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Stock markets volatility before and after COVID-19 Pandemic: A bibliometric analysis

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Abstract
Purpose: The study aims to identify the reasons behind volatility in stock markets pre or post COVID for getting insights that may be beneficial for coping with similar situations in the future.
Design/Methodology/Approach: To analyze the same, the paper has review procedures used in the study as following (Anggraini *et al.*, 2021) with modifications, also adopted systematic literature review with the help of VOS Viewer and Biblioshiny to conducted review of included analysis of co-words to map themes. Reviewed articles were identified by entering the search keywords "Pandemic AND Stock Markets", "Pandemic AND Volatility", "Stock market volatility" and "COVID-19 Pandemic" in the Scopus Database. A set of criteria was applied, 77 articles were used in this subsequent analysis. There is a recognition of country setting and recognised their findings, and the lessons learned are further determined.
Findings: As per WHO, COVID-19 has been designated a global pandemic as its impact is seen in many countries, many researchers have adopted the setting in 2 or more countries i.e. International. 6 clusters of themes are identified namely. Thus, the several lessons learnt cover several elements related to the stock market.

Keywords: Stock markets, COVID-19 pandemic, volatility, literature review

Introduction

The COVID-19 outbreak that emerged in early 2020 had far-reaching consequences, posing risks to both the health and economic sectors of numerous countries across the globe. The COVID-19 pandemic has been distinguished from the preceding global financial crisis of 2007-08, despite its comparable effect on the worldwide financial system (Deb, 2021) [22]. The COVID-19 pandemic has had a significant impact on various sectors, societal levels, and nations across the globe. According to Yaseen and Omet (2021) [104], there exist several ramifications on a macro level, notably the unparalleled influence on the capital markets, particularly the stock markets. The World Health Organisation declared COVID-19 a global pandemic on March 11, 2020. Following this announcement, the MSCI World Index experienced a decline of up to 18% on the eighth day, as reported by Market Watch in 2021. Also, various events occurred in the economy since the COVID-19 outbreak led to a decline in the stock price return, uncertainty, and loss of investor confidence that automatically affected the financial markets negatively (Iyke & H, 2021) [47]. The observed adverse impacts on the stock markets are consistent with Fama's (1970) [28] theoretical proposition that stock prices promptly respond to novel information pertaining to the stock, encompassing risk considerations. Burns, Peters, and Slovic (2012) [14] and Liu *et al*. (2020) [43] have observed that a positive correlation exists between the market value and the prevalence of favourable news concerning the external environment. Conversely, an inverse relationship is evident between market value and unfavourable news. The severe health crisis happened due to COVID-19, with a continuous rise in confirmed cases and fatalities observed during its initial year. To combat this outbreak and prevent the pandemic's rapid spread, various measures undertook like restrictions on mobility, lockdown, social distancing, ban on gatherings, learning from home, cancellation of events, restrictions on cross-boundary entry and fiscal stimulus, etc. around the globe (Phan & Narayan 2020, Abu *et al*., 2021; Hunjra *et al*., 2021) [79, 114, 46]. In the last years, various economies around the globe have experienced financial crises, market crashes, and recession. There has been negative impact on overall economic growth due to the impact of COVID-19, with an average decline of -3.59% as

reported by the World Bank in 2021. Additionally, the pandemic has been found to cause shock, fear, and panic among investors, as noted by He *et al*. (2020) [41]. In light of the aforementioned phenomenon, it is imperative to conduct an analysis and gain comprehension of the reactions exhibited by various stock markets, as well as to review literature pertaining to global stock markets amidst the pandemic of COVID-19. The research questions trying to be addressed in this research paper are.

1. What has been done in the research area of stock market till here has to be finding out by their findings, themes, and country setting.
2. From the first step, the results have to be drawn out?

Thus, this bibliometric analysis investigated what and how results in volatility in stock markets in pre or post-COVID using the Scopus Database. The articles related to the topic were taken and the search query was further refined by publication years and document types. Finally, 77 articles were used in this paper. The data analysis was performed using Ms. Excel, VOS Viewer, and Biblioshiny software.

Methodology: The procedures for conducting a literature evaluation as well as the search technique that was applied were outlined in this section. Systematic Literature Review is the research approach that was adopted for this study. PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis), is a set of recommendations that can be used to carry out SLR. According to Moher *et al*. (2015) [71], the PRISMA framework comprises clearly defined protocols that facilitate the comprehension and execution of reviews of extant studies while ensuring the validity, reliability, and replicability of said studies. The PRISMA framework incorporates a four-phase flow chart that facilitates the identification of high-quality literature and promotes transparent reporting of the review process, as outlined by Liberati in 2009 [56]. A systematic literature review has also been incorporated into this search strategy. This review should identify the motivation for the research topic and questions, apply screening criteria, strike a balance between breadth and depth, concentrate on the concept, provide syntheses and interpretations of the analysis, and adhere to an organised structure. (Fisch & Block, 2018) [33] To conduct SLR, 77 papers or journal articles were reviewed.

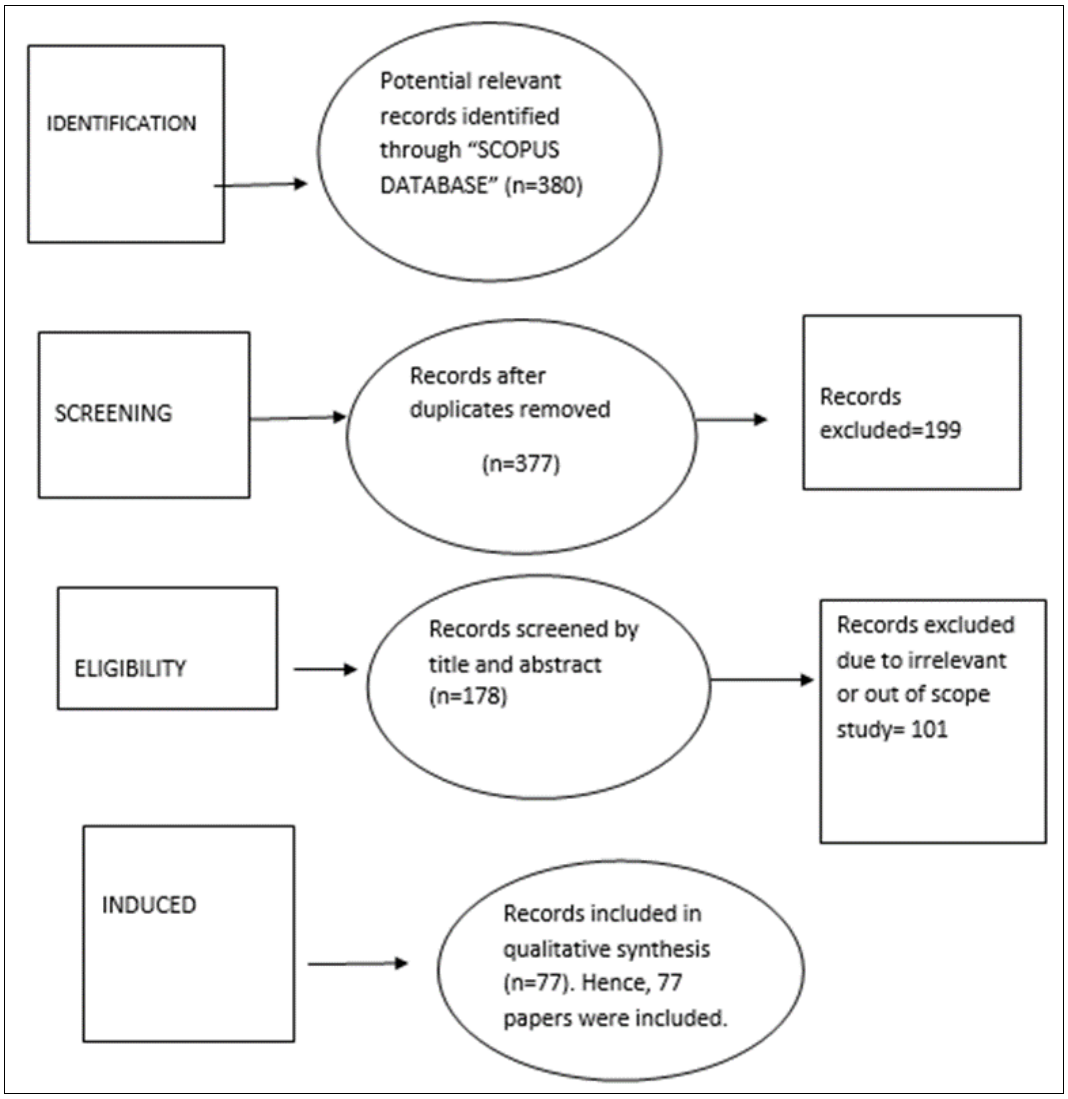

Fig 1: Reporting items for the Systematic Literature Review as per the PRISMA

Table 1: Characteristics of Included Studies

Year	The Number of Records Included
2017	5
2018	8
2019	14
2020	21
2021	14
2022	15
Grand Total	77

Research objectives and analytical techniques

This study makes an effort to improve previous economic literature by conducting a systematic literature review on the topic of volatility in stock markets, both before and after COVID-19, and by offering potential solutions to this problem. Through the utilization of VOS Viewer and Biblioshiny, the purpose of this study is to determine which core institutions, nations, authors, and research articles exist. In addition to this, the goal is to recognize relevant research subjects by utilizing techniques of scientific mapping such as co-occurrence and co-citation analysis. This will help achieve the goal. By making use of these research tools, we are able to carry out a comprehensive analytical evaluation and identify gaps in the existing corpus of published research.

Author's Keyword Analysis

This figure illustrates the results of the author's keyword analysis of the literature derived by the VOS Viewer software regarding the volatility of the stock market. The occurrence of two was chosen as the bare minimum. Hence, 32 different keyword clusters comprised the 32 terms that satisfied this criterion. The size of the bubbles represents the total connection strength as well as the number of times a particular item or term has been found. The top 5 keywords are- Stock market volatility, Volatility, COVID-19, Garch, and China with the occurrence of 41, 22, 9, 7, and 4 respectively.

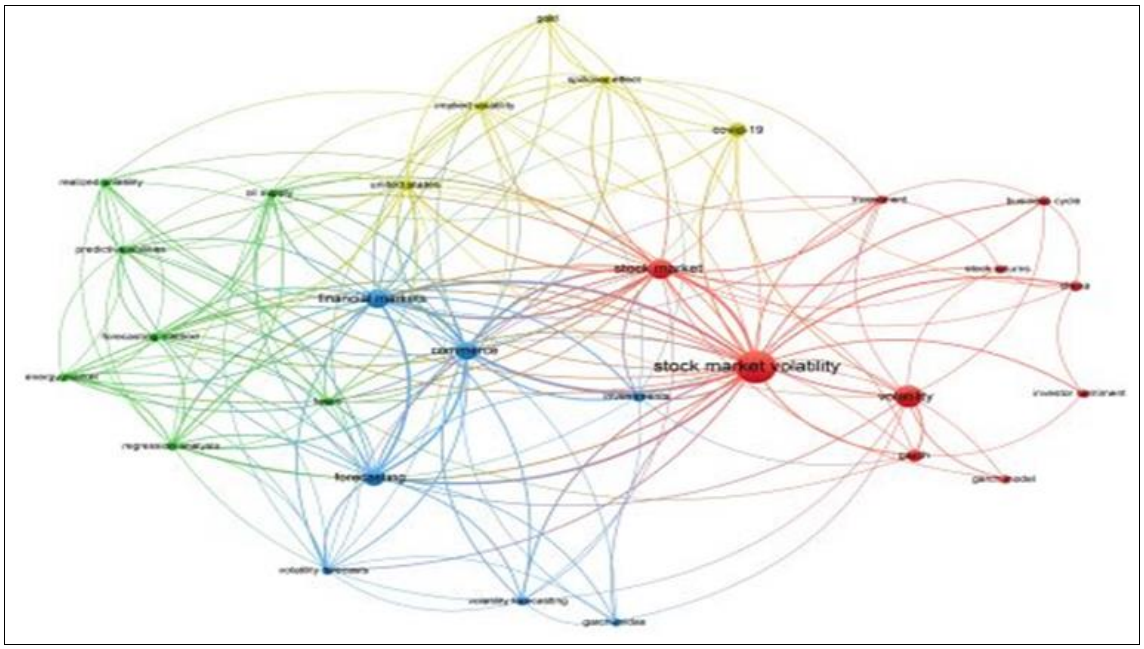

Fig 2: Authors' Keyword Analysis for volatility in stock markets from VOS Viewer software

Overview

3 - Field Plot: Affiliations, Keywords, and Countries

The presented figure depicts a three-factor analysis of the interrelationship between keywords (left), affiliations (middle), and countries (right). The findings indicate that the primary focus of the literature published by the top six countries, namely China, USA, India, Ireland, New Zealand, and France, is centred around four key themes, namely commodity, futures volatility, lasso, and garch-Midas. Furthermore, the study reveals a significant correlation between these themes and five prominent institutions, namely Atlanta Federal Reserve, Southwest Jiaotong University, Central University of France and Economics, Southern Illinois University Edwardsville, and the University of Pretoria.

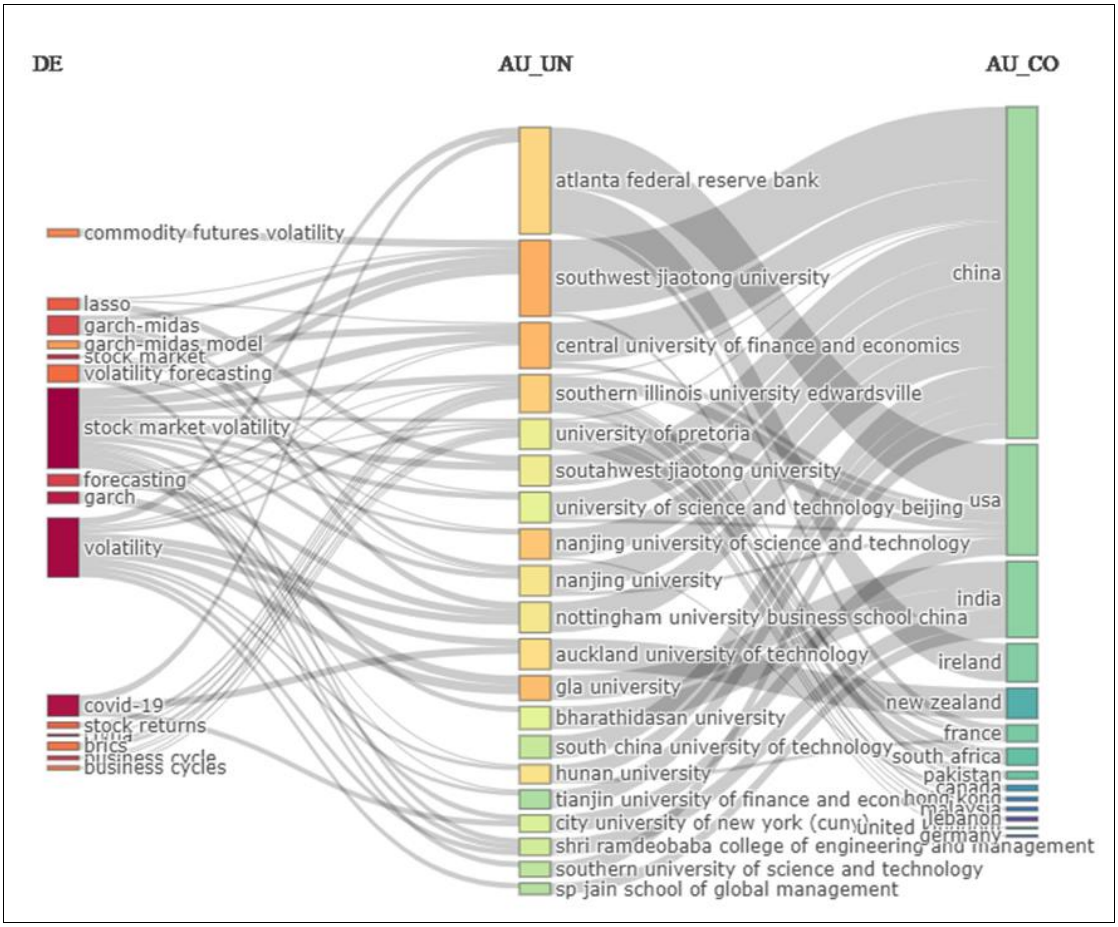

Fig 3: Relationship between affiliations, keywords, and countries

Most relevant authors

A total of 380 articles contributed to 77 publications related to volatility in stock markets research. The present section of the paper indicates information about the authors statistically. As per the graph, MA F ranked top as the most active author on the criteria of total documents with 5 documents (6.49% of all articles, followed by Gupta R (5.19% of all articles) and Demirer R (3.89% of all articles) and as follows.

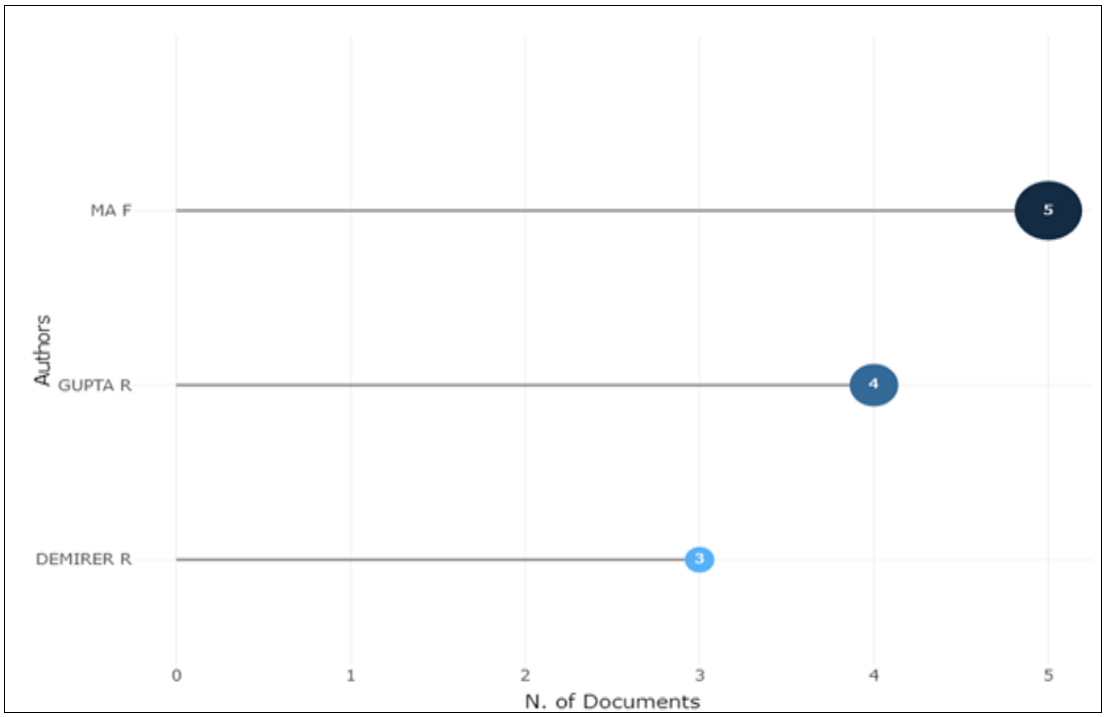

Fig 4: Most Relevant Authors

Table 2: The top 10 most active authors on volatility in stock markets research

Rank	Author Articles	Fractionated
1	MA F 5	1.42
2	Gupta R 4	1.00
3	Demirer R 3	0.75
4	Sun B 3	1.25
5	Yin L 3	1.00
6	Zhang Y 3	0.92
7	Agrawal V 2	0.83
8	Balcilar M 2	0.50
9	Dixit JK 2	0.83
10	Fang T 2	0.67

Conceptual framework

In this section, the selected studies analyse multiple research streams. A conceptual framework is proposed to analyse the density and centrality of network analysis, which integrates a bi-dimensional matrix and a co-occurrence network analysis known as a "thematic map."

Co-Occurrence analysis

Co-occurrence analysis, which may be defined as "the number of times two articles are cited together," is where we kick off the process of developing our conceptual framework. According to Rossetto *et al.* (2018) [115], the usage of co-occurrence analysis makes it easier to examine the intellectual structure in a systematic literature review, which in turn reveals the research structure and advancements of the most recent literature. The depiction of the citation of two different articles as separate nodes is a part of the co-occurrence analysis. According to Hjorland (2013) [44], the co-occurrence of two articles in a research publication can be used to determine whether or not the articles in question belong to the same topic area.

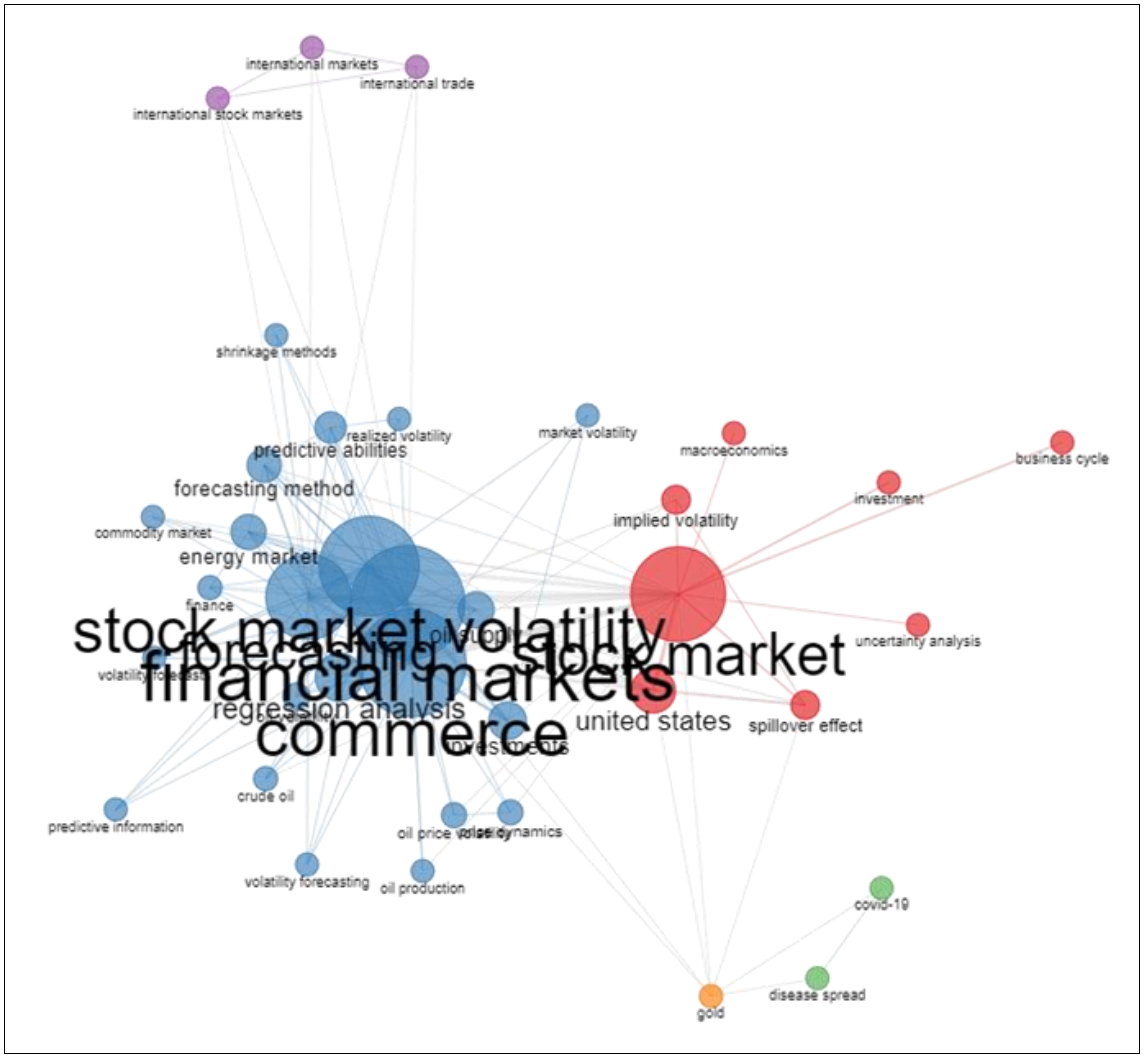

Fig 5: Co-occurrence Network Analysis

Thematic Map

We utilise the themes map to comprehend the growth of research related topic themes in the literature so that we may conduct a more in-depth analysis of the research tendencies. A graphical representation of research topics has been presented in the form of a thematic map. The x-axis of the map shows research theme centrality, while the y-axis depicts research theme significance and density. This depiction is used in order to conduct an analysis of the development of the selected study theme. The thematic map can be broken down into a total of four different sub-components. The thematic map illustrates a quadrant in the lower left region that encompasses themes experiencing a decline or emergence. These themes may either lose

relevance within the research area or garner heightened attention for further investigation. The quadrant located in the lower right of the diagram indicates a high degree of centrality but a low level of density, thereby demonstrating the presence of transversal or emergent themes. This study requires additional research focus. The section located in the upper left quadrant exhibits a low centrality metric, yet it demonstrates a high density value. The aforementioned themes are commonly referred to as motor themes, owing to their fundamental nature and extensive research focus. The "biblioshiny" software was utilised with a minimum frequency threshold of 5, and the representation label for each theme was established at 3. We would like to clarify that there is no discernible association between our work and the existing literature. However, it reflects the authors' subjective evaluation based on the optimal representation and fundamental dynamics of the dataset under consideration. Seven clusters have been identified, including predictive information, business cycle, financial markets, stock market, international markets, investment, and uncertainty analysis.

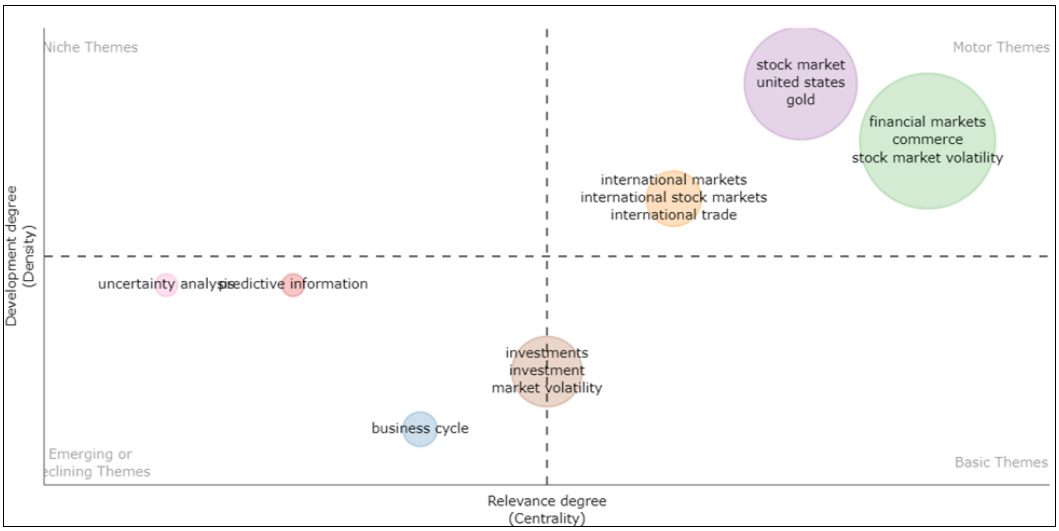

Fig 6: Thematic Map Analysis of Conceptual Framework

Thematic evolution

Tracing the evolution of various topics allows us to better explore and examine our analytical strategy. By using two time periods that are based on the author's subjective assessment to describe thematic evolution during the publishing time-frame of economic literature, we highlight the development of economic literature and the history of themes. We do this by using "Biblioshiny" and the "bibliometrics R package." The primary research intervals are from 2017 to 2020 and then from 2021 to 2022 accordingly. According to the findings of our analysis, research topics have developed. As per the table of thematic evolution, the main clusters are stock markets, volatility, forecasts, predictive information, financial markets, investment, and finance.

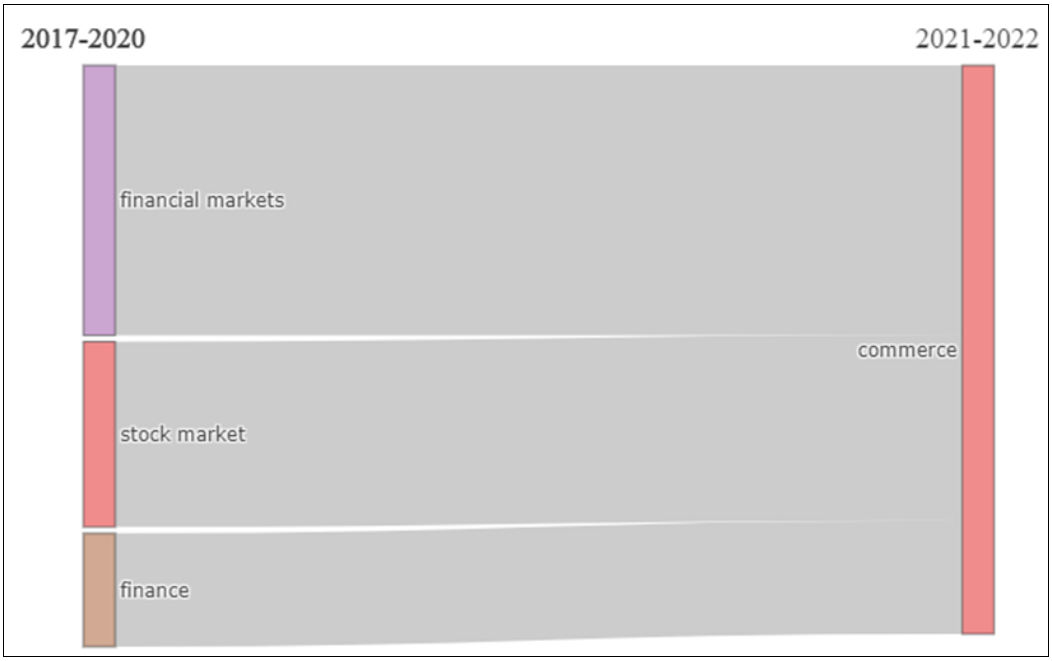

Fig 7: Thematic Evolution Map of Conceptual Framework

Conclusion and Discussion

This study has tried to provide an extensive review of scientific publications in the field of volatility in stock markets over time using Bibliometric Analysis. A total of 77 records were retrieved from a particular database. This literature review tries to identify the progression of discoveries from past study and, as a result, to take lessons from the causes that have been analysed for the world.

The bibliometric review conducted herein primarily summarises the findings of studies pertaining to stock market volatility across multiple nations. The research conducted on those documents was primarily undertaken by extensive teams. The present study involves an examination of research data obtained from the SCOPUS Database spanning the years 2017-2022. It is important to note that the observed data and patterns are subject to change as the global spread of COVID-19 continues to unfold. The article keyword grouping produced six cluster themes: Stock market volatility, COVID-19, Volatility, Garch, Forecasting, and Business Cycle. Future studies will provide updates on these dynamics.

Various themes emerged from the existing research findings based on Vos Viewer which are as follows

Assets Intensity: Asset intensity has been identified as a theme in market response, albeit with limited research conducted on it, as revealed through the analysis of Vos Viewe's themes. In the COVID-19 uncertainty, this theme emerged as the main characteristic of firms that has the potential to affect corporate resilience. Due to its high effecting potential, this study separates asset intensity and market responses discussion from one another. As per Poretti and Heo (2021) [10], The hospitality business is one of the most affected industries with asset-light strategies, and it incurred less negative anomalous returns within a minimal length of time when the World Health Organisation declared a global pandemic. This asset-light strategy leads to a fixed asset ratio in lower proportion, and more adaptability of companies towards uncertainty. Or, in other terms, the firms with an asset-light strategy are better at cash flow maintenance, and protection and able to avoid the cost of maintaining fixed assets. Various studies related to this also highlighted that variability in COVID-19 resilience can be explained through growth, cash amounts, and the firm's capital structure.

(Ding *et al*., 2021) [107], says that companies with more cash on hand are immune to pandemic pressure and companies with debt-sourced funds are less likely to cope with consequences of financial performance at market due to any uncertainty. In conclusion, certain studies have indicated that firms possessing asset flexibility and significant growth prospects are better equipped to respond to the impacts of a pandemic through the implementation of diverse cost-reduction measures, alterations to their operational strategies, or the acquisition of external funding, among other potential strategies. In the current era of the COVID-19 pandemic, the asset intensity approach is being widely implemented across various industries.

Contagion: as per (Siddiqui *et al*., 2020; Yu *et al*., 2021) [92, 107], the global outbreak of COVID-19 has prompted investors worldwide to capitalise on the advantages of diversification. The primary considerations pertaining to contagion that are of relevance to investors pertain to the stock market and the optimal timing of investment. The aforementioned issues have gained prominence due to the heightened correlation observed between stock markets amidst the ongoing pandemic, as noted by Le and Tran (2021) [53]. According to Yu *et al*. (2021) [107], when faced with an uncertain situation, short-term investors tend to prioritise risks that have a short-term impact, whereas long-term investors tend to give more weight to the risk of slower contagion.

Since the COVID-19 global pandemic, the most important factor for investors to take into account is the risk of contagion as it has spread throughout the world as a result of its impact on the global supply chain and investors' long-term expectations from financial markets around the world (Nogueira Reis and Pinho, 2020; Yu *et al*., 2021) [76, 107].

Market Responses- the COVID-19 pandemic caused disrupt in the global economy and capital markets, as noted by Hunjra *et al*. (2021) [46]. According to Alsedran and Hacine Gerbi (2021) [2], there has been a decrease in short-term trading activity as investors opt to hold onto their investments due to fear, which is believed to be a mediating factor in the impact of COVID-19 on the stock market. According to Khanthavit (2020a) [52], the majority of stock markets experienced adverse reactions subsequent to media coverage and the announcement of the pandemic, leading to a decline in stakeholder confidence in the market.

Various authors ascertain the fact that there was a damaging effect of a pandemic on stock market volatility (Chowdhury *et al*., 2021; David *et al*., 2021; Mishra and Mishra, 2021; Sheraz and Nasir, 2021; Uddin *et al*., 2021) [17, 21, 69, 89, 96].

Investor Herding: According to Khan *et al*. (2020) [51], an efficient market hypothesis was observed, wherein security prices always fully reflect all pertinent information. The research conducted by Harjoto *et al*. (2021) [40] suggests that the stock market returns, stock volatility, and trading volumes in emerging and developing economies have been adversely impacted by the daily cases and death rates caused by the COVID-19 pandemic. Investors have performed an updated analysis of the expected yields on the stocks that they own. According to the Efficient Market Hypothesis (EMH), investors respond in a variety of different ways to information presented in the media. During the beginning stages, there was a dearth of interest from potential investors. Despite this, investors gradually started to reassess the situation as information regarding the negative impacts of the epidemic began to circulate and become more widely known. This subsequently resulted in an abrupt and unfavourable response from all of the main stock markets (Khan *et al*., 2020) [51].

Lessons Learned through the Study

Due to COVID-19, irrationality has grown among investors in the market. When there is efficient information about the security prices and media reporting on deaths and the pandemic's negative effect, automatically rationality is overtaken by the irrationality of investors. As per (Shrotryia and Kalra, 2021) [91], an efficient investment portfolio is a way to handle the pandemic in the stock markets and two factors must be taken into consideration when constructing a portfolio, namely the type of portfolio and the timing of investment. (Siddiqui *et al*., 2020) [92].

Various industries like hospitality, tourism, and the utility sector got most affected due to the pandemic and restrictions imposed by the government like lockdowns, inter-state or inter-country travel bans, restricted movement, etc. There was a lack of coordination among various stakeholders of the government. Poor handling of the situation and lack of communication with the general public about the actual scenario results in fear in society. Insufficient coordination among nations has resulted in investor anxiety and apprehension. (Matos *et al*., 2021) [66]

According to the data obtained, the initial COVID-19 case was reported in China, however, the pandemic rapidly disseminated to other economies and nations as a result of their economic interdependence with China. The Chinese government's response to the COVID-19 pandemic was prompt and accurate in order to mitigate its adverse effects. As a consequence, investors continue to maintain their trust in the Chinese stock market (Siriopoulos *et al*., 2021; Yu *et al*., 2021) [93, 107].

The government should also pay attention to stock market liquidity while making policies. Various measures can be taken to restrict volatility due to panic among investors like a viable economic structure could be maintained. Government can help in revitalizing the economy by reducing its interest rates, infusing more funds into the capital markets, and economic recovery packages.

Companies should also take part on their behalf by adopting flexibility in their operation by lasing fixed assets and sufficient cash holdings. Companies also have to maintain financial leverage to deal with the shortcomings generated by the uncertain situation such as in the case of this pandemic.

Limitations and Future Research Dynamics

The scope of this investigation was restricted to Scopus publications that were catalogued under the subject area of stock market volatility prior to and following the COVID-19 outbreak. As our study was primarily concerned with bibliometric considerations, we did not undertake an assessment of the geographic relevance of the research incorporated. The databases, namely Web of Science, PubMed, Google Scholar, and Dimension, may yield distinct search results. However, conducting a comparative analysis of these databases is beyond the purview of this study.

Subsequent research in this field would need to corroborate the current results with data collected over an extended period of time. The research may also examine the influence of economic and diverse financial market tools on an extensive quantification of partnerships in individual studies.

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