility, options, options pricing, etc. have become the new trend.



*Figure 2: Co-occurrence of the keywords: Density Visualization*



*Figure 3: Thematic Clusters using Network Visualization*





Figure 4: Co-Citation analysis in terms of cited references

As per Figure 4, the most cited reference for co-citation is black, f., Scholes. with 54 citations followed by bakshi with 37 citations [30-32].

Table 5: Identifying future research themes using Open Interest with other variables

Category	Research Finding	Future Research Scope
Open Interest and Earnings	OI value tends to increase or decrease before announcement in different studies in CBOE and AEX	Empirical research can be undertaken to analyse the relation between earnings announcement dates and open interest
Open Interest and M&A	Trading activities (OI and TV) have increased significantly on days prior to M&As announcement on CBOE	Similar studies on other exchanges can be applied
Open Interest and News	TVs are slow in their responsiveness for announcements with a lag of two hours	How social media can address this issue of time lag gap effect?
Open Interest and Volatility	Trading Volume of FIIs is significant in predicting the volatility for study based on Taiwan Exchange	Similar studies on other exchanges can be applied
Open Interest and Price	OI-based active strategies generate better return than passive strategies	Empirical research can be undertaken to analyse the relation between OI-based active strategies and passive strategies for generation of returns
Stock options and option returns	Analyzing the empirical study on individual equity options and providing suggestions for further studies	How equity option returns are calculated and how algorithmic trading affects the option markets?

### Research Implications

Researchers in the field of financial markets who want to work on the equity options and open interest domain can use this review article as a reference. The study suggested a few untapped research topics in this area that could be the subject of future investigation. This review study will not only help scholars, but it will also help policymakers and investors make better decisions.

### Conclusion

It is evident from an analysis performed using publication related metrics (total publications), total citation analyses, countries analysis, author analysis, source title analysis, article analysis, authorship analyses, keyword analysis and co-occurrence analysis that the studies in the area of index options and stock options have not gained much interest. This article highlights the present research

status and to follow the most influential authors, impactful sources, highest publication institutions in the field of Index options, stock options and open Interest. The use of open interest analysis in the live market hours has therefore possess a significant scope for the researchers to explore. With the emergence of cryptocurrency as a digital financial asset globally, the results produced by bibliometric analysis clearly highlights the untapped potential of research in the area of this study in a meticulous manner. In line with what has been found in previous studies, open interest and option volumes are still important for predicting future prices. The Fourth Industrial Revolution, also known as Industry 4.0, emphasizes connectivity, automation, machine learning, and real-time data. The Asia-Pacific area has surpassed all of America and Europe in terms of stock derivative growth because of artificial intelligence, which is a component of Industry 4.0. Algorithmic trading, which is the manifested form of artificial intelligence, has positively affected the volumes in the financial markets. Considering these developments, the scope of equity options has widened and the same can be explored by various stakeholders.

### Competing interests

The author(s) declare no competing interests.

### Data availability

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request

### Ethical Statement

- This article does not contain any studies with human participants performed by any of the authors.
- For all research involving human subjects, freely-given, informed consent to participate in the study must be obtained from participants (or their parent or legal guardian in the case of children under 16) and a statement to this effect should appear in the manuscript

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