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Review Article

Response of Financial Markets to COVID-19 Pandemic: A Review of Literature on Stock Markets

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Abstract

The objective of this research is to consolidate the literature published on the COVID-19 crisis impact on global stock markets to gain managerial implications from the crisis. It performs a thematic bibliometric review of the literature published in Scopus-ranked journals since the beginning of the pandemic using FCWI, Piecharts, and VOSViewer. It identifies the most under-researched regions and eight emerging sub-themes. The research finds that the benchmark theme is market behavior during the COVID-19 crisis, whereas an emerging benchmark theme is the markets after the COVID-19 crisis. The holistic view of the literature supporting eight sub-themes suggests that the government's role is of utmost importance to handle the impact of the COVID-19 crisis, which should be industry-specific. It identifies that all eight sub-themes of the research are the future research directions in all and specifically in the South American, African, South East Asian, and Oceania regions till the crisis continues.

Keywords:

COVID-19 Crisis; Stock Markets; Thematic & Bibiometric Analysis; Economic Growth; Managerial Implication.

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1- Introduction

Stock markets are always affected by major events and uncertainties [1]. COVID-19 has affected all aspects of the global economy, and stock markets are not an exception [1–3]. Its impact on the stock markets around the globe has been addressed in various studies [2, 3]. However, there is a need to set a benchmark for contemporary research by taking a holistic perspective of the findings of the leading researchers [4]. This is important because the stock markets are sensitive to economic, social, natural, political, and environmental shocks and uncertainties [4, 5]. The instabilities caused by such sensitivities work in two ways. That is stay the stock market receives instabilities from social, natural, political, and socks and spills them over to the economy [5]. The information about historical trends, themes, and forests is important because it urges investors to make decisions about buying, selling, and holding the investment portfolio according to the situation of the respective stock markets. Furthermore, news related to the economy, such as news related to economic growth, monetary policy, and foreign exchange, etc., influences the decisions of investors. Besides news, events and expectations affecting the economy also affect the stock markets and their respective indices [4, 5].

A new challenge to the stock markets that has emerged recently is from the health sector, viz., the COVID-19 crisis. Its impact on the economic and financial indicators is also unprecedented [5]. Literature suggests that previous the pandemics, viz., Ebola and Severe Acute Respiratory Syndrome (SARS), also had an impact on the stock markets [6,

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7]. The impact of the COVID-19 on stock markets is therefore quite natural and logical [8, 9]. Bloomberg (2022) suggests that COVID-19 has emerged as the most significant event in the entire history of the world has ever faced [10].

Countries around the globe applied unusual monetary, administrative, and fiscal measures to counter the negative effects of the COVID-19 crisis on their economies. The administrative measures include local lockdowns, quarantines, and a ban on flights. However, the restrictions on mobility instigated uncertainty and fear among the investors, which urged them to look for alternative investment opportunities to remain profitable [11, 12]. This is because during the COVID-19 pandemic the stock indices around the globe got affected in a similar manner as were affected in the case of previous crises [13–17].

The economic impact of COVID-19 has been categorized into demand and supply sides. The supply-side effects mean a loss in employment opportunities, and the demand-side effects mean a loss in income. It is argued that the supply side effects actually create demand side effects. This is because the loss of employment opportunities creates a loss of income that ultimately affects demand for goods and services, including the investment potential of the investors in the stock markets [18]. This situation creates many research questions: (1) How are the pandemic effects passed on to the stock markets and what disturbances are created in the stock markets as a result? (2) What are the reactions of stock market investors? (3) What is the response of the government? (4) What are the future options available for remedial actions? To answer these questions, this research uses literature published on the COVID-19 impact on the stock markets in the journals ranked by the Scopus database.

This study makes significant contributions to the literature in the following ways. First, this is the first comprehensive attempt to consolidate the quality literature on the COVID-19 impact on the stock market. This is because all previous reviews address the impact of the COVID-19 partially, such as the economic impact on the whole economy; the impact on all financial markets, but not on the stock markets specifically; or the impact on any particular region or group of regions [13–17]. This study narrows down the work of Goodell [5], Maliszewska et al. [18], and Padhan and Prabheesh [19] by investigating the impact on the stock markets only. Lastly, this research makes consolidated policy recommendations for the global coordinated efforts and for handling the COVID-19 crisis with reference to the stock markets.

The COVID-19 pandemic has augmented the risks faced by investors in the stock markets [20–26]. The augmented risks mainly come from the increased volatility and the reduced stock returns across the global stock markets [20, 27–34]. It is further observed that the delays in investor decisions resulting from the global news of the COVID-19 crisis also affect the stock markets negatively [5]. The rest of this manuscript has been organized as follows. Section 2 discusses methodology; Section 3 summarises findings and literature on the COVID-19 impact on the stock markets; Section 4 discuses results; and Section 5 presents conclusion, limitations, policy recommendations and the future research directions.

2- Materials and Methods

In order to address the research objectives, this research performs the thematic bibliometric analysis in terms of [35, 36]. It also follows Noor at l. [37] for conducting thematic analysis using VOSViewer. These are the methods to evaluate outcomes and performance using scientific mapping of the literature. Scientific mapping has been primarily used to understand structure, and development of a scientific field using different types of inputs and outputs as units of analysis [38, 39]. Following scientific mapping this research has created various bibliometric networks using keywords. The keywords have been linked using co-occurrence analysis leading into sub-themes [40]. This form of inquiry is important because it clarifies cognitive and conceptual dimensions [38].

2-1- Data

This manuscript and its relevant information viz., citations, journals, publisher and FCWI have been extracted from Scopus and Web of Science databases. Initially research papers have been searched using the keyword “Stock Markets” that yielded 72,670 documents in Scopus and 72,431 documents in Web of Science. Subsequently, we restricted this research to include publications since 2020. This yielded 12,537 documents in Scopus and 12,386 documents in Web of Science. In the next step we narrowed down the manuscripts using the keyword “COVID-19”. This resulted in 126 documents in Scopus and 22 documents in Web of Sciences. Finally, the research selected manuscripts published in business, finance, management, social sciences and accounting journals. This produced 112 manuscripts in Scopus and only 12 in Web of science. Of the 12 journals in Web of Science 11 appeared in Scopus as well. Therefore we used Scopus only as the primary database for the purpose of this research.

3- Summary Findings

3-1- Analysis of Scientific Production on COVID-19 Crisis Impact on Stock Markets

Since COVID-19 is a new topic consisting of publications within the last about 1.5 years, therefore this research identifies the most cited and influential manuscripts, journals, publishers and authors along with the themes of research

emerging from the keywords and conclusions of the research publications. The influence has also been calculated in terms of field-weighted citation impact (FWCI). FWCI is a measure that is provided by the Scopus with each published document that "Shows how well this document is cited if compared to similar documents. A value greater than 1.00 means that the document has been more cited than expected. Field-Weighted Citation Impact is the ratio of the total citations actually received by the denominator's output, and the total citations that would be expected based on the average of the subject field."

Table 1 shows 5 journals that have published research papers in the area of the COVID-19 impact on the stock markets. It shows that the journal Finance Research Letters has published the most and has been cited the most. Their number of publications and citations has exceeded by far than the other journals, which shows significant contribution of the journal Finance Research Letters towards the development and understanding of the topic. The Journal of Behavioral and Experimental Finance is at the second position and the Journal of Emerging markets is at the third.

Table 1. Top 5 Most Cited Journals

Journals	TP	Publisher	Citations
Finance Research Letters	33	Elsevier	774
Journal of Behavioral and Experimental Finance	8	Elsevier	412
Emerging Markets Finance and Trade	6	Routledge Taylor & Francis	361
International Review of Financial Analysis	9	Elsevier	178
Research in International Business and Finance	3	Elsevier	125
Others	53		379
Total	112		2229

Table 2 shows the most cited publishers in the area of the COVID-19 impact on the stock markets. It shows that the journals by the Elsevier group have by far produced more publications than any other publisher with 72 publications and 1733 citations. The publisher at the second place is Routledge Taylor & Francis with 21 publications and 462 citations.

Table 2. Top 5 Most Cited Publishers

Publishers	TP	Citations
Elsevier	72	1733
Routledge Taylor & Francis	21	462
Emerald	10	14
John Wiley & Sons Ltd	4	14
Springer	4	4
SAGE	1	2
Total	112	2229

Table 3 shows the top most 5 influential journals in terms of FWCI. It can be witnessed that the FWCI shows different results as compared to the order based on citations. In the list here although the top journal is the same as the most cited journals viz., the Finance Research Letters, however, the second most influential journal is Emerging Markets Trade and Finance, which is different than the second most cited journal.

Table 3. Top 5 most influential Journals

Journals	TP	Publisher	FWC Impact
Finance Research Letters	33	Elsevier	782.41
Emerging Markets Finance and Trade	6	Routledge Taylor & Francis	278.09
Journal of Behavioral and Experimental Finance	8	Elsevier	208.27
Research in International Business and Finance	3	Elsevier	96.1
International Review of Economics and Finance	3	Elsevier	50.22
Others	59		408.23
Total	112		1823.32

Table 4 shows the top most 5 publishers in terms of number of publications and influence in the area of the COVID-19 impact on stock markets. It shows that the journals by Elsevier group have by far produced significantly more than any other publisher with 72 publications. The publisher at the second place is Routledge Taylor & Francis with 21 publications. Table 4 also that the ranking of the publishers on the basis of number of publications and their influence is the same.

Table 4. Top 5 most Influential Publishers

Publishers	TP	FWC Impact
Elsevier	72	1407.51
Routledge Taylor & Francis	21	376.55
John Wiley & Sons Ltd	4	17.39
Springer	4	10.72
Emerald	10	8.71
SAGE	1	2.44
Total	112	1823.32

Table 5 shows that the top 5 most cited manuscripts in the area of COVID-19 impact on the stocks markets. As against the total most cited and influential journals, the top three most cited manuscripts are from three different journals viz., Journal of Behavioral and Experimental Finance with 173 citations, International Review of Financial Analysis with 161 citations, and Emerging Markets Trade and Finance with 124 citations.

Table 5. Top 5 Highly cited articles

No.	Title	Journal	Cites
1	Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns	Journal of Behavioural and Experimental Finance	173
2	COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet based approach	International Review of Financial Analysis	161
3	Country Responses and the Reaction of the Stock Market to COVID-19—a Preliminary Exposition	Emerging Markets Finance and Trade	124
4	Stock markets' reaction to COVID-19: cases or fatalities?	Research in International Business and Finance	117
5	The contagion effects of the COVID-19 pandemic: Evidence from gold and cryptocurrencies	Finance Research Letters	114

Table 6 shows the 5 most influential manuscripts in the area of COVID-19 impact on the stocks market. A comparison of Table 6 with Table 5 reveals that the top influential articles are different articles from top cited articles. The most influential manuscript is "Financial contagion during COVID–19 crisis" published in the journal of Finance Research Letters. The second most influential manuscript is also from the journal of Finance Research Letters titled "COVID-19 and the March 2020 Stock Market Crash. Evidence from S&P1500". The third most influential article is "Country Responses and the Reaction of the Stock Market to COVID-19—a Preliminary Exposition" published in the journal of Emerging Markets Trade and Finance.

Table 6. Top 5 Highly Influential articles

No.	Title	Journal	FWC Index
1	Financial contagion during COVID–19 crisis	Finance Research Letters	143.69
2	COVID-19 and the March 2020 Stock Market Crash. Evidence from S&P1500	Finance Research Letters	106.53
3	Country Responses and the Reaction of the Stock Market to COVID-19—a Preliminary Exposition	Emerging Markets Finance and Trade	91.74
4	Death and contagious infectious diseases: Impact of the COVID-19 virus on stock market returns	Journal of Behavioral and Experimental Finance	85.42
5	COVID-19 pandemic, oil prices, stock market, geopolitical risk and policy uncertainty nexus in the US economy: Fresh evidence from the wavelet based approach	International Review of Financial Analysis	80.73

Table 7 shows the top 5 authors that have contributed the most in terms of publications that have been cited frequently and have influenced the research in the area of COVID-19 impact on the stock markets. Figures 1 to 6 show graphical analysis of the contribution of authors using VOSviewer. Figure 1 shows contribution of all the authors and Figure 2 shows network and collaboration of research between the authors. A combined analysis of table 7 with Figures 1 and 2 suggests that Syed Aun Rizvi and Paresh Kumar Narayan are the most contributing authors with 4 articles each. However, Mr. Rizvi tops the citations list and Mr. Narayan tops the most influential author list. This is followed by Mr. Omair Haroon who is actually the first author of 2 manuscripts with Mr. Rizvi, and Mr. Badar Nadeem Ashraf.

Table 7. Top 5 Authors Producing Maximum Number of Papers

No	Author Names	Papers Produced	Citations	FWCI
1	Syed Aun R. Rizvi	4	271	168.49
2	Paresh Kumar Narayan	4	219	230.36
3	Omair Haroon	3	166	116.09
4	Badar Nadeem Ashraf	3	158	92.98
5	Adam Zaremba	3	85	61.88

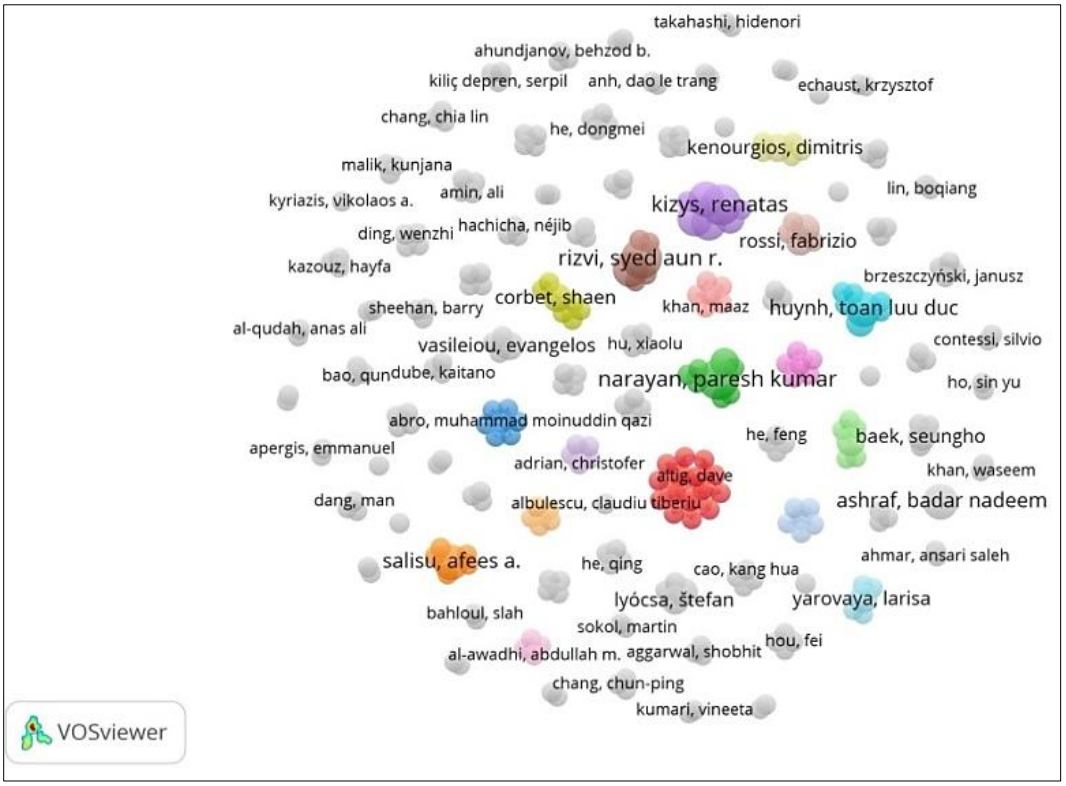


Figure 1. Network Visualization (All Authors)

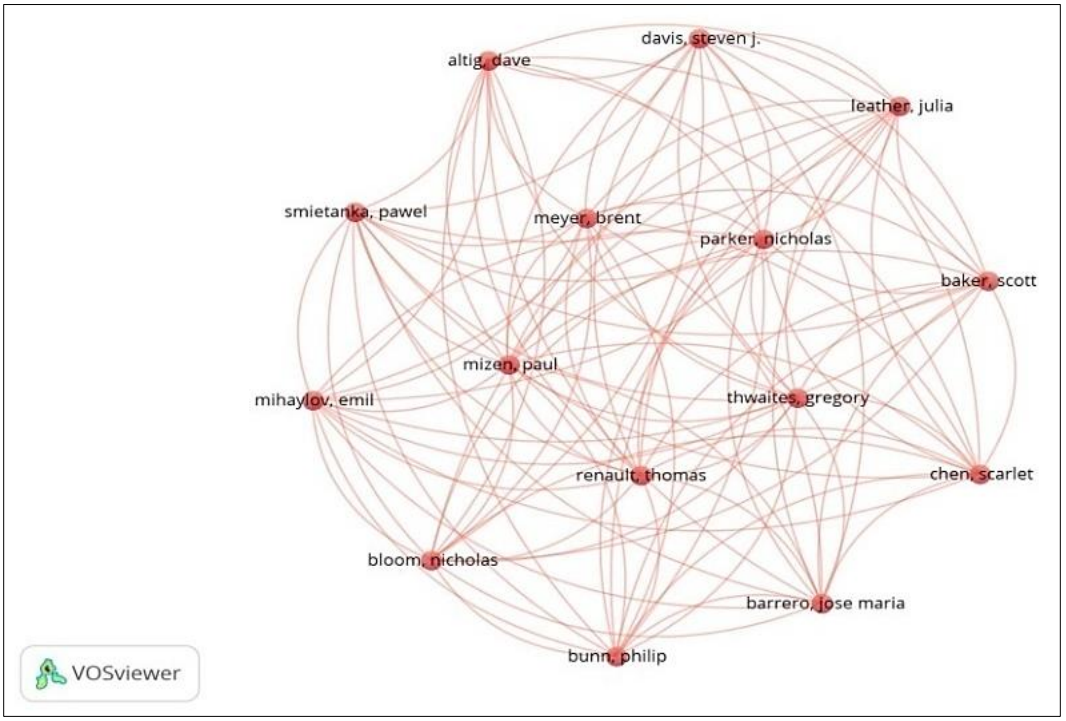


Figure 2. Network Visualization of connected authors

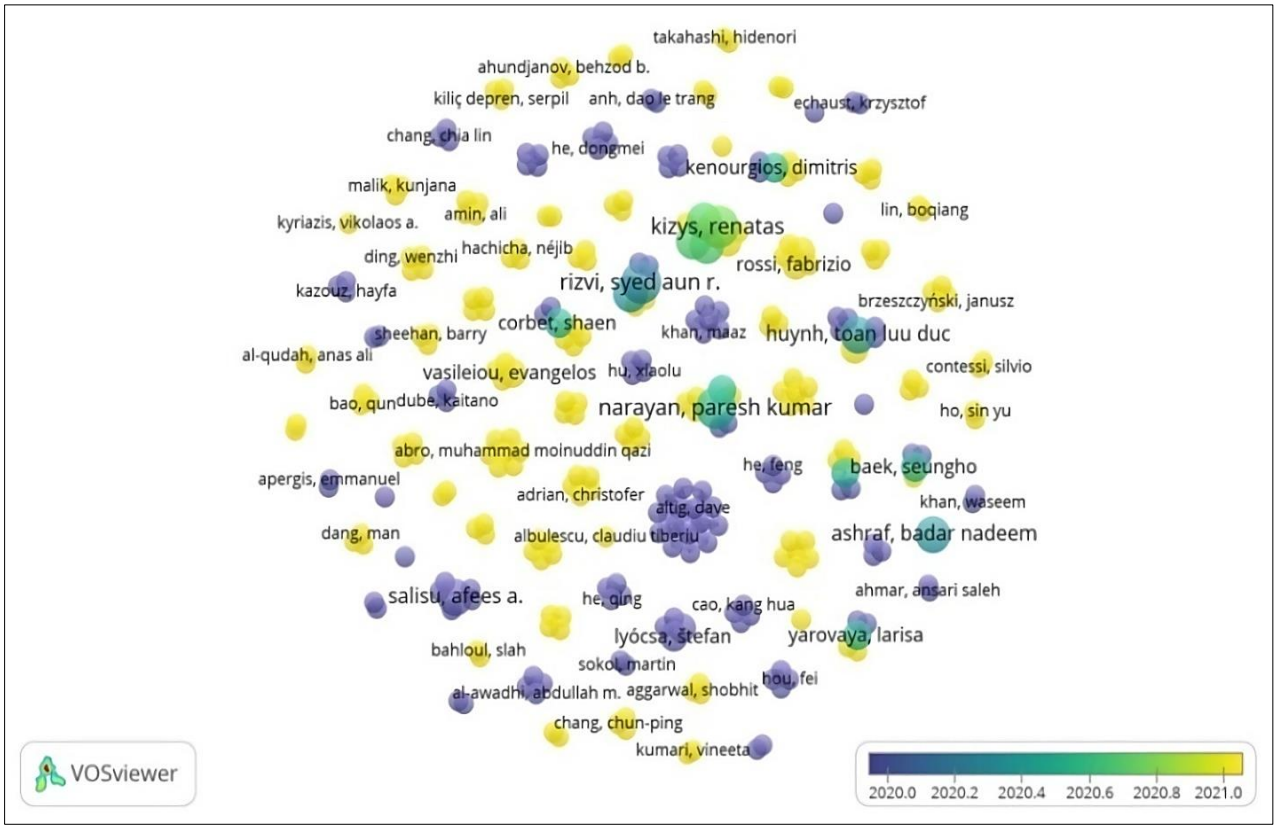


Figure 3. **Overlay Visualization (All Authors)**

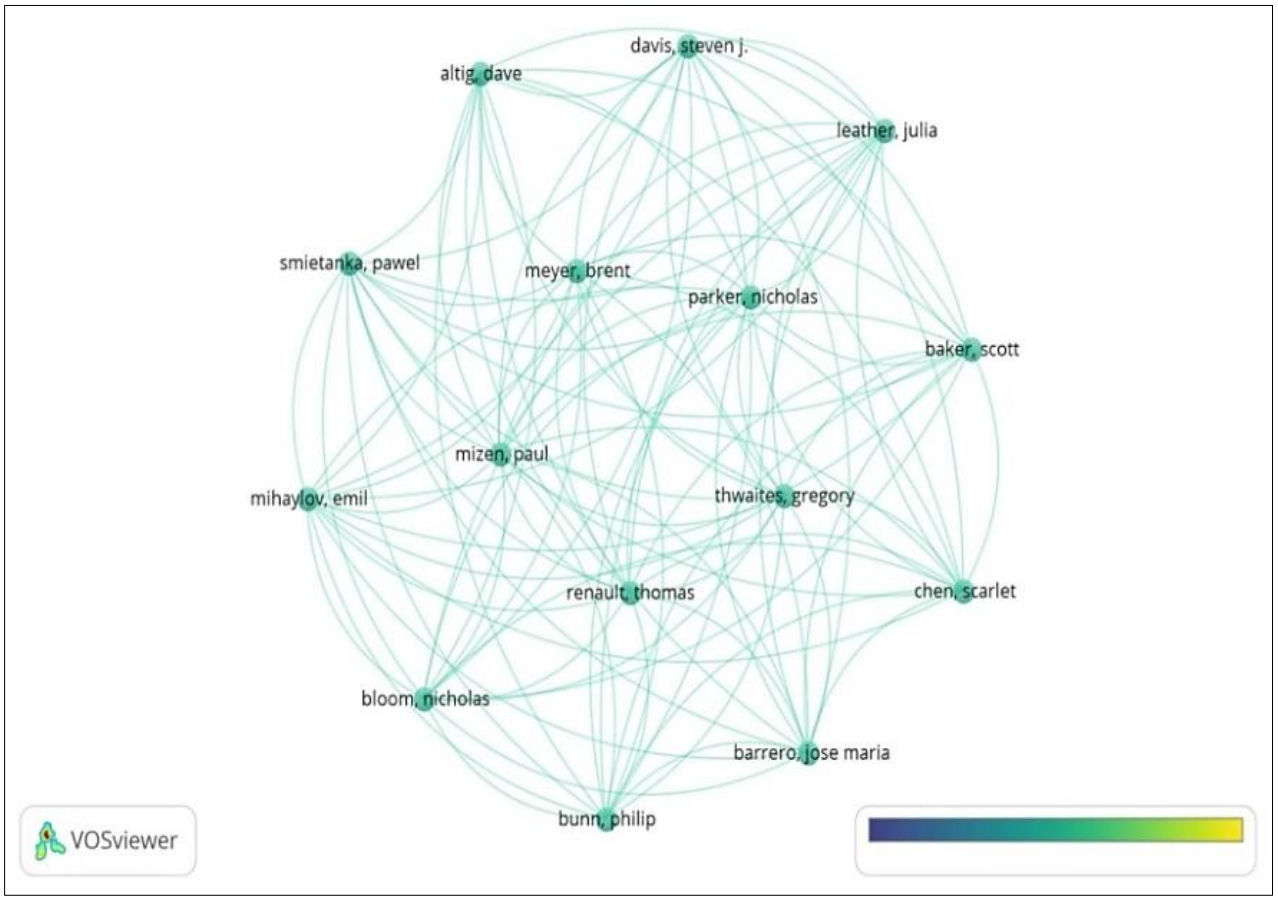


Figure 4. **Overlay Visualization of connected author**

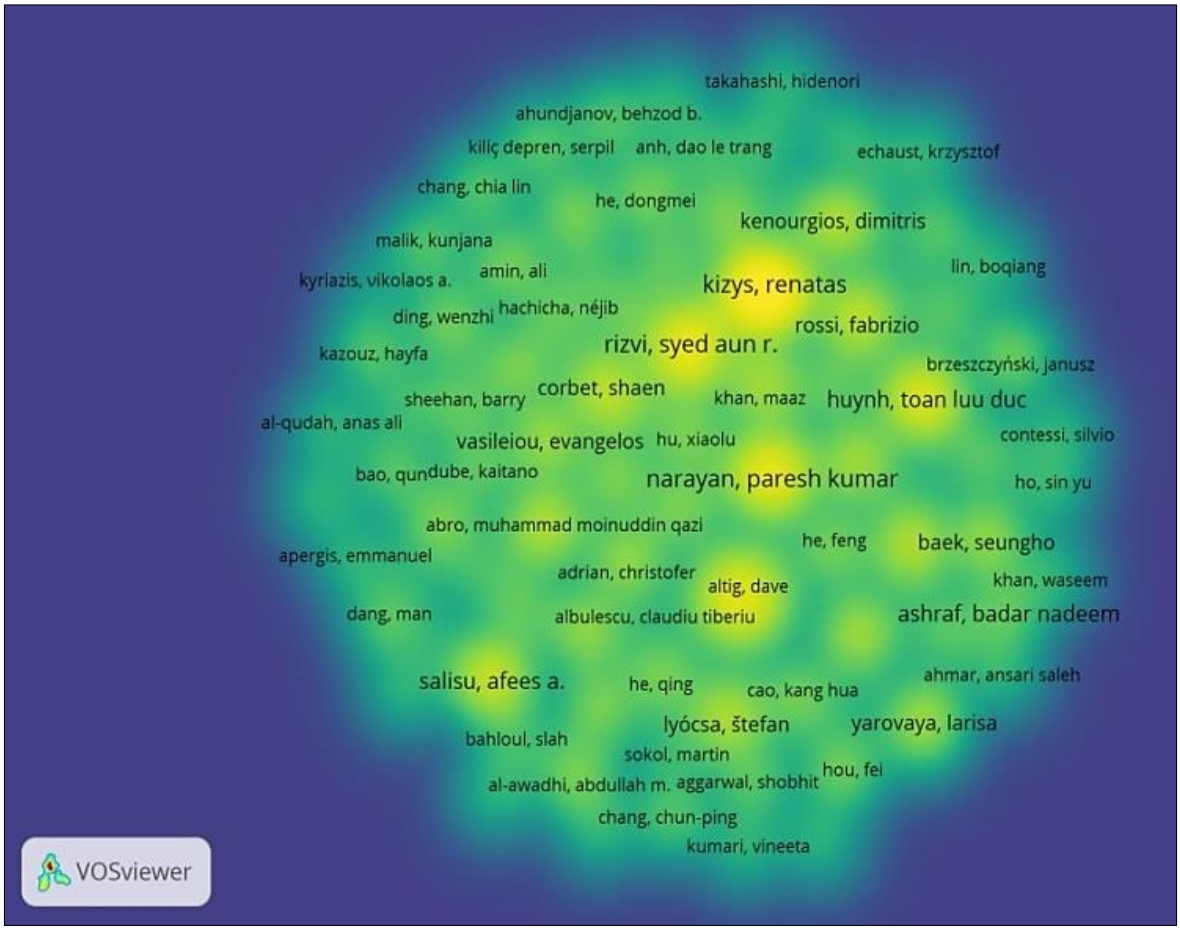


Figure 5. Item Density Visualization (Authors)

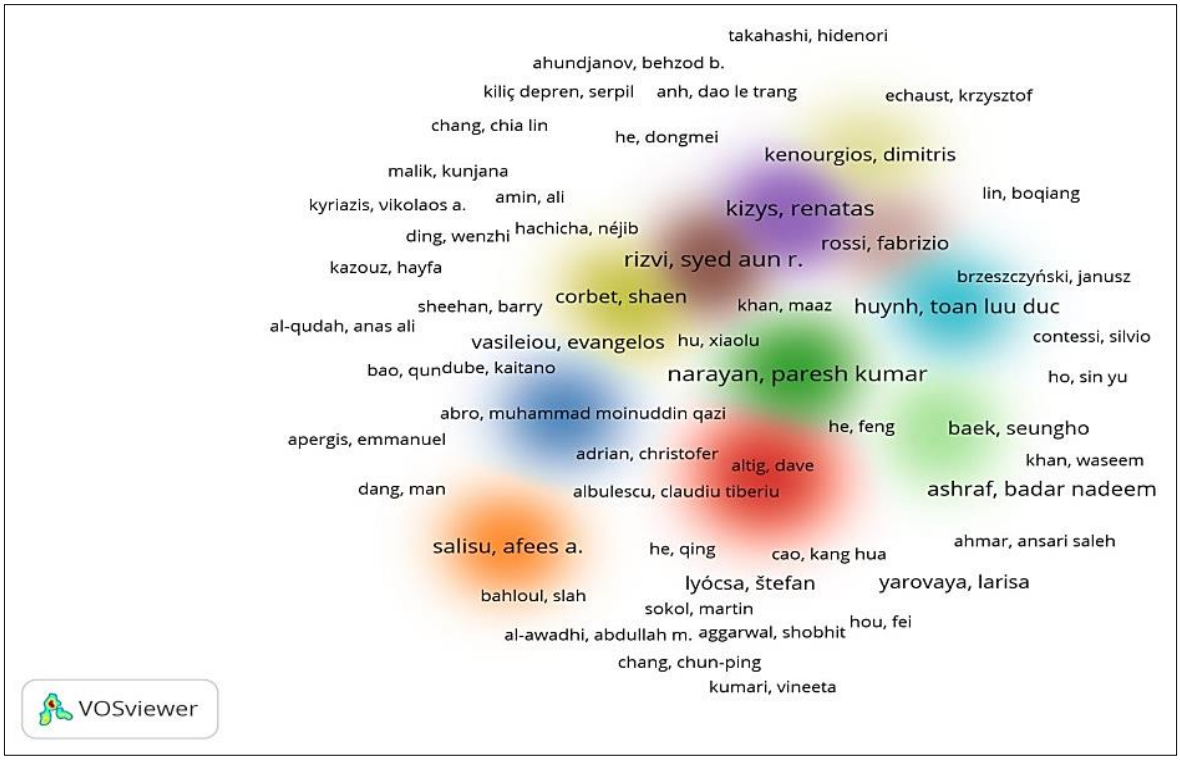


Figure 6. Cluster Density Visualization

Mr. Badar Nadeem Ashraf has contributed the most as a single author and ranks 4th in the most cited and influential authors list. This can also be confirmed in item density and cluster density visualization of the authors in Figures 5 and 6. The top contributing authors however, do not appear in the network visualization of the connected authors.

Figures 3 and 4 show the network overlay display i.e., the contribution of authors over the period of time. The bigger blue circles show that most of the authors have emerged during the year 2020 and they have contributed significantly. The smaller yellow circles show that a large number of authors have also emerged during the year 2021. The overlay visualization of the connected authors is almost of the same color, which shows that the network between the authors has either not proceeded or has been reduced in the year 2021.

3-2-Analysis of the Mapping of COVID-19 Impact on Stock Markets Clubbed into Sub-Themes

Table 8. Market Behavior Return , Liquidity & Volatility

S #	References	Findings
1	[28]	Pandemic generates uncertainty, which weakens investor confidence.
2	[20]	Stock returns are negatively related to the growth in the number of deaths and the number of infections. The negative effect is mainly evident in the stocks meant for the foreign investors.
3	[41]	Timely action by the authorities in the form of lockdowns etc., ensured quick recovery in the Chinese markets. Returns are more negatively related to the deaths.
4	[42]	The positive relationship became even stronger during the COVID-19 pandemic.
5	[43]	The COVID-19 first affects investor sentiments, which increases volatility and reduces stock returns.
6	[44]	COVID-19 deaths have more pronounced negative effects on the stock returns. On the other hand the effect on volatility is positive.
7	[45]	Stock market returns react more proactively to the number of cases.
8	[15]	The results show that the positive correlations between the stock indices increased during the corona virus spread.
9	[46]	The dependence between the industry and the stock returns has reduced the benefits of diversification. Risk return relationship has shown contagion type pattern, which is similar to the 2008 crisis.
10	[47]	Volatility has three dimensions viz., total, market and idiosyncratic. In terms of total risk gas & petroleum, hotel and lodging industry suffered the highest risk; whereas consumer spending depicted lower risk. In terms of market risk, defense industry and other capital intensive industries depicted the largest market risk while the automobile industry has the smallest. Lastly, idiosyncratic risk increased in all the industries.
11	[22]	The stock markets tend to respond negatively to severe cases of the COVID-19 in local settings.
12	[48]	The COVID-19 effect is even higher than that of the Global Financial Crisis(GFC) of 2008.
13	[49]	The emerging market stocks are more vulnerable to uncertainty due to epidemics and pandemics.
14	[24]	Stock markets have responded negatively to the COVID-19, particularly in the emerging markets.
15	[32]	The reduction in death rates is associated with improved liquidity in the emerging equity markets.
16	[50]	The results show that after the GFC-2008, investors are more concerned about asset losses.
17	[51]	The reversal effects of the COVID-19 occurred at the industry and firm level with positive cumulative abnormal return. A major factor of these reversals was investor over reaction.
18	[52]	Distortions in expected correlations between returns appeared one day ahead of the break in volatility. However, liquidity remained unaffected.
19	[25]	Chinese and Asian stock markets significantly declined, showing negative cumulative returns.
20	[53]	Autocorrelations that remains zero normally became negative during the time of crisis. The behavior of the stock markets during the COVID-19 crash was similar to all other crashes.
21	[54]	Fear of the coronavirus increased in search volume in particular direction. This is a significant indicator for stock market variations.
22	[55]	The affect of the GFC and the COVID-19 is not the same across countries.
23	[56]	The COVID-19 has substantial oil price volatility, market & geo political risks.
24	[57]	Stock market has been reduced by 30% and market volatility has increased.
25	[58]	The COVID-19 has increased volatility and distorted the traditional relationship between stock and inflation.
26	[59]	The COVID-19 has affected the stock markets badly in most of the African countries.
27	[60]	Negative effects of the COVID-19 spread from the developed to the emerging markets.
28	[61]	Heterogeneous volatility models are superior for forecasting the volatility of the stocks during the COVID-19 pandemic.
29	[62]	There is a short term contagion effect of the COVID-19 on the stock markets.
30	[63]	The COVID-19 crisis has increased the volatility of the stock markets.
31	[64]	Increase in the COVID-19 cases has increased the financial volatility and has also affected the stock market performance.
32	[65]	Although COVID-19 has affected the stock markets all over the world yet the effect on the developed markets is harder in the longer window.
33	[66]	Stock indices decreased with the increase in severeness of the disease.
34	[67]	The instability of the stock markets spread from the chinese stock markets to other countries.
35	[68]	It is imperative to develop specific pandemic related measures to gauge the behavior of the investors during pandemic.

36	[69]	The COVID-19 has decreased the stock returns and increased the volatility.
37	[70]	A rise in the investor attention has mixed effects on stock returns in the African countries.
38	[71]	The crisis response of the stock markets against COVID-19 crisis is similar to the previous crises rather than the previous pandemic.
39	[11]	The study finds no significant effect of the COVID-19.
40	[72]	The effect of the COVID-19 on the stock markets is heterogeneous, therefore portfolio diversification is recommended.
41	[73]	Positive death rate of a particular day has effect on the next day's return of the respective state. The states that have higher resources and higher aid have lower effects of COVID-19.
42	[74]	Investor attention negatively influences stock market returns during the COVID-19 crisis.
43	[75]	From all the pandemics occurred so far COVID-19 has the most serious impact on the stock markets lasting atleast 30 days.
44	[76]	BMI effects on the stock returns and volatility are lead by the GDP changes, unemployment rates, and the long-term interest rate for the developed countries. Dynamics for the developing countries are different.
45	[77]	CORONA news has negative and economic news have positive effect on the investor medical portfolios. Further, the economic news mainly affect the institutional investors.
46	[78]	Asian markets are more resilient to the COVID-19 effect. Non Asian markets are showing weakening effect over time.
47	[79]	Japanese stock markets are negatively affected by the increase in the COVID-19 infections and deaths because of increased foreign ownership and large exposure to the investments from China and USA.
48	[80]	Health risk has not been incorporated in the prices of stocks that has also caused market inefficiency.
49	[81]	The market response to COVID-19 is slow and is not properly estimated. This has resulted in underestimation of the heath risk and wrong implications of the efficient market hypothesis.
50	[82]	The COVID-19 has greatly affected the stock markets. The longer the pandemic prevails, the stronger will be the impact.
51	[83]	The COVID-19 pandemic has negatively affected the market risk premium. On one hand it has negatively affected the returns by lowering the growth estimates. On the other hand, it has positively affected the returns by inculcating the sense of security amongst the investors, hence demanding lower market risk premium.
52	[84]	The effect of the COVID-19 on the stock returns is not the same. The West Pacific region has suffered the highest effect. Feeling of fear among the investor serves as the mediator for transmitting the effect of the COVID-19 on the stock returns.
53	[85]	Confirmed cases, pubic fear deaths from the COVID-19 deteriorates liquidity and stability of the stock markets. There are also negative effect of lockdowns on the liquidity and the profitability.
54	[86]	The COVID-19 has decreased correlations between the stocks and the bonds, which means flight of the quality. Bond returns are lagging behind the stock returns.
55	[9]	The countries where the investors have more trust in the government policies exhibited less volatility in the stock markets.

Table 9. Forecasting

S #	References	Findings
1	[87]	GFI is a better predictor of the fear/panic in the stock market than the existing fear index (technically described as the Chicago Board Options Exchange (CBOE) Volatility Index (VIX)) at least during the pandemic period.
2	[88]	Stock markets did not anticipate the effects from the COVID-19 until late February 2020.
3	[89]	Forecasting enables policy makers to draft policies keeping in view the forecasted effects.
4	[90]	The economies that have dealt with the COVID-19 before others, will grow at faster pace making more gap in the flow of the global finances.

Table 10. Corporate moves and Stock Returns

S #	References	Findings
1	[91]	Restaurant firms with larger size, more leverage, more cash flows, less ROA, and more internationalization are more resilient to the stock declines resulting from the COVID-19.
2	[92]	The firms with better funding position before the pandemic have shown better immunity in the stock returns during the COVID-19 pandemic.
3	[93]	In the short run COVID-19 has negative impact on the international exposure, whereas in the long run the firms with international exposure are more resilient.
4	[94]	Firms with high operating flexibility have better stock performance.
5	[95]	Tourism related companies and stocks lost almost 20% of their values due to the COVID-19 pandemic, with the drop in business upto 80%.
6	[96]	Stock returns of natural gas, food, healthcare and software companies have exhibited positive returns. On the other hand share prices of petroleum, real estate, entertainment, and hospitality sectors fell drastically with asymmetric volatility.
7	[60]	Transportation, mining, electricity & heating and environment industries have been impacted adversely by the pandemic. However, manufacturing, information technology, education and health-care industries have shown resilience to the pandemic.
8	[98]	Oil and gas stocks have experienced negative impact of the COVID-19.
9	[99]	The COVID-19 outbreak has increased pandemic risk for the investment in tourism that is pulling down its share prices.
10	[100]	Firms in transportation, food and beverage, hotel and tourism, postal, warehouse, real estate, video entertainment, and construction industries are more vulnerable to the COVID-19. This means that the firm specific argument prevails during this crisis.

Table 11. COVID News & Media

S #	References	Findings
1	[27]	The COVID-19 news affect the market volatility but did not affect the market returns.
2	[26]	Markets overreacted to the news of the COVID-19 however, corrected as soon as more news arrived.
3	[101]	While stock markets have crashed, health, consumer goods and IT based companies have gained. The investors are searching online news to further understand the dynamics of the COVID-19 to manage their response.
4	[102]	Search for the COVID-19 news resulted in the decline in relevant prices and stocks.
5	[31]	Panic index is positively related to the volatility of the world index. Negative sentiment in news is positively related to the volatility in USA markets.
6	[103]	Speculations about the COVID-19 news will continue to create bubbles in stock markets that need to be dealt with prudent policies by the regulators.
7	[104]	The investor fear in response to the COVID-19 news is higher in the equity segment of the markets.

Table 12. Safe Heaven

S #	References	Findings
1	[105]	The bitcoins have served as the complimentary safe haven assets.
2	[106]	COVID-19 deaths have exerted weaker effect on the European stock indices. The findings further reveal that the gold may act as the safe haven for the investors during the COVID-19 crisis.
3	[107]	Conventional safe heavens such as cryptocurrency, bond and gold did not serve well during the COVID-19 crisis. However, return connectedness has been improved.
4	[108]	Bitcoins and Ethereum can be termed as short term safe heavens, however, Ethereum may performed better.

Table 13. Culture & COVID-19

S #	References	Findings
1	[109]	Uncertainty aversion increases the impact of the COVID-19 in the stock returns according to culture.
2	[110]	Culture has significant effect on the magnitude and the volatility of the COVID-19 effect on stock returns.

Table 14. Herding Spill Over & Connectedness

S #	References	Findings
1	[111]	The stock returns and the volatility connectedness increased across the phases of the COVID-19 pandemic. This become more pronounced as the severity of the pandemic builds up.
2	[112]	Bitcoin and S&P 500 have moved in lockstep that has increased the downside risk.
3	[30]	COVID-19 has strong and positive impact on the volatility of the exchanges. Gold and cryptocurrency have no relation with the Chinese stock markets. Furthermore, these do not appear as safe heavens during the time of distress.
4	[60]	The effect of the COVID-19 is bi-directional spillover between the USA, the European and the Asian stock markets with the average losses matching the global losses.
5	[12]	The correlations between the stock returns have been increased. This has caused increase in the transmission of the COVID-19 effects.
6	[113]	The European stock markets are causing shift contagion in the stock market linkages around the world.
7	[114]	Bad news have more effect than the good news. There also exists spillover effect.
8	[115]	Market connectedness and spillover has increased.
9	[116]	Conditional correlations have been increased between the stock returns and the cryptocurreny.
10	[117]	The Stock markets are firstly affect the investor sentiment, then affect volatility and lastly the prices. There are also significant spillover effects.
11	[118]	Bad volatility spillover has strong market connectedness effects in the Chinese markets.
12	[119]	Islamic bonds can serve as safe heavens during the pandemic era. Spillovers between the Islamic and conventional bonds during the COVID-19 have become stronger during the pandemic regime.
13	[120]	Return spillover occurs in the short run whereas liability spill over occurs in the long run.
14	[121]	As compared to other crises, the COVID-19 has produced more market connectedness. This means increase in systemic risk in the financial systems during the COVID-19 outbreak.
15	[122]	BRIC countries have experienced volatility spillover during the COVID-19 pandemic regime.

Table 15. Government Reaction

S #	References	Findings
1	[123]	Announcement of the social distancing measures have mixed effects on the stock returns. Public awareness, testing & quarantine policies and income support positively affect the stock returns.
2	[124]	The magnitude of affects on the stock markets is different due to different quantum and quality of corrective actions taken by the respective governments.
3	[29]	The impact of outbreak is higher in the Asian economies and lower in the European economies. The response time and stimulus packages by the government also affect recovery of the stock markets.
4	[34]	Cancellations of the public events and public campaigns have increased volatility in the stock markets.
5	[125]	Lockdowns, stimulus packages and travel bans affect the stock returns.
6	[126]	Government response has significantly positive effect on the stock market returns.
7	[127]	Government response, especially intervention in the stock markets to stop short-selling has stabilizing and countering effect against the investor herding.
8	[128]	Regulatory actions failed to control the investor over-reactions. The investor fears reached at the highest level. COVID-19 news has profound negative effects on the energy markets.
9	[129]	There is a negative impact of the COVID-19 on the stock prices of solar companies. The impact did not recover even after the government intervention support.
10	[129]	Government support in the countries with low unemployment rates, firms with consistent financial policies and low valuations have shown resilience towards the COVID-19 pandemic.
11	[130]	Work place and school closure reduced liquidity in the emerging markets, whereas information campaign increases the trade activity.
12	[131]	Announcement of the COVID-19 and fiscal measures negatively affect the stock markets. However, monetary measures positively affect the stock markets.
13	[132]	Monetary and Fiscal policy should aim to reduce the uncertainty during the pandemic.
14	[133]	There is a strong role of the government stringency in controlling the impact of the COVID-19 pandemic.
15	[134]	Higher government effectiveness is the predictor of response.

4- Discussion

This study consolidates research on the COVID-19 impact on the stock markets published since February 2020. This is important because dynamic spread of the COVID-19 crisis across the globe has highlighted inefficiencies creeping into the stock markets. The results have been summarized and interpreted with the help of the figures hereunder.

Figures 7 suggests that the research on the COVID-19 effect on the stock markets has concentrated on the early phases of the COVID-19 pandemic i.e., February, March and April 2020 with March being the month used the highest number of times in the research studies. Although this is important but this suggests that there is still a lot to be done in this area. A lot more research is required on the periods after June 2020, which are the periods when the COVID-19 pandemic aggravated all around the world. Similar is the case for the research focusing events that lead COVID-19 pandemic into the stock markets. Research in this regard is required to compare the behavior of the stock markets during the previous health and economic crisis.

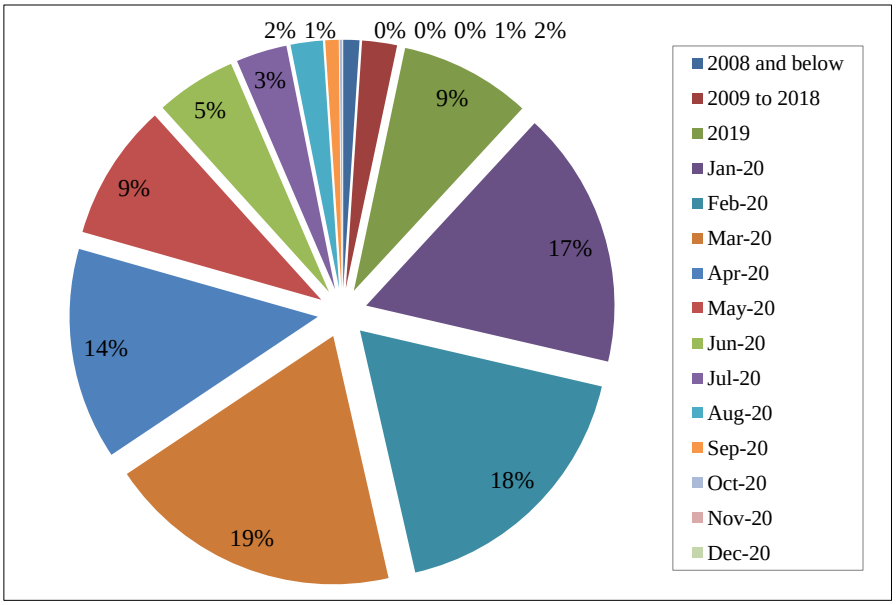


Figure 7. Percentage of Crisis Months/Periods used in Research

Figure 8 illustrates the crises periods that have been worked upon in different regions of the world, and Figure 9 identifies regions of the world that have been the focus of world researchers. Figures 8 and 9 actually further explain the Figure 7 that the most researched periods in different regions of the world are February, March and April 2020 and the most researched regions of the world are North America and East Asia followed by Europe.

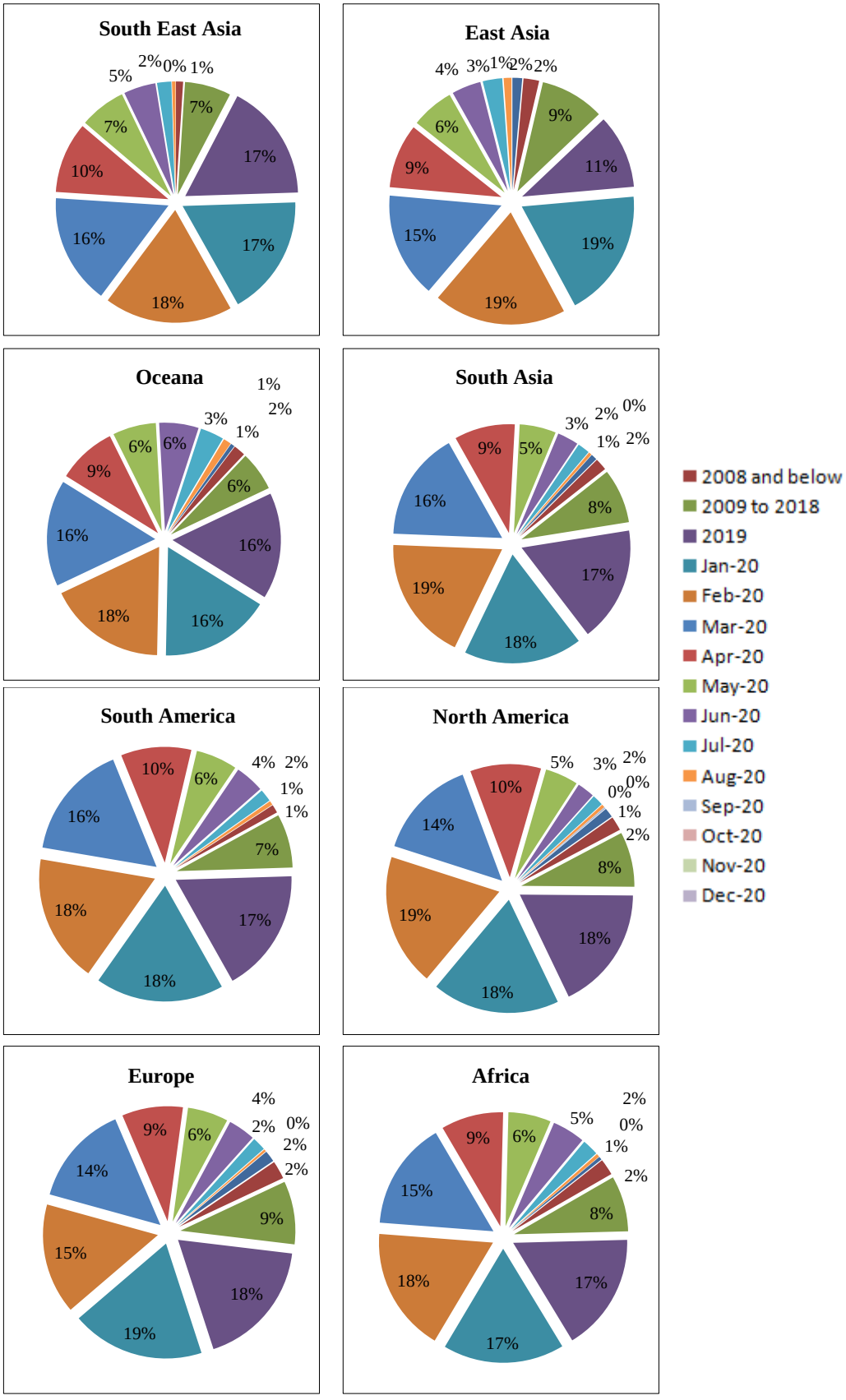
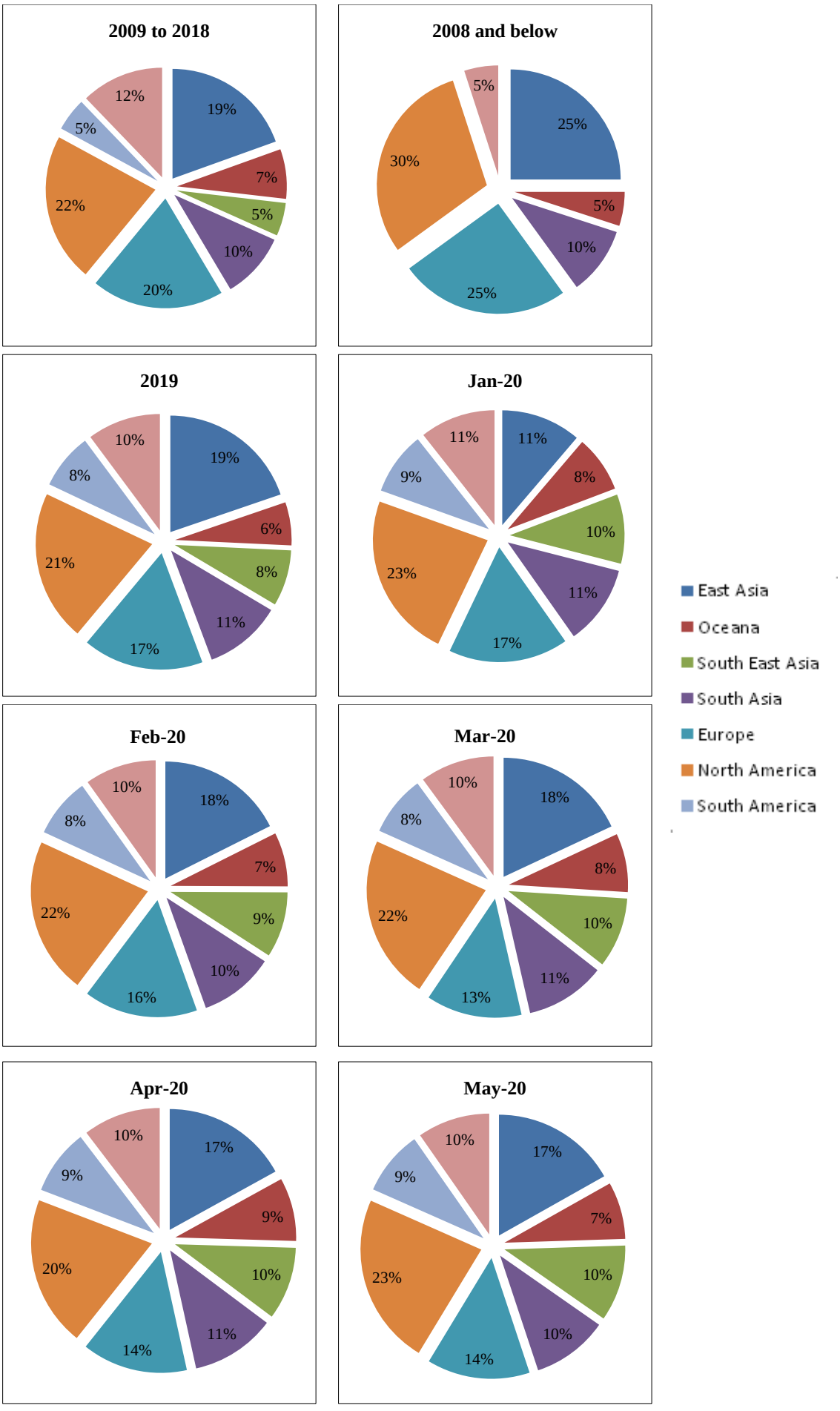


Figure 8. Crisis Months/Periods used for Research in World Regions


2009 to 2018
19%
7%
5%
10%
20%
22%
5%
12%
2008 and below
25%
5%
10%
25%
30%
5%
2019
19%
6%
8%
11%
17%
21%
8%
10%
Jan-20
11%
8%
10%
11%
17%
23%
9%
11%
Feb-20
18%
7%
9%
10%
16%
22%
8%
10%
Mar-20
18%
8%
10%
11%
13%
22%
8%
10%
Apr-20
17%
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May-20
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Oceana
South East Asia
South Asia
Europe
North America
South America

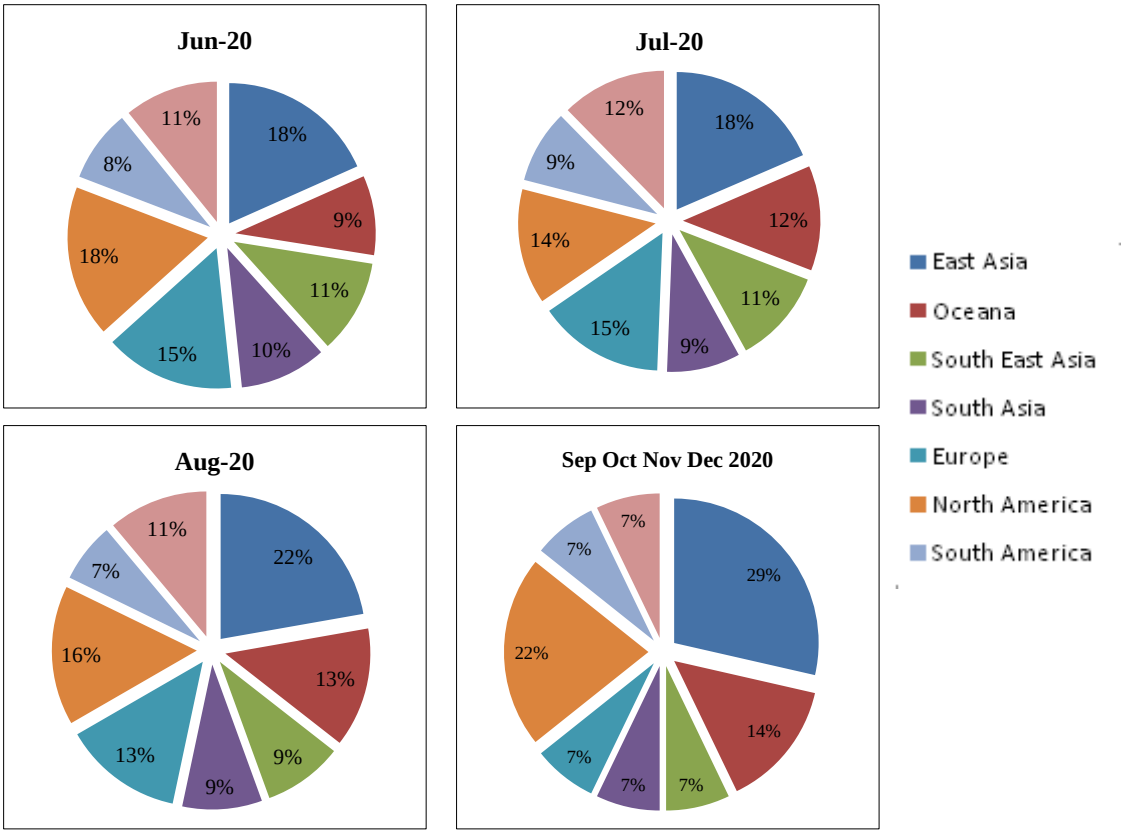
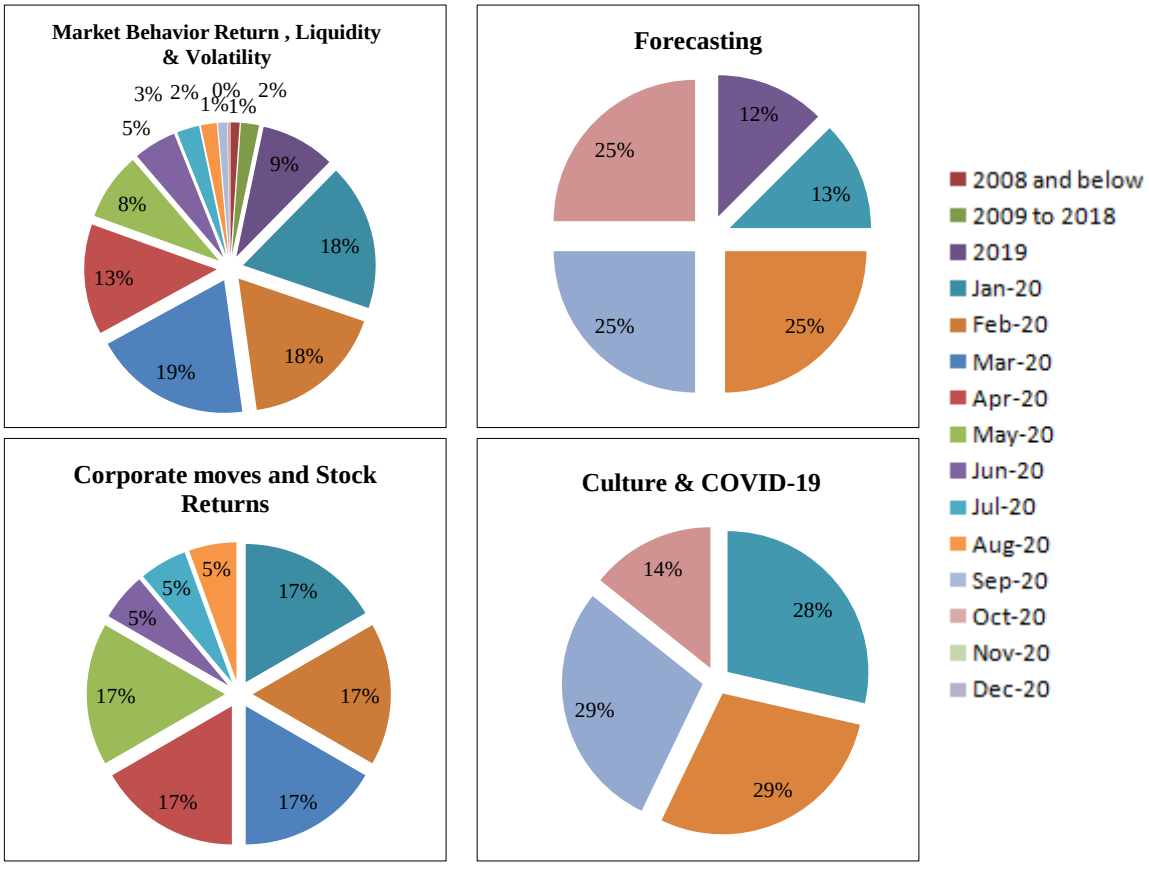


Figure 9. Regions used for Research Study in Months/Periods of Crisis

Figure 10 identifies the crisis periods that have been used for working in different sub themes of the research in current review of the literature. The figures suggests that February, March and April have been the most widely used months even for research in different sub-themes of research under the major theme of the COVID-19 impact on stock markets.



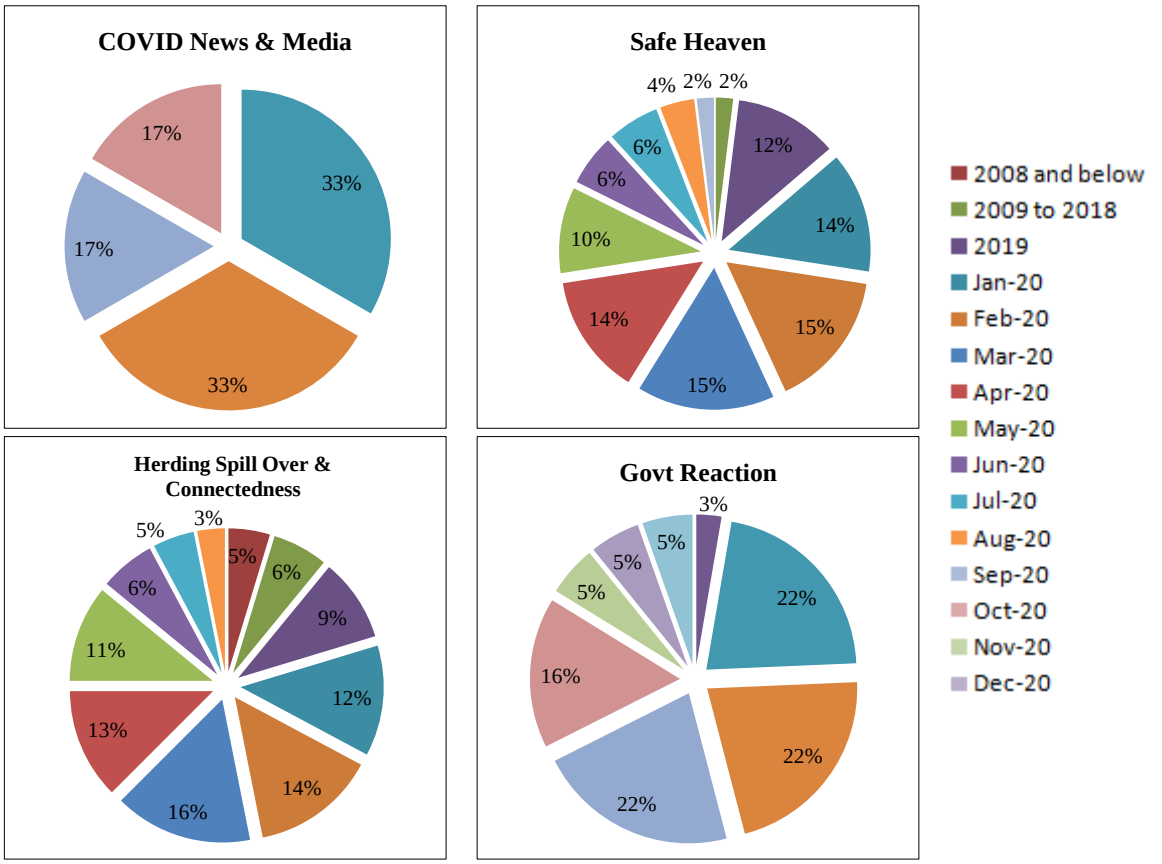
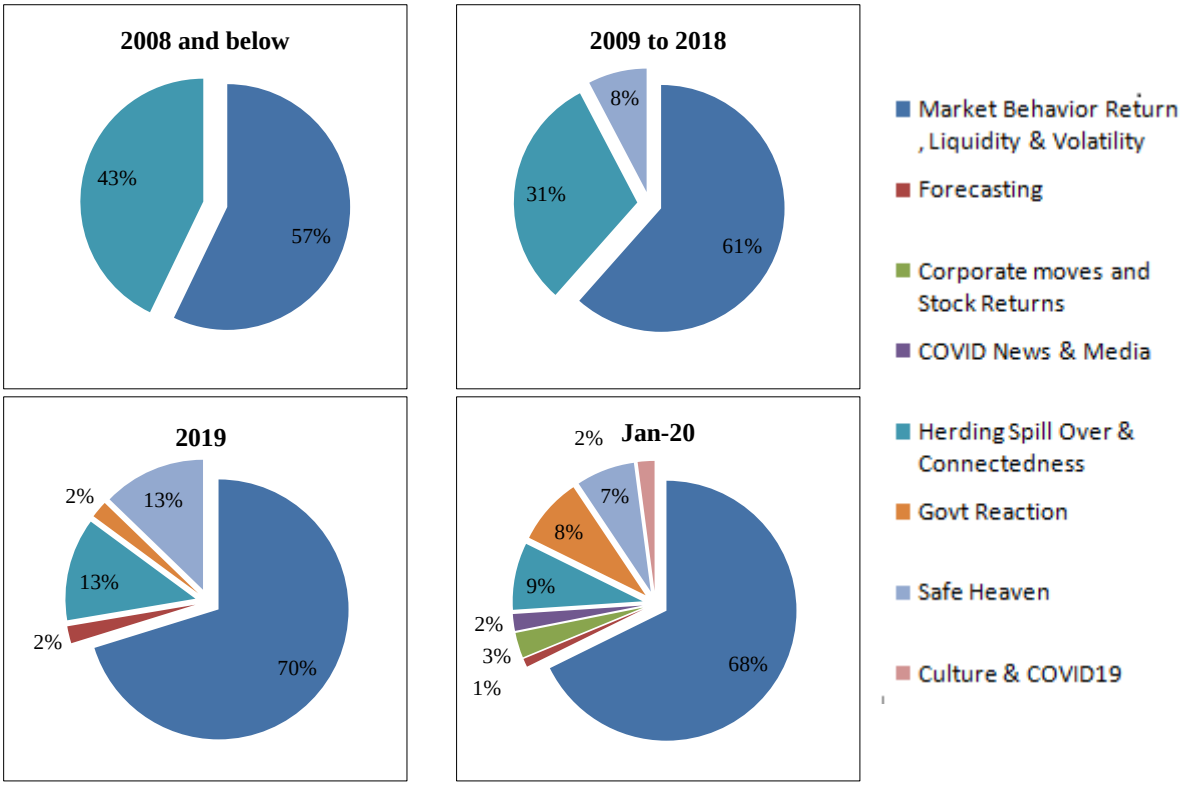


Figure 10. Themes of Research used for Months/Periods of Crisis

Figures 11 and 12 highlight different sub themes emerging from the literature on the COVID-19 impact on the stock markets. Figures 12 and 13 illustrate network visualization of all the connected keywords. In both the cases the first and the most popular theme emerging from the literature is the stock market behavior and reaction to the COVID-19 pandemic. This theme is connected with the research using the stock prices, the stock volatility, the stock returns, the investor behavior, the liquidity, the investor decision making and the relation between any of the two variables. Comparing these figures with Figure 8 of overlay visualization it can be seen that the researchers concentrate on the earlier period of the pandemic.



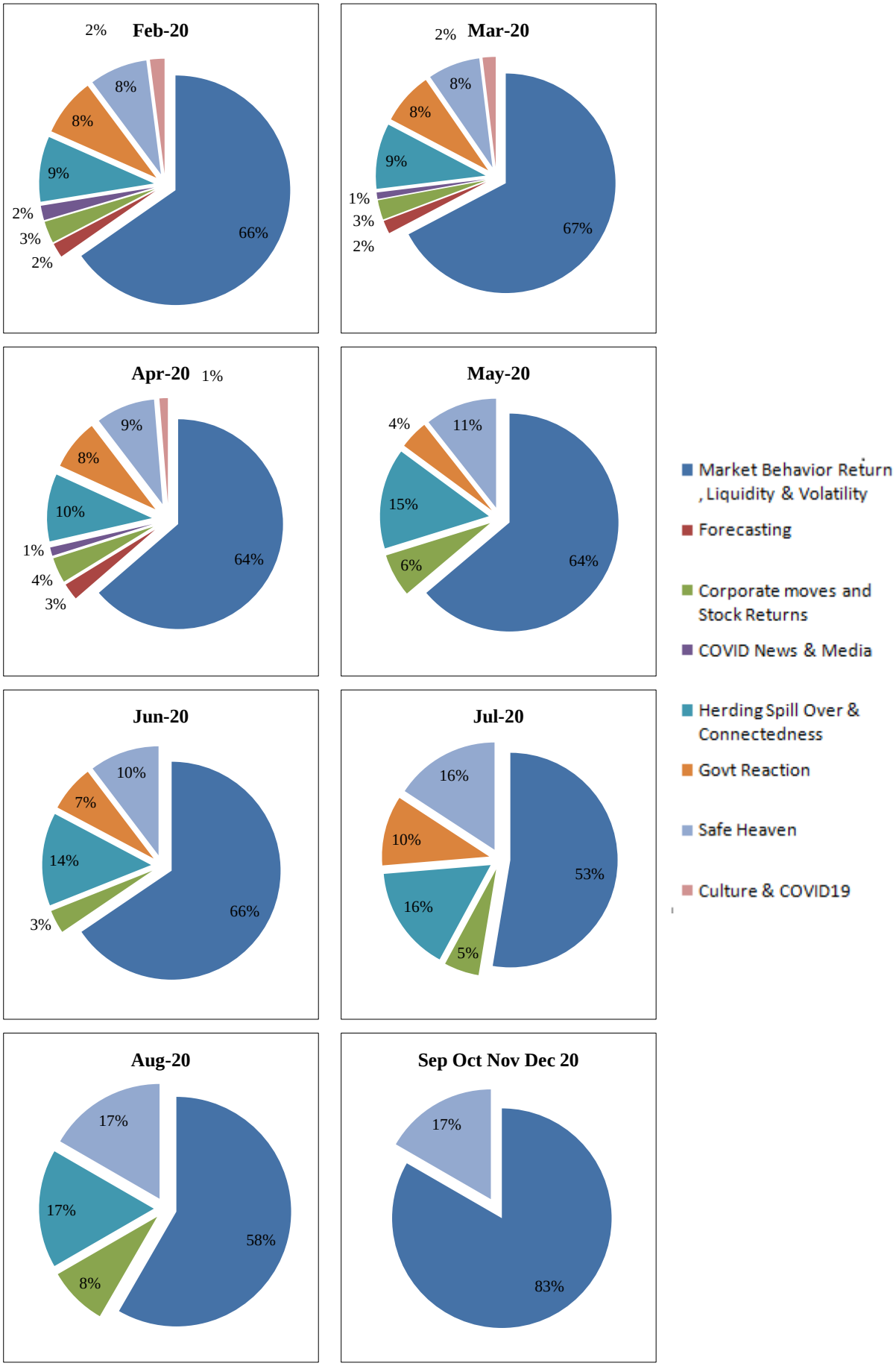


Figure 11. Themes of Research used in Research in Crisis Months/Periods

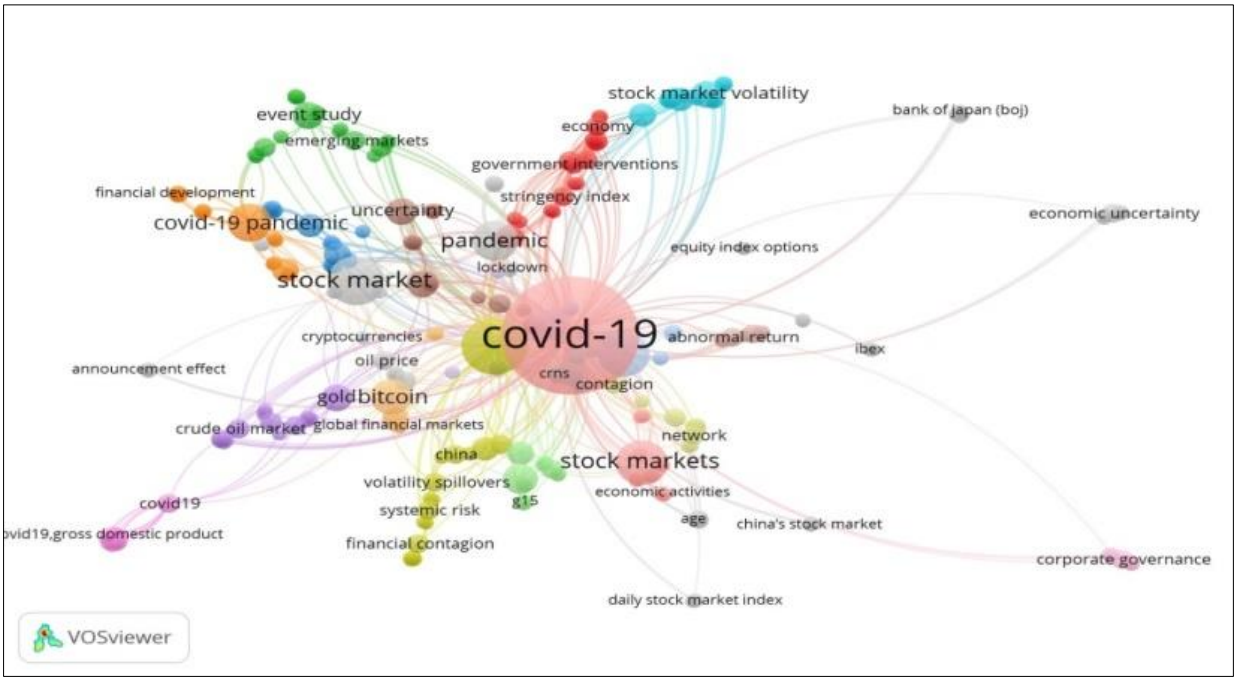


Figure 12. **Network Visualization (Keywords)**

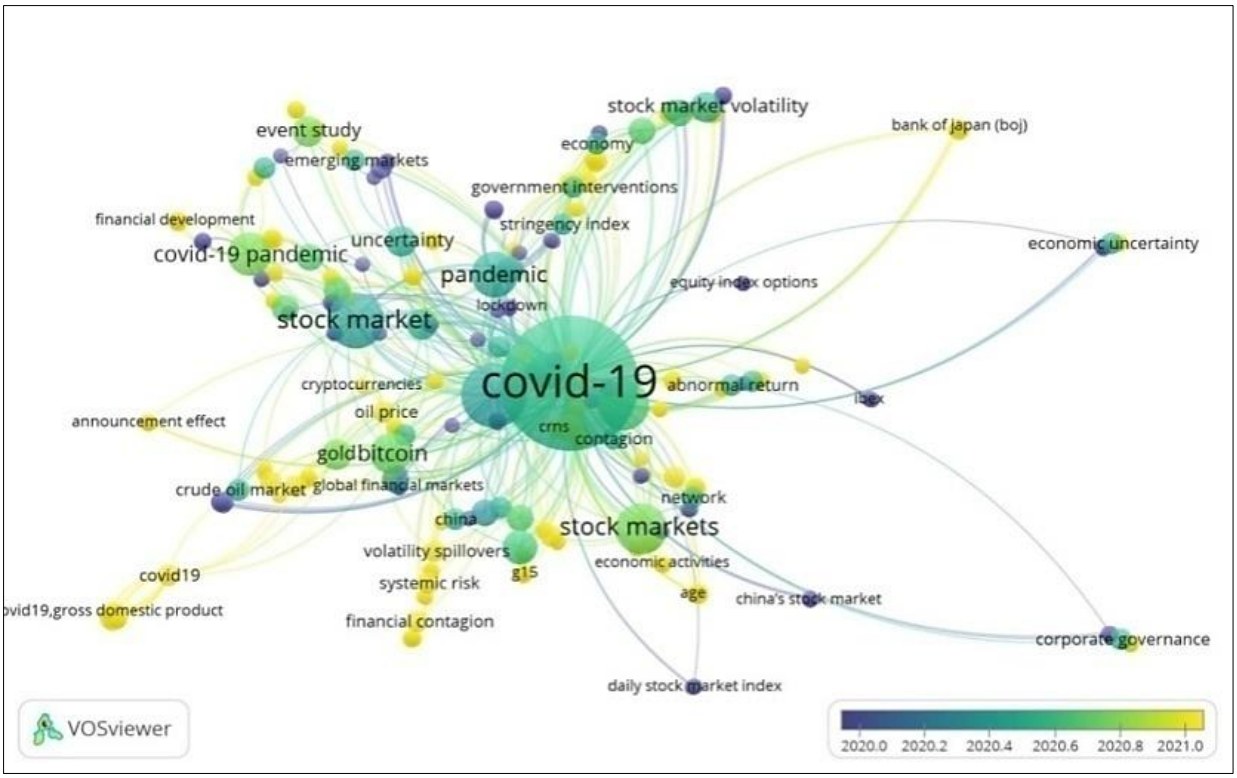


Figure 13. **Overlay Visualization (Keywords)**

Figure 14 explains item density visualization and Figure 15 explains cluster density visualization. Connecting these figures with Figures 13 and 15 help identify the second most popular theme that is "herding spillover and connectedness" in the stock markets. However, the quantum of research on this theme is very low and concentrated towards earlier parts of the research as well. Market connectedness and spillover is a very important theme particularly in the context of the COVID-19 pandemic. This is important because the impact of the COVID-19 has happened in different waves at a particular point in times, and not all world regions have been the subject of the similar waves. It is therefore important to study that whether there exists any similarity between the occurrence of difference waves and spillovers of COVID-19 and its impact on the stock markets.

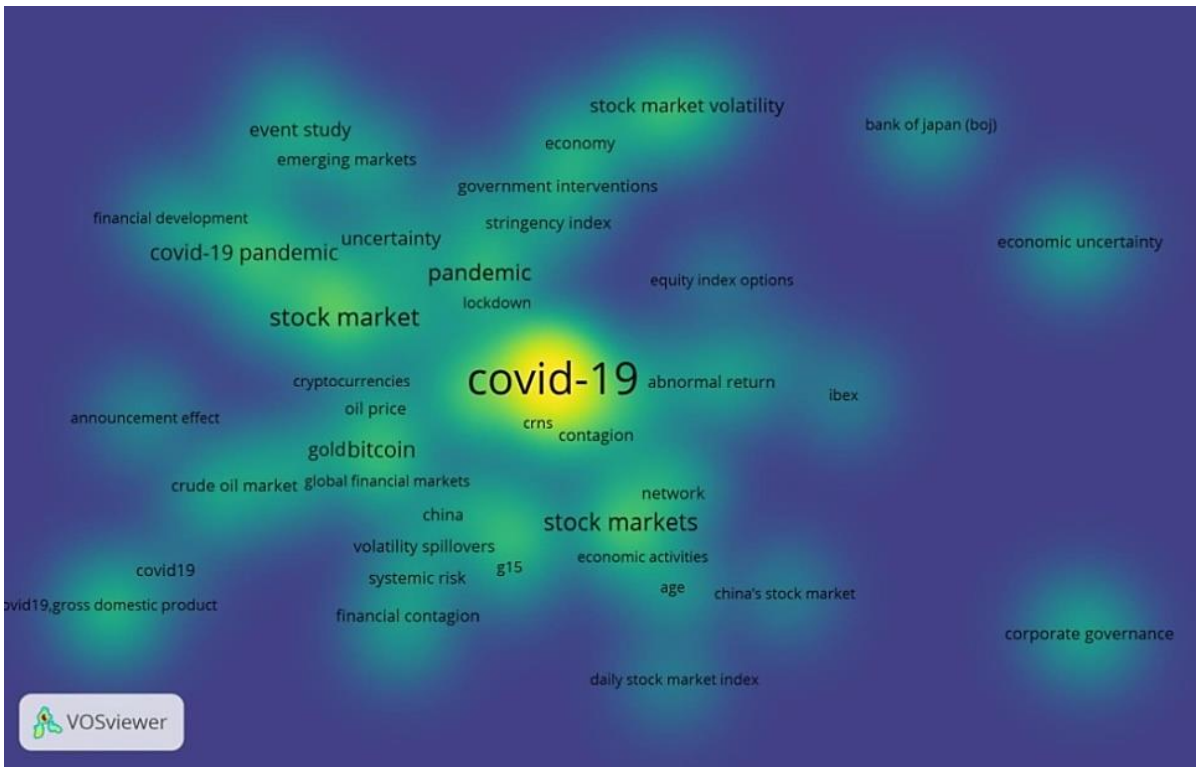


Figure 14. **Item Density Visualization (Keywords)**

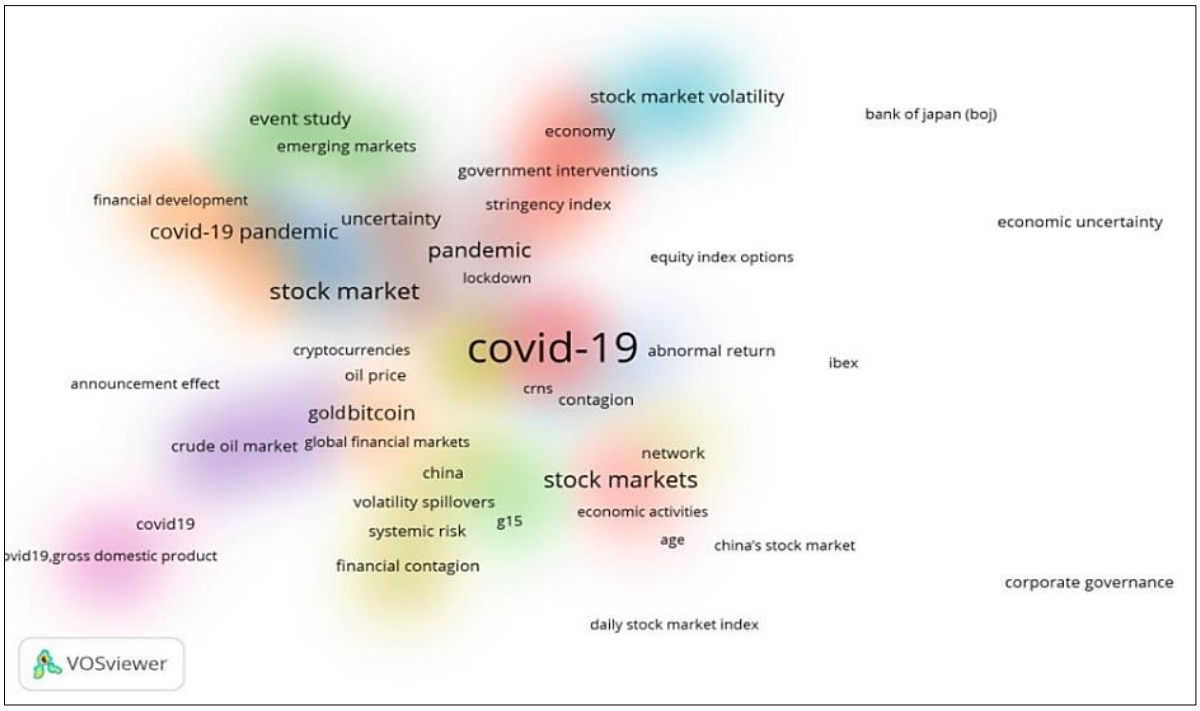


Figure 15. **Cluster Density Visualization (Keywords)**

Still, other important but under-researched themes are safe heavens and government reactions to the COVID-19 crisis. This study has shown that the government has primarily reacted in two dimensions. First is the monetary, where the government has provided financial support; and second is the administrative, where the government has taken measures such as lockdown, social distancing, ban on travelling and tourism and ban on international flights. There is no literature that suggests any financial support to markets. Rather, financial support has been provided to the general masses for living. On the other hand, administrative actions have shown a positive impact on the return and volatility of the stock markets. Concerning safe heavens, the literature suggests that there are unanimous safe heavens for investors, which vary according to the region of the stock markets. Other emerging themes include the effects of the news and media, culture, corporate moves and decisions, and forecasting the impact of the COVID-19 crisis on the stock markets. The impact of COVID-19 on the stock markets and emerging themes has been summarized in Figure 16 hereunder.

Figure 16. Cluster Density Visualization: Author Estimation for Research Themes

5- Conclusions

The COVID-19 crisis has affected the global stock markets, but not in any particular manner. Its impact differs in magnitude across the geographical boundaries. Since the beginning of the COVID-19 crisis, research has been conducted on its impact on various segments of the economy, including the impact on the global stock exchanges. Utilizing top-quality published research, this research performs thematic and bibliometric analysis of the 112 manuscripts published in the journals ranked by Scopus. The analysis suggests that the most researched region is North America, followed by East Asia, led by China. The review of literature suggests that the contemporary research has primarily focused on the periods at the beginning of the pandemic, that is the period between January to May 2020. Very few studies have been conducted on the comparison of the COVID-19 crisis with the global financial crisis of 2008 and other similar crises.

The consolidation of literature identifies 8 themes, the progress of research on which has been presented in Figures 5 and 15. The first sub-theme identified by this research is "Market Behavior Return , Liquidity & Volatility". The research underlying this theme suggests that the COVID-19 caused increased volatility and decreased returns, though with different magnitudes across the global stock markets. There exists a lot of room for conducting research on different sources that channel the effects of the COVID-19 crisis on stock markets, viz., news, spillovers, market connectedness, and culture of different countries. Also, there exists a huge gap in assessing the magnitude and effects of government responses to handle the crisis. The second sub-theme identified by this research is "Forecasting". The research supporting the theme of forecasting suggests that it is vital to forecast the impact of COVID-19 during and after the crisis. This is because forecasting helps in reducing losses and will help in a faster recovery after the crisis.

The third sub-theme identified by the research is "Corporate Moves and Stock Returns". The literature supporting this theme suggests that COVID-19 did not impact all industries similarly. There are some companies that have benefited, such as pharmaceutical and information technology-related companies, and there are companies that have suffered heavy losses, such as hotels, tourism, and airlines. Therefore, the corporate strategies to deal with the COVID-19 impact vary from industry to industry and country to country. The fourth sub-theme identified by this research is "COVID News & Media". This theme suggests that the COVID-19 news created multiple effects. The effect on COVID-19 affected and death patients varied globally.

The literature supporting the fifth sub-theme "Safe Heaven" indicates that as the spread of COVID-19 is global and profound, therefore the role of the safe heavens is only short-term. The sixth sub-theme of "Culture and COVID-19" is very much under-researched. There is a lot more to be explored in terms of assessing the impact of culture. The literature supporting the seventh sub-theme "Herding Spill Over & Connectedness" indicates how the COVID-19 impact on the stock markets created herding behavior among investors. It also indicates connectedness between the global stock markets that transmits and spills over the trend in the major stock markets to the regional and emerging stock markets.

Lastly, the literature supporting the 8th sub-theme of "Government Reaction" identifies various financial and non-financial measures taken by governments around the globe to handle and protect against the effects of the COVID-19 crisis on the stock markets. The literature indicates that the reaction of the government should be industry-specific. The blanket policy to support stock markets has failed because not all industries have been affected similarly.

Besides, this manuscript also shows leading publishers, journals, manuscripts, and authors who have made significant contributions in terms of manuscripts published, citations received, and being influential in terms of the FWCI index. The research suggests that the journals from Elsevier have by far produced the most number of articles that have received the most number of citations and have been the most influential. This is followed by the journals from Routledge Taylor & Francis on similar criteria. Regarding the leading authors, Syed Aun Raza Rizvi And Paresh Kumar Narayan are by far the most contributing authors in terms of number of publications, citations received and being influential.

5-1- Limitations and Future Research Directions

This research suffers from a number of limitations out of which the first is the use of the Scopus database and Web of Science (WOS) only. More comprehensive research, taking manuscripts from Google Scholar, etc., may bring more comprehensive results regarding the trends of research on the COVID-19 effect on the stock markets. Another major limitation of the research is the length of time. Because of the very nature of a pandemic of less than 2 years at present, the manuscripts published are only between the years 2020 and 2021. Therefore, continuous effort is required to keep the topic updated in the years to come. The final limitation is the concentrated research in all dimensions, i.e., data periods, citations, influence, and publishers etc.

This research brings a lot of future research directions in the area of the COVID-19 impact on the stock markets. All the eight sub-themes identified under this research actually are the future research directions, primarily because the data used in all those sub-themes does not cover even a period of one year. Future research can also be conducted in comparing the effects of the COVID-19 crisis with all the previous crises. Finally, future researches are also required specifically on the Africa, South America, South and South East Asia and Oceana regions.

6- Declarations

6-1- Author Contributions

Conceptualization, B.A.F., M.H., and S.A.AS.; methodology, B.A.F.. S.A.A.S., M.S., and R.F. ; software, S.A.A.S., M.S., and R.F.; validation, B.A.F., M.H., S.A.A.S., M.S., and R.F. ; formal analysis, B.A.F., M.H., S.A.A.S., M.S., and R.F. ; data curation, S.A.A.S., M.S., and R.F. ; writing original draft preparation, S.A.A.S., M.S., and R.F. ; writing—review and editing, B.A.F., M.H., and S.A.A.S.; visualization, B.A.F., M.H. and S.A.A.S., ; supervision, B.A.F., M.H., and S.A.A.S. ; project administration, B.A.F., M.H., S.A.A.S., ; funding acquisition, N.A. All authors have read and agreed to the published version of the manuscript.

6-2- Data Availability Statement

The data presented in this study are available on request from the corresponding author.

6-3- Funding

The authors received financial support from Universitas Airlangga under Covid-19 Grant.

6-4- Institutional Review Board Statement

Not applicable.

6-5- Informed Consent Statement

Not applicable.

6-6- Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies have been completely observed by the authors.

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