





“An overview of investor sentiment: Identifying themes, trends, and future direction through bibliometric analysis”

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AN OVERVIEW OF INVESTOR SENTIMENT: IDENTIFYING THEMES, TRENDS, AND FUTURE DIRECTION THROUGH BIBLIOMETRIC ANALYSIS

Abstract

Investor sentiment is the result of trading behavior and irrational beliefs of investors leading to high volatility and market mispricing. This review aims to study the entire spectrum of articles in the domain of investor sentiment using a bibliometric analysis approach. To this end, the study analyzes a total of 1,919 articles published in the Scopus database between 1979 and 2022. The review uncovers major themes, leading authors, influencing articles, trend topics, top contributing countries, and affiliations. The review shows that the research in the domain of investor sentiment is growing exponentially with an annual growth rate of 15.88%, and the year 2020 witnessed the highest number of scientific productions accounting for 252 (13.68%) total publications. The results display that the USA and China are leading countries in terms of the total contribution and volume of studies from respective authors. The review also reveals that existing research in the field has mainly focused on themes such as market efficiency, asset pricing, stock returns, sentiment analysis, IPO underpricing, overreaction, and volatility, whereas Covid-19 and Bitcoin depicted as emerging themes from recent scholarly works.

Keywords

behavioral finance, investor sentiment, sentiment index, stock return, bibliometric analysis, R-studio

JEL Classification

G40, G41, G12

INTRODUCTION

Traditional finance theories are based on rational behavior of investors and the market efficiency that have given various explanations for the price discovery process in the securities market (Malkiel, 2003). However, traditional finance theories have failed to explain the volatility in prices and the benefits derived by the active investors resulting in the development of behavioral finance theories (Olsen, 1998). Behavioral finance as an alternative theory does not firmly reject the traditional approaches but argues that investor rationality is limited (Kahneman & Tversky, 1979). Investor sentiment in relation to stock market activity is acquiring great relevance in behavioral finance (Barberis et al., 1998), and the relevance is evidenced by an increase in the number of publications on investor sentiment from 6 in 1998 to 252 in 2020 (Figure 3).

Investor sentiment is the level of optimism or pessimism of investors towards securities and financial markets. The studies on investor sentiment are diverse due to various proxies and methodologies employed by the researchers to measure investor sentiment, and the literature on investor sentiment does not seem to have a clear understanding and lacks cohesion (Aggarwal, 2022). Recent trends show an

increase in the participation of retail investors, especially from 2019, accounting for one-fifth of market trading volume at present (Osipovich, 2020). With a significant increase in the role of retail investors, irrational behavior, i.e., times of overly pessimistic and optimistic expectations in the market operations may emerge (Aramonte & Avalos, 2021). This necessitates research on investor sentiment as they substantially affect the market return, volatility, and liquidity (Baker & Wurgler, 2006; Liu, 2015). Hence, there is a need to gain a clear insight into the emergence of studies on investor sentiment by compiling the existing literature.

In this direction, this study investigates the current state of knowledge in the field of investor sentiment through bibliometric analysis. The findings of the study would facilitate academicians and researchers, especially the infancy researchers in the area of investor sentiment.

1. LITERATURE REVIEW

Baker and Wurgler (2007) stated that sentiment is the “belief about future cash flows and investment risks that are not justified by the facts”. Keynes (1936) made an early study on financial markets and the sentiment of investors. Kahneman and Tversky (1979) developed the prospect theory, explaining that investors are more sensitive to losses than gains and are prone to sentiment. Another noteworthy theory of DeLong, Shleifer, Summers, and Waldmann (DSSW theory) validates investor sentiment and states that the risk created by noise traders and the unpredictability of the noise traders’ beliefs causes asset prices to differ significantly from their fundamental value (De Long et al., 1990). Subsequently, various models were developed to interpret the impact of investor sentiment on markets, and it was found that investor sentiment cannot be observed directly and has to be estimated (Barberis et al., 1998). Researchers have used several measures such as direct survey data, indirect market-wide sentiment data, and composite sentiment indices to investigate the role of investor sentiment (Bathia & Bredin, 2018; Bouteska, 2020). Direct sentiment indicators are the result of survey data, which relate directly to the pessimistic or optimistic perspective of investors. It comprises of American Association of Individual Investors Index (AAII index), US Investor Intelligence Index (II index), Wall Street Analyst Sentiment Index, Michigan Consumer Sentiment Index (MCSI), and Market Mood Index (MMI). Indirect sentiment indicators represent proxy variables that indicate sentiments through statistical business transaction data. These indicators indirectly reflect investors’ psychological characteristics after the event. To

measure investor sentiment various proxy indicators such as closed-end mutual funds (Lee et al., 1991), initial public offerings (Bessler & Thies, 2007), return on initial public offerings (Baker & Wurgler, 2006), buy-sell imbalance (Kumar & Lee, 2006), turnover (Baker & Stein, 2004), odd-lot sales (Barber, 1994; Neal & Wheatley, 1998) have been utilized. The compound sentiment indicator is an overall detailed representation of market sentiments by synthesizing individual market sentiment proxies. B-W index, developed by Baker and Wurgler (2006) is a widely recognized and adopted composite sentiment index in the area of investor sentiment.

Researchers gave a shred of early concrete evidence that focused on the demonstration of the impact of sentiments on future market returns (Lee et al., 1991; Neal & Wheatley, 1998). Most studies have proved a significant relationship between investor sentiment and stock market returns, volatility, liquidity, and stock predictability (Olsen, 1998; Baker & Wurgler, 2006; Liu, 2015). On the contrary, researchers showed a negative sentiment-return relation in the aggregate level of the US stock market (Brown & Cliff, 2005). Kling and Gao (2008) showed no effect of investor sentiment in the Chinese stock market. In German stock markets, researchers (Finter et al., 2010) were unable to measure the stock price predictability on future stock returns. Moreover, the views on the impact of sentiment on stock market dynamics are diverse and empirical results are mixed depending on the proxy and methodology employed.

Paule-Vianez et al. (2020) and Singh (2021) have undertaken a bibliometric analysis of the liter-

ature on behavioral finance, and both studies have exerted consensus on the emergence of investor sentiment as a prominent area in behavioral finance. Also, the studies uncovered the fact that investor sentiment stands out both in productivity and impact, which requires further investigation. In accordance with the recent advancement in the field of investor sentiment, this study aims to present a general overview of the research on current trends, major themes, and provide future directions. Thus, this review attempts to address the following research questions (RQ).

RQ1: *What is the research and publication trend in the field of investor sentiment and sentiment index?*

RQ2: *Who are the most prolific contributors in the field of investor sentiment and sentiment index?*

RQ3: *What are the most influencing articles in the field of investor sentiment and sentiment index?*

RQ4: *What are the major themes and trends in the field of investor sentiment and sentiment index?*

RQ5: *What are the future scopes in the field of investor sentiment and sentiment index?*

2. METHODS

This review employs bibliometric analysis to uncover the publication trend, prolific authors, top contributing countries, and major themes in investor sentiment. Bibliometrics is a complex and cumbersome science mapping tool developed in the R language by Aria and Cuccurullo (2017) to perform bibliometric analysis. It aids in identifying research clusters, demonstrates patterns for emerging themes in a field, and gives insights into existing research interests. This study uses the following workflow for conducting science mapping for bibliometric analysis (Figure 1), which includes a five-step approach: (1) Research design, (2) Data collection, (3) Analysis, (4) Visualization, and (5) Interpretation (Figure 1) (Aria & Cuccurullo, 2017).

The data collection stage encompassed selecting the database, extracting literature with inclusion-exclusion criteria, exporting the extracted data to biblioshiny, and filtering the articles. The data search was conducted on the Scopus database, as the Scopus database includes most of the journals indexed in the Web of Science (WoS), and has most publications with broader coverage of all fields (Martín-Martín et al., 2018). Additionally, by complementing WoS, Scopus has become a popular database (Zhu & Liu, 2020). The data analysis was carried out following Mongeon and Paul-Hus (2015). The study conducts a keyword strategy to gather significant bibliographic data, as shown in

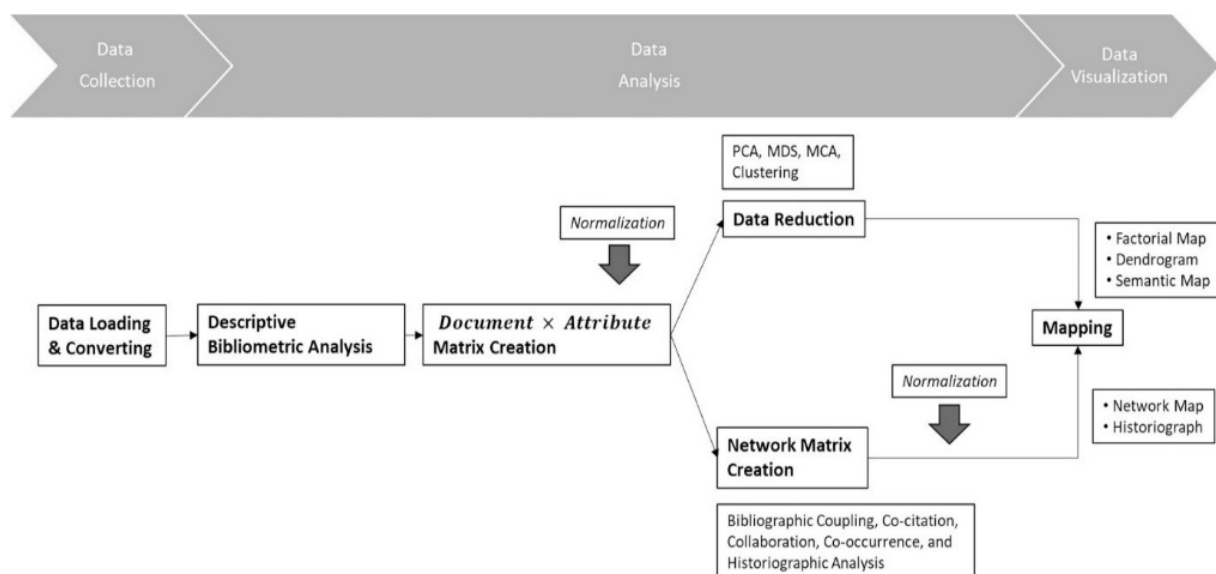


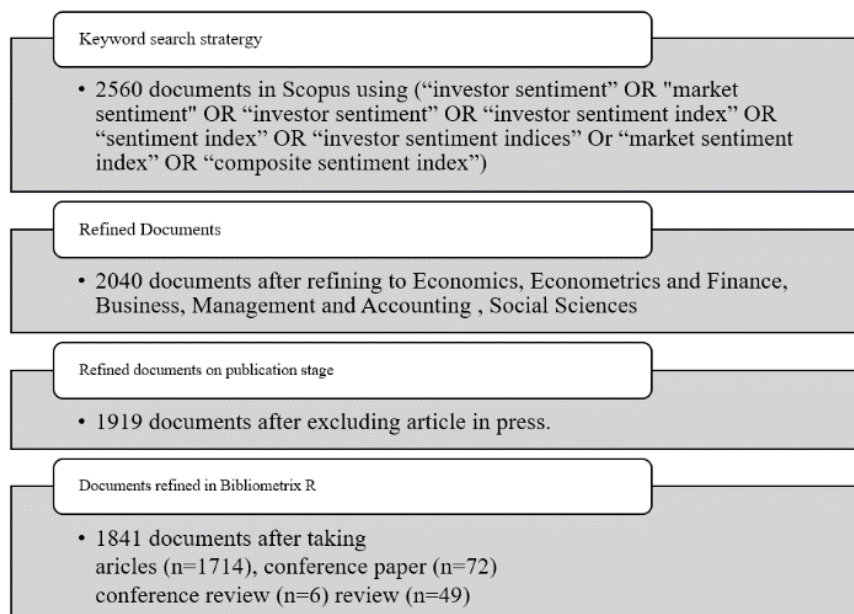
Figure 1. Bibliometric and recommended science mapping workflow

Table 1. Characteristics of the bibliometric study

Step 1	Defining the area of research	Investor Sentiment and Investor Sentiment Index
Step 2	Database selection	Scopus
Step 3	Search parameter for field	Keywords: "investor sentiment", "market sentiment", "investors sentiment", "investor sentiment index", "sentiment index", "investor sentiment indices", "market sentiment index", "composite sentiment index"
Step 4	Time period	No time restriction from authors
Step 5	Tool for analysis	Bibliometrix R package
Step 6	Examination of information	Analysis and discussion of results

Figure 2. The effective key terms employed in the search strategy are "Investor Sentiment" and "Investor Sentiment Index" (Table 1). Without any filtering, the original query run on 10-12-2021 yielded in 2,560 documents. The data was later screened to exclude any insignificant items based on our inclusion-exclusion parameters (Figure 2). The search string combinations and Boolean operators used are TITLE-ABS-KEY ("investor sentiment" OR "market sentiment" OR "investors sentiment" OR "investor sentiment index" OR "sentiment index" OR "investor sentiment indices" OR "market sentiment index" OR "composite sentiment index"). Further, the data is refined to the Scopus category of the subject areas such as "Economics, Econometrics, and Finance", "Business Management and Accounting", and "Social Sciences": TITLE-ABS-KEY ("investor sentiment" OR "market sentiment" OR "investor sentiment" OR "investor sentiment index" OR "sentiment index" OR "investor sentiment indices" OR "market senti-

ment index" OR "composite sentiment index") AND (LIMIT-TO (SUBJAREA, "ECON") OR LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "SOCI")), refined documents yielded in 2,040 articles. Additionally, documents that are in the final publication stage are considered excluding articles in press: TITLE-ABS-KEY ("investor sentiment" OR "market sentiment" OR "investors sentiment" OR "investor sentiment index" OR "sentiment index" OR "investor sentiment indices" OR "market sentiment index" OR "composite sentiment index") AND (LIMIT-TO (SUBJAREA, "ECON") OR LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "SOCI")) AND (LIMIT-TO (PUBSTAGE, "final")). Finally, 1919 articles were extracted from Scopus in bibtex format and exported to biblioshiny for further filtration. Articles, conference papers, review papers, and conference reviews were included after excluding editorials, notes, book chapters, and erratum notes from the data in biblioshiny.

**Figure 2.** Inclusion-exclusion criteria

The data synthesis depicted in Table 2 using primary information indicates the summary of the sources, and the table disclosed the timespan, sources, and document type of the collected data. The study sources the data without restricting it to a definite time period in Scopus and the documents published from 1979 to 2022 have been considered as depicted by biblioshiny. As a result, 1,919 documents retrieved from Scopus were filtered with biblioshiny fetched 1,841 documents. The most common text forms are articles (1,714), conference papers (72), review papers (49), and conference reviews (6). Table 2 also revealed the average year from publication (5.44), average citation per document (22.61), and average citation per document per year (2.764). The output from biblioshiny reveals 3,728 author keywords and 1,369 keyword plus. Author keywords represent the list of key terms the authors believe reflect the article's substance, and keyword plus reflects the phrases and terms in the title of cited documents by the authors (Zhang et al., 2015). The study has yielded more author keywords than keyword plus, so author keywords are used for the analysis.

Table 2. Data synthesis indicating primary information and summary of the sources

Description	Results
Main information about data	
Timespan	1979-2022
Sources (Journals, Books, etc.)	507
Documents	1841
Average years from publication	5.44
Average citations per document	22.61
Average citations per year per doc	2.764
References	1

Description	Results
Document types	
Article	1714
Conference paper	72
Conference review	6
Review	49
Document contents	
Keywords plus (ID)	1369
Author's keywords (DE)	3728
Authors	
Authors	3139
Author Appearances	4506
Authors of single-authored documents	284
Authors of multi-authored documents	2855
Authors collaboration	
Single-authored documents	352
Documents per Author	0.586
Authors per Document	1.71
Co-Authors per Documents	2.45
Collaboration Index	1.92

3. RESULTS

The study employed bibliometric analysis to provide an overview of the research in the field of investor sentiment. The results have been discussed in the following seven subsections: annual scientific production, three-field plot, most relevant authors, local cited authors, authors' impact, global cited documents, frequently used keywords, thematic map, and thematic evolution in investor sentiment.

3.1. Annual scientific production

Figure 3 illustrates the research and publication patterns from 1979 to 2022. The figure depicts a consistent growth in the publication since 2008,

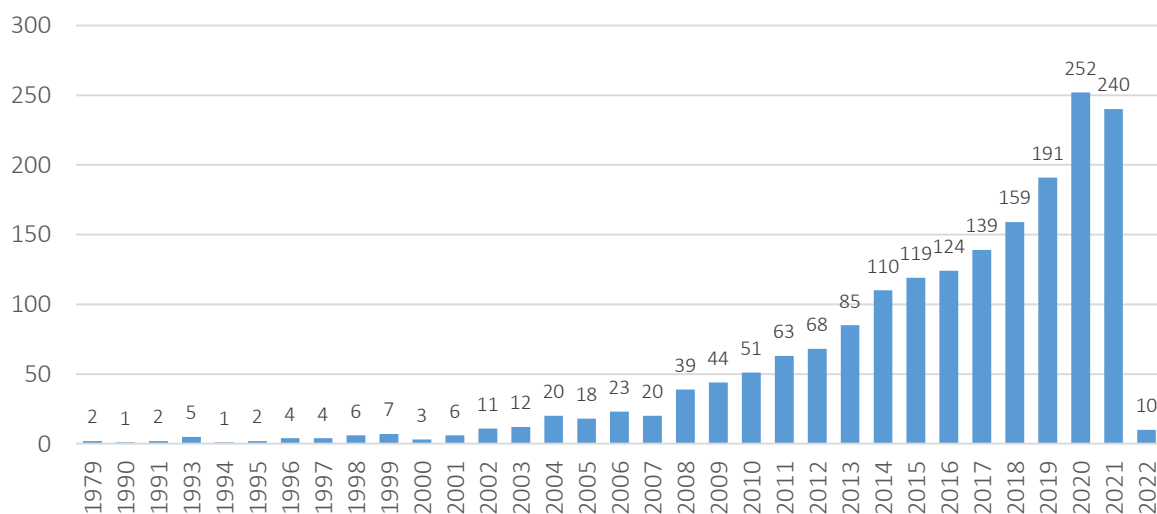


Figure 3. Annual scientific production

and the annual growth rate is 15.88%. From 1979 to 2005, there was slow and steady growth in the research field. After 2006, there was a surge in publications demonstrating the growing interest among field scholars. The total number of publications (n) from 1979 to 2022 yielded 1,841 documents; 94.35% were published between 2006 and 2022. 2020 is the year with the highest number of publications (n = 252, 13.68%) (Table 3). The scientific production of 2021 and 2022 could be understated as the data collection was conducted on December 10th, 2021. The statistics of annual scientific production show that investor sentiment has emerged as a research theme.

Table 3. Annual scientific production

Year	Articles	Year	Articles	Year	Articles
1979	2	2001	6	2012	68
1990	1	2002	11	2013	85
1991	2	2003	12	2014	110
1993	5	2004	20	2015	119
1994	1	2005	18	2016	124
1995	2	2006	23	2017	139
1996	4	2007	20	2018	159
1997	4	2008	39	2019	191
1998	6	2009	44	2020	252
1999	7	2010	51	2021	240
2000	3	2011	63	2022	10

3.2. Three-field plot and most cited countries

The visualized representation of the three-field plot (Figure 4) depicts three elements. The authors (AU), the country they are associated with (AU_

CO), and the keywords (DE) used in this study. These three elements are connected with the help of grey lines, which show the link between the countries, authors, and keywords. The left-hand side portrays the active countries, the middle column displays names of authors who have contributed to those countries and the right-hand side displays the most frequently used keywords by the authors. The USA ranks first in citations (20,029), and China ranks second (3,160). However, in terms of author affiliation, China ranks first (249), followed by the USA (79) (Figure 5). In this order, Korea has the third-highest number of authors (48), followed by India (25), Spain (25), and the United Kingdom (24). It can be interpreted that authors such as Yang C, Li Y, Gupta R, Dash S. R, and Kumar A are some prominent contributors in this field. Investor sentiment, behavioral finance, stock returns, and asset pricing are the significant keywords associated with authors and the countries they are affiliated.

3.3. Most relevant authors, local cited authors, and authors' impact

Table 4 displays the top 20 most relevant authors, author impact, and author affiliation. Baker M., Wurgler J., and Shleifer A. are the only authors with more than 3,000 citations. Baker and Wurgler have significantly contributed to the area by constructing a sentiment index (B-W index). Yang C. is the most relevant author in the area with 23 articles, followed by Li Y. with 19 articles. There were 3,139 authors in core research articles, with

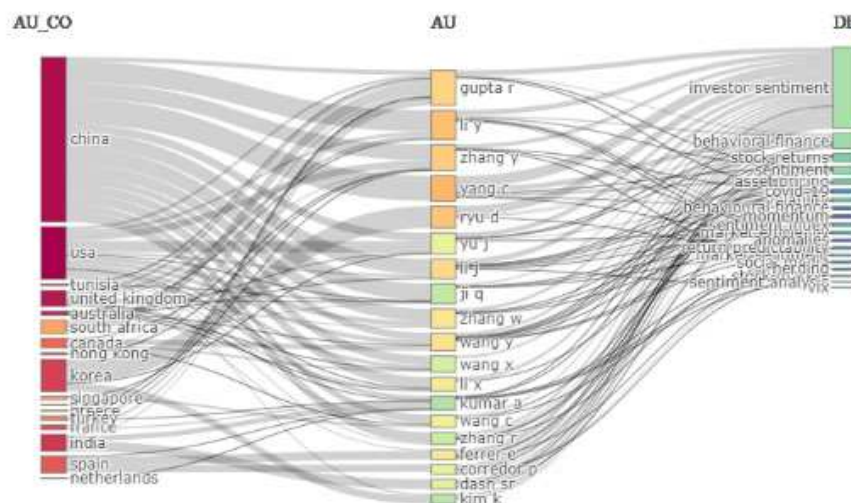


Figure 4. Three-field plot of author's country, authors, and keywords

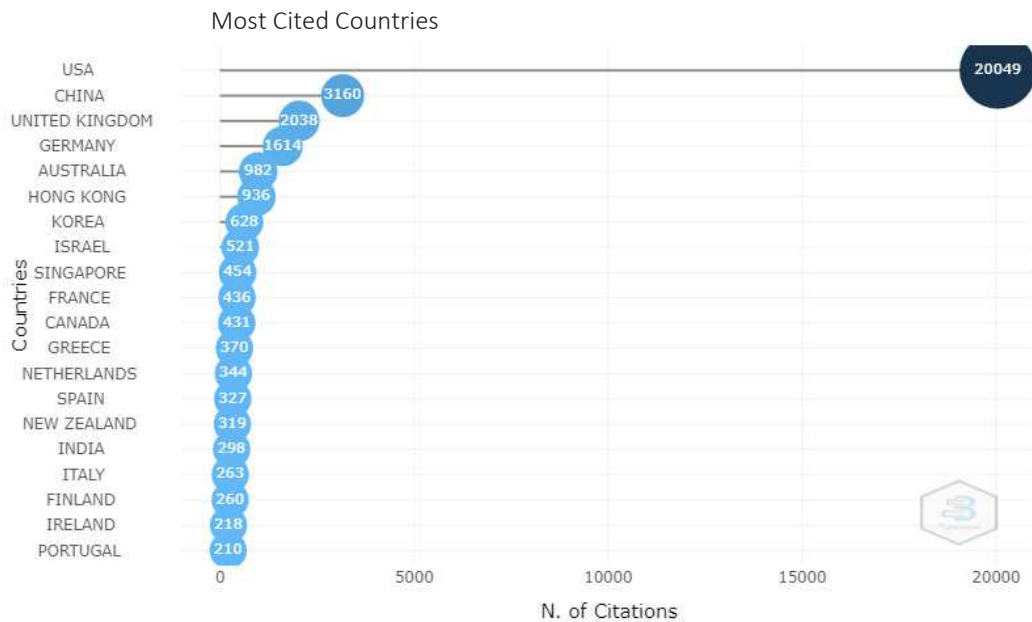


Figure 5. Top 20 most cited countries

an average of 1.71 authors per document, 284 authors in single-authored documents, and 2,855 in multiple-authored documents (Table 2).

Table 4. Top 20 most relevant authors, author's impact, and author's affiliation

Author Impact			Relevant Cited Authors	
Element	h_index	Total citation	Authors	Articles
Baker M	5	4054	Yang C	23
Wurgler J	5	4054	Li Y	19
Shleifer A	4	3083	Ryu D	17
Barberis N	1	1952	Zhang Y	17
Vishny R	1	1952	Gupta R	16
Yuan Y	6	1787	Li J	16
Tetlock PC	2	1586	Wang Y	13
Lee CMC	5	1568	Zhang W	13
Yu J	7	1317	Ferrer E	10
Brown GW	3	1198	Li X	10
Stambaugh	4	1093	Brown GW	10
Cliff MT	2	1072	Wang C	10
Thaler RH	2	931	Yu J	10
Chen MY	1	661	Corredor P	9
Das SR	1	661	Dash SR	9
Kumar A	5	658	Wang X	9
De Grauwe P	6	503	Zhang R	9
Schmelting M	3	498	Ji Q	8
Da Z	2	493	Kim K	8
Statman M	4	481	Kumar A	8

3.4. Global cited documents

The bibliometric analysis provided the top 20 most globally cited documents (Table 5). The results show that the paper proposed by Baker and Wurgler (2006) on investor sentiment is with the largest number of citations. They examined the effect of investor sentiment on the cross-section of stock returns by constructing a sentiment index using six market-wide sentiment proxies. Barberis et al. (1998) presented a model of investor sentiment based on psychological evidence that speaks about overreaction and underreaction of stock prices. Thirdly, the most globally cited document belongs to Tetlock (2007), where the relationship between news media reports and daily stock market activity was described, and it was found that earnings and stock return can be predicted with news media content. Baker and Wurgler (2007) published an article by developing “bottom-up” and “top-down” approaches to investor sentiment and demonstrated that stocks that are “hard to value” and “hard to arbitrage” respond more strongly than stock groups with paradoxical characteristics. Lee et al. (1991) investigated the fluctuations in discount on closed-end funds driven by investor sentiment, and stated that investor sentiment has more effect on small firms and closed-end funds. Das and Chen (2007) tried to extract sentiment from opinions and text to construct a sentiment index. They developed a methodology

for small investors' sentiment through web sources and evidenced a strong association between market movements and sentiments. Stambaugh et al. (2012) investigated the impact of investor sentiment on the cross-section of stock returns and showed that investor sentiment had a systematic effect on stock returns. Brown and Cliff (2004) tried to investigate the relationship between investor sentiment and near-term stock returns, they found a strong linkage between investor sentiment and contemporaneous return. However, they do not see any effect on individual investors and small stocks. Kumar and Lee (2006) stated that retail investors are influenced by sentiments that motivate them to trade stocks at prices that are not justified by their fundamental value.

3.5. Most frequent keywords and trend topics

Table 6 shows the most often referred keywords in investor sentiment and trend topics; extensively used keywords in the literature are investor sentiment, behavioral finance, market sentiment, stock returns, volatility, asset pricing, and market efficiency. Figure 6 is a visual representation of the most significant keywords used over time. Table 6 depicts that investor sentiment is currently a trending topic; various models and methodologies have been developed to fathom the impact of

investor sentiment on market (Baker & Wurgler, 2007; Stambaugh et al., 2012). Followed by the keyword behavioral finance, the theories and models of behavioral finance do not adhere to the assumptions of traditional finance. Behavioral finance investigates the impact of the irrationality and biases on decision-making (Paule-Vianez et al., 2020). Subsequently, market efficiency (Malkiel, 2003), stock returns (Chu et al., 2015), volatility (López-Cabarcos et al., 2021), and asset pricing (Brown & Cliff, 2005; Bathia & Bredin, 2018) are trending topics. Researchers can use these top keywords and trend topics to find the most relevant articles in the area of investor sentiment.

3.6. Thematic map (Co-word analysis)

A co-word analysis of author keywords helps to identify core themes in the field. A strategic thematic map was developed following the technique used by Cobo et al. (2011). Figure 8 is divided into four quadrants (clusters of keywords) based on the relevance degree (centrality) and development degree (density) along two axis. Cobo et al. (2011) state that centrality is a measure of the importance of a theme and developments in the entire research field. Density identifies the degree of development of themes. The size of the cluster denotes the number of occurrences of keywords, and the software chooses the cluster labels in ac-

Table 5. Top 20 the most influencing articles

Paper	DOI	TC per Year
Baker M., 2006, The Journal of Finance	10.1111/j.1540-6261.2006.00885.x	129.6875
Barberis N., 1998, Journal of Financial Economics	10.1016/s0304-405x(98)00027-0	81.3333
Tetlock P.C., 2007, The Journal of Finance	10.1111/j.1540-6261.2007.01232.x	104.4667
Baker M., 2007, Journal of Economic Perspectives	10.1257/jep.21.2.129	85.2667
Lee C. M. C., 1991, The Journal of Finance	10.1111/j.1540-6261.1991.tb03746.x	28
Das S. R., 2007, Management Science	10.1287/mnsc.1070.0704	44.0667
Stambaugh R. F., 2012, Journal of Financial Economics	10.1016/j.jfineco.2011.12.001	63.4
Brown G. W., 2004, Journal of Empirical Finance	10.1016/j.jempfin.2002.12.001	32.7778
Kumar A., 2006, The Journal of Finance	10.1111/j.1540-6261.2006.01063.x	35.625
Brown G. W., 2005, Journal of Business	10.1086/427633	28.3529
Da Z., 2015, The Review of Financial Studies	10.1093/rfs/hhu072	62.1429
Baker M., 2012, Journal of Financial Economics	10.1016/j.jfineco.2011.11.002	42.1
Lemmon M., 2006, The Review of Financial Studies	10.1093/rfs/hhj038	25.8125
Brunnermeier M. K., 2004, The Journal of Finance	10.1111/j.1540-6261.2004.00690.x	21.7778
Schmeling M., 2009, Journal of Empirical Finance	10.1016/j.jempfin.2009.01.002	28.9231
Frazzini A., 2008, Journal of Financial Economics	10.1016/j.jfineco.2007.07.001	23.6429
Lee W. Y., 2002, Journal of Banking and Finance	10.1016/S0378-4266(01)00202-3	16.1
Fisher K. L., 2000, Financial Analysts Journal	10.2469/faj.v56.n2.2340	12.9091
Keller K. L., 2003, Marketing Management	NA	14.6842
Huang D., 2015, The Review of Financial Studies	10.1093/rfs/hhu080	39

Table 6. Top 20 most frequently used author keywords associated with investor sentiment

Most Frequent Words		Trend Topic	
Words	Occurrences	Item	Frequency
Investor sentiment	617	Behavioral finance	103
Behavioral finance	103	Market efficiency	41
Sentiment	94	Stock returns	65
Market sentiment	72	Volatility	53
Stock returns	65	Asset pricing	43
Volatility	53	Investor sentiment	617
Asset pricing	43	Sentiment	94
Stock market	42	Market sentiment	72
Market efficiency	41	Stock market	42
Sentiment index	34	Return predictability	33
Return predictability	33	Sentiment index	34
Sentiment analysis	32	Sentiment analysis	32

cordance with the predominant author keywords.

Motor theme: The themes of the first quadrant are well-advanced with high centrality and density. There are very few motor themes such as “stock market sentiment index”, “sentiment analysis”, and “momentum”. Baker and Wurgler (2006) stated that the “sentiment index” predicts cross-sectional stock return. Huang et al. (2014) proposed a sentiment index to predict aggregate stock market return. Dergiades (2012), following Baker and Wurgler (2007), constructed a sentiment index and found significant predictive power of sentiment on stock return. Researchers have attempted to develop a sentiment index using various proxies and tried to examine the relationship between investor sentiment and stock returns (Bouteska, 2020). “Momentum” is the most explored keyword in the field, researchers shred a piece of early evidence on how low momentum stocks are more sensitive to changes in sentiment (Bathia & Bredin, 2018).

Niche themes: Second quadrant themes are with high density and low centrality. They are well-developed and specialised themes but minimal compared to the overall field. “Consumer confidence” is one of the noted themes in this quadrant. Researchers have tried to link consumer confidence with asset prices (Lemmon & Portniaguina, 2006), stock returns (Schmeling, 2009), and corporate disclosure (Bergman & Roychowdhury, 2008). The concept of “closed-end funds” is associated with investor sentiment, small stocks (Lee et al., 1991), and the prediction of stock returns (Neal & Wheatley, 1998). “Panel data”, “monetary policy” and “real estate” are studied by relating to investor sentiment.

Peripheral themes: The third quadrant consists of both emerging and declining themes. They lie in low density and low centrality axis. This quadrant includes themes such as “granger causality”, “stock prices” and “financial crisis”. Abundant studies are employing the Granger causality test



Figure 6. Word cloud analysis showing most frequently used keywords

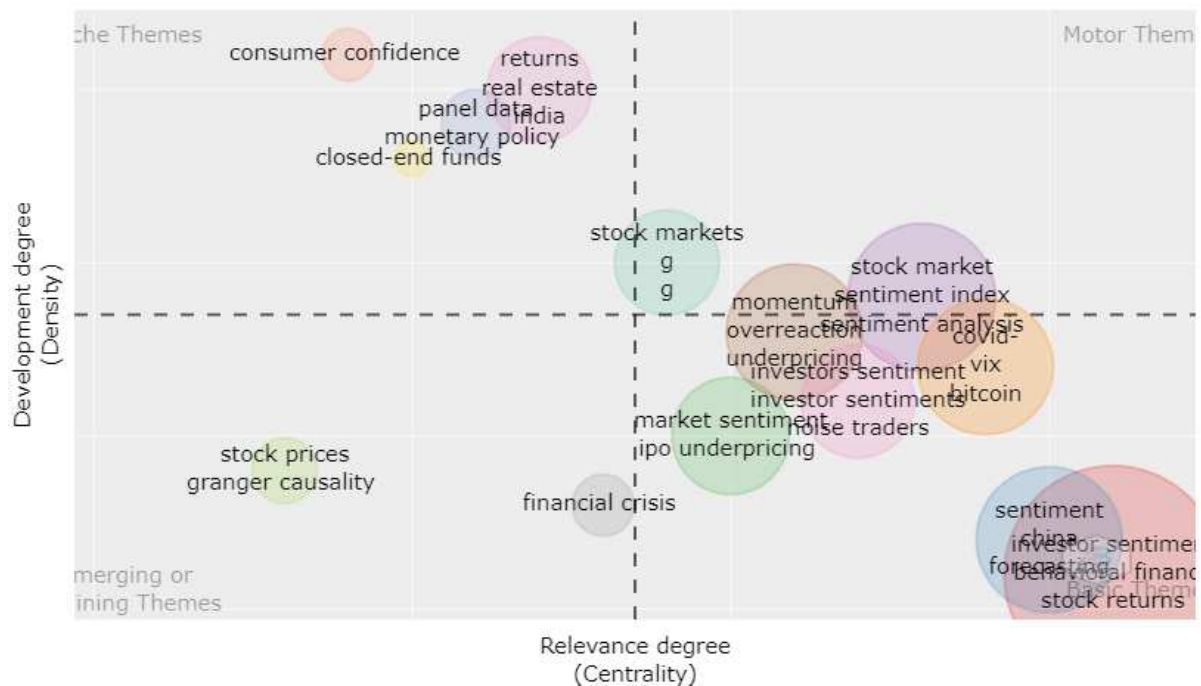


Figure 7. Thematic map

to study investor sentiment with stock market liquidity (Liu, 2015), stock returns (Chu et al., 2015), and financial crisis (Debata & Mahakud, 2018). Peripheral themes are shrinking moderately as there are a plethora of studies available in this area.

Transversal, general and basic themes: Themes under the fourth quadrant are high centrality and low density. These are not well developed but are still significant in the area and are evolving quickly. Themes such as “IPO (Initial Public Offering) underpricing”, “overreaction”, “Covid-19”, “volatility index (VIX)”, and “Bitcoin” are popular but have not gained focus. Bitcoin is gaining popularity among researchers. They are exploring the relationship between Bitcoin, investor sentiment, and stock market volatility (López-Cabarcos et al., 2021) demonstrating the effect of investor sentiment on Bitcoin return and volatility for future periods. Researchers also examined the relationship between Bitcoin and social media (Guégan & Renault, 2020), price discovery (Entrop et al., 2020), and behavioral biases such as herding and anchoring (Gurdgiev & O’Loughlin, 2020). VIX covers studies that relate investor sentiment with index options trading (Chordia et al., 2020), and artificial intelligence (Janková & Dostál, 2019). The influence of the Covid-19 pandemic on asset

prices, more specifically stock prices and volatility, has gained importance due to the impact of the pandemic on the securities market. Several articles investigated the impact of Covid-19 with heuristic biases (Kathpal et al., 2021), investor herding (Dhall & Singh, 2020), and sentiment analysis (Eachempati et al., 2021).

3.7. Thematic evolution

Figure 8 represents the thematic evolution that provides the global view of the research topic for three periods 1979–2005, 2006–2014, and 2015–2022. Each node represents a cluster and is labelled with cluster terms. The themes that belong to the same thematic field are given different colors, and edges in the figure are temporal evolution tracks created by keyword co-occurrence of research topics between two-time slices (Cobo et al., 2011). Figure 8 shows research progress and the pattern in the research themes, which displays an evolution and gradual shift in the research themes. In the Initial stage (1979 to 2005), the focus of the themes revolved around investor sentiment, market sentiment, and emerging markets in general. In the developing stage (2006 to 2014), new themes such as VIX, panel data, institutional investors, asset pricing, and liquidity have evolved widening

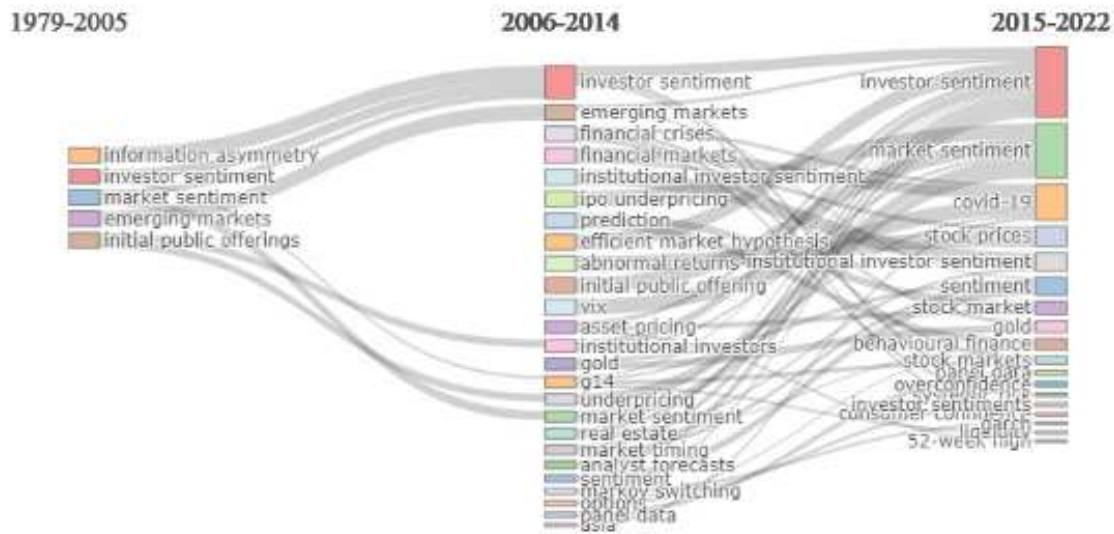


Figure 8. Alluvial diagram of thematic evolution

the research area. In the advanced stage (2015 to 2022), the themes developed in earlier stages have lumped together to form research areas such as investor sentiment, market sentiment, stock prices, Covid-19 and stock market.

4. DISCUSSION

This study investigated the research and developments in the area of investor sentiment and sentiment index through bibliometric analysis. The study results revealed that Baker and Wurgler (2006) laid the foundation for research on investor sentiment using the composite sentiment index. It was observed that after 2006 there was a surge in publication, 94.35% of research articles were published between 2006 and 2022. Researchers have given keen attention to investor sentiment analysis in recent years, considering the persistent volatility in the stock market. Like any other emerging field of research, it can be observed that the works from the USA guide the research, and the majority of the research on analyzing the impact of investor sentiment stems from developed markets in comparison to emerging markets. Investor sentiment, behavioral finance, stock returns, and asset pricing are the significant keywords associated with authors and a majority of the studies used the above-mentioned author keywords in their research.

Due to the fact of the significance of investor sentiment, different studies using various proxy

measures revealed the major themes in this arena. Previous studies have concentrated on sentiment index and sentiment analysis, presently IPO underpricing, VIX, Covid-19, and Bitcoin are quickly evolving themes. These findings are in alignment with studies of Dhall and Singh, (2020), Entrop et al. (2020), and Eachempati et al. (2021), which exhibited a strong effect of Covid-19 and Bitcoin pertaining to investor sentiment as they are gaining prominence. Baker M., Wurgler J., and Shleifer A. are the only authors with more than 3000 citations. The studies by Baker and Wurgler (2006), Barberis et al. (1997), and Tetlock (2007) are significant documents in the field of investor sentiment with a great number of global citations. The study by Baker and Wurgler (2006) constructing a sentiment index (B-W index) provided a piece of significant evidence between stock market returns and investor sentiment. Barberis et al. (1998) showed that market mispricing is attributable to the presence of investors' overreaction and underreactions. On the contrary, Brown and Cliff (2004) failed to determine the predictability of stock returns through investor sentiment. It further shows that globally cited works have concentrated on examining and measuring investor sentiment with alternative models and methodologies. The studies that have applied these models have found both confirmatory and contradictory results depending on the economic context (Baker & Wurgler, 2006; Brown & Cliff, 2004). Heterogeneity in the studies is observed due to the existence of different cultures, institutional quality, intelligence, and

varied behavior of individual investors. The effect of investor sentiment on market return, volatility, stock predictability, and liquidity is of great significance, but one cannot simply transfer evidence from one market to another.

Further research in the area of investor sentiment will be required in search of a systematic explanation for changes in asset prices. The field is moving away from definitional and conceptual analysis using qualitative measures toward empirical examinations. Researchers have attempted to measure investor sentiment and its influence on asset prices in the economies like the USA, China, and

UK using market, survey, and social media data. Hence, there is a scope to study investor sentiment and develop a comprehensive index in emerging markets and thereby get a suitable explanation for asset price changes. Global studies have identified the need to examine the impact of investor sentiment on the oil market, crypto market, bond market, and futures market. However, the existing studies have primarily concentrated on equity markets. As media data is gaining popularity among investors due to its information symmetry, further studies need to establish the relationship between social media and investor sentiment in various financial markets.

CONCLUSION

Investor sentiment has gained remarkable attention in the field of behavioral finance. This study aims to synthesize the current status and future development in the literature on investor sentiment and sentiment index. The results obtained from annual scientific production reveal that the field has become popular among academicians since 2006, as Baker and Wurgler constructed a composite sentiment index using six explicit market sentiment proxies and demonstrated a significant sentiment sensitivity with future stock return. This led to an increase in the trends in scientific production from 2008 till the beginning of 2022 (91.93%).

The results reveal interesting insights, particularly about the major themes. Accordingly, sentiment index and sentiment analysis are the well-advanced themes in this area with the high number of scientific productions. Consumer confidence, closed-end fund discount, panel data, monetary policy, and real estate are specialized themes with potential research trends as there are limited studies on the themes. Stock price, Granger causality, and financial crisis are minor themes with abundant studies. Interestingly, researchers and academicians have concentrated on evolving themes such as IPO underpricing, overreaction, volatility, Covid-19, Bitcoin, and social media with the growing evidence of fluctuations and vulnerability in the global financial markets.

Although this study justifies the use of Scopus as a primary database, the scope of the study may be limited; and there is a scope for future research using databases such as Google Scholar and WoS. The study does not include notes and book chapters, leading to the exclusion of a significant part of existing literature. The bibliometric attributes presented in the study will provide insights into the developments in the field over the decades and informs future researchers about relevant themes and topics for their research. To this end, the study on investor sentiment remains significant, and further theoretical and empirical research in this domain will encourage advancement in the area.

AUTHOR CONTRIBUTIONS

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Writing – review & editing: Aditi N Kamath, Sandeep S Shenoy, Subrahmanya Kumar N.

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