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Article

The impact of macroeconomic variables on financial performance: A bibliometric analysis

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Abstract: This study aims to review the literature on the relationship between the stock market and macroeconomic variables. Given the stock market's role in driving economic activity, understanding this interaction is critical for investors, policymakers, and economists. The research uses bibliometric analysis to explore the current literature, identify trends, and map the intellectual landscape. Using Scopus data from 1979 to 2023, 867 publications were analyzed with Bibliophagy, a tool in R's Bibliometrics package, automating the identification of influential journals, authors, and themes. Citation analysis, co-citation analysis, and social network analysis further provided insights into the academic discourse. The findings show that the relationship between macroeconomic variables and stock markets has evolved with changing economic conditions. This study also identifies research gaps and suggests future studies focus on specific industries to understand better how macroeconomic factors impact different economic segments.

Keywords: crude oil; exchange rate; investment; macroeconomic variables; stock market

1. Introduction

The interaction between stock markets and macroeconomic variables has long been a subject of interest in both academic and professional circles. Financial markets play a pivotal role in modern economies by facilitating capital allocation, promoting economic growth, and serving as a barometer for economic health. At the same time, macroeconomic variables—such as inflation, interest rates, gross domestic product (GDP), and exchange rates—exert significant influence on stock market performance. Understanding the complex relationship between these two domains is essential for a wide range of stakeholders, including investors seeking to optimize portfolio returns, policymakers aiming to foster economic stability, and economists working to forecast future economic trends. Over the past few decades, numerous studies have been conducted to explore the linkages between stock market performance and macroeconomic variables. However, the findings have often been mixed and context-dependent, reflecting the complexity of these relationships across different countries, periods, and economic conditions. For instance, while some studies suggest a strong positive correlation between economic growth and stock market returns, others point to the influence of inflation and interest rates in driving market volatility. Moreover, globalization and technological advancements have further complicated the interaction between financial markets and macroeconomic factors, adding new dimensions to the research in this area.

Given the growing importance of financial markets in shaping economic outcomes, there is a need for a comprehensive review of the existing literature to identify major trends and gaps in our current understanding. By doing so, researchers can uncover the intellectual structure of this field and map out the key themes and research directions that have emerged over time. The purpose of this study is to provide an extensive bibliometric analysis of the literature on the relationship between stock markets and macroeconomic variables. Using data from the Scopus database spanning the period from 1979 to 2023, this study employs bibliometric tools to analyze a sample of 867 academic documents. Using Bibliophagy, a web-based tool in the R-based Bibliometrics package, this research aims to identify influential journals, authors, articles, and countries, as well as to conduct citation analysis, co-citation analysis, and social network analysis. The results of this study will offer valuable insights into the evolution of research themes, highlight conceptual frameworks, and point out areas for future exploration.

Ultimately, this study aims to contribute to the broader understanding of how macroeconomic variables and stock markets interact, providing a foundational map for future research while also identifying emerging trends that have the potential to shape the field in the years to come. This review will also serve as a practical resource for investors, policymakers, and academics interested in navigating the ever-evolving landscape of financial markets and macroeconomic forces.

Despite the extensive body of literature examining the relationship between stock markets and macroeconomic variables, significant research gaps remain. Many studies offer conflicting results, often influenced by different economic contexts, timeframes, and methodologies, making it difficult to draw definitive conclusions. Additionally, while globalization and technological advancements have altered the dynamics between financial markets and macroeconomic factors, there is a lack of comprehensive studies that explore these new dimensions. Furthermore, existing research tends to focus on individual macroeconomic variables without considering their complex interactions or the evolving global context. This study seeks to address these gaps by providing a comprehensive bibliometric analysis that identifies trends, frameworks, and emerging research directions in this field.

The remainder of this paper provides a detailed explanation of its objectives, methodology, and expected contributions. The paper aims to offer an extensive bibliometric analysis of the literature concerning the relationship between stock markets and macroeconomic variables. The analysis is based on a dataset of 867 academic documents from the Scopus database, spanning the years 1979 to 2023. It utilizes bibliometric tools, including Bibliophagy, to identify influential journals, authors, articles, and countries, as well as to conduct various types of analyses such as citation analysis, co-citation analysis, and social network analysis. The findings are intended to shed light on the evolution of research themes, highlight key conceptual frameworks, and suggest directions for future research. The ultimate goal is to provide a comprehensive map that will help researchers, policymakers, and investors understand the interplay between stock markets and macroeconomic variables, offering insights that could guide future inquiries and decision-making in this field.

2. Literature review

The growth of a nation's economy and its prosperity is possible only when stock market works efficiently. Investors are interested in knowing when to invest for profit and when to sell their holdings to protect their capital. There is a long-term correlation between the Indian capital markets and important macroeconomic indicators like interest rates, inflation, currency rates, and gross domestic savings (GDS) of the Indian economy [1]. Since the 1980s, academics, investors, and stock market regulators have all shown a keen interest in the literature-established idea that macroeconomic variables affect the stock market. In the last two decades, researchers have been working hard to scientifically investigate this relationship [2]. Several models were developed that examined the relationship between asset prices and real economic activity in terms of production rates, productivity, growth rate of the gross domestic product, unemployment, yield spread, interest rates, inflation, dividend yields, and other factors [3]. Recently, developed, and emerging economies have received more attention in investigating the relationship between the underlying macroeconomic indicators and stock market [4,5] empirically examine the dynamic link and volatility spillover effects between exchange rates and stock returns in five Central and Eastern European (CEE) nations. Hung [6] reveals that there are significant implications for financial risk management as well as portfolio management in the BRICS equity markets, as well as providing straightforward insight for monetary and fiscal policies by considering the pressure generated by international crude and gold prices on the stock and exchange rate markets. Salisu et al. [7] examine whether stock returns contain useful information that may be used to improve the forecast accuracy of BRICS exchange rate movements using a large data sample based on the Uncovered Equity Parity. Also, develop a predictive model that connects exchange rate movements to the difference in stock returns between the domestic and foreign (US) markets. Olayeni et al. [8] explore the dynamic association between oil price, global oil production, stock market activity, Nigeria-US exchange rate and Kilian's world economic activity index. And create a robust, stable single-equation error correction model in which the exchange rate bears the weight of short-run changes with causal inputs from the other variables in the model. Humpe and McMillan [9] using a pooled mean group estimator for panel ARDL cointegration, investigate a positive long-run relationship between stock prices, industrial production, and consumer prices. Abbas Ghulam et al. [10] examine the relationship between stock market return and volatility and macroeconomic fundamentals for the G-7 countries using a spillover index technique based on the generalized VAR framework. And reveals considerable interactions between the returns and volatility of the G-7 stock markets and the collection of comparable macroeconomic parameters, which include industrial production, money supply, interest rates, inflation, oil prices, and currency rates. Andries et al. [11] using the cross-wavelet power, cross-wavelet coherency, and phase difference techniques suggest that stock price shifts lag both exchange rate and interest rate fluctuations. The interest rate lead over stock price changes is much more evident, especially after 2006, implying that the stock market follows interest rate signals. Paramati et al. [12] examine the relationship between call money rates, exchange rates, and stock returns in India. And finds a significant lead-lag relationship exists

between exchange rates, call money rates and stock returns. A similar association was seen between exchange rates and call money rates, as well as stock returns. Singhal et al. [13] explore the dynamic link between international oil prices, international gold prices, the Mexican exchange rate, and the stock market index. Using the ARDL Bound testing cointegration technique, it finds that worldwide gold prices favorably affect Mexican stock prices while oil prices negatively affect them. Oil prices have a negative long-term impact on the exchange rate, but gold prices have no substantial impact on the exchange rate.

Numerous studies have recently been conducted using bibliometric analysis. In comparison to earlier bibliometric studies on oil price shocks, stock market returns and volatility [14], cryptocurrencies [15] and green finance [16]. This motivates us to study the scarcity of analysis concerning publications studying the impact of macroeconomic variables on the stock market. Our study focuses on research trends in macroeconomic variables and the stock market to suggest a research gap for research to be conducted in this domain. As far as we are aware, current research symbolizes a groundbreaking effort to incorporate a systematic analysis of literature and bibliographic data discussing the relationship between macroeconomic indicators and the stock market. Based on this, we can answer the following research questions:

RQ1: What is the current trend in the existing literature in terms of publication and citation?

RQ2: What is the trend in publication in the most prominent journals?

RQ3: Which academic articles are most cited in the literature?

RQ4: What are the most commonly used keywords in the literature?

RQ5: Who are the notable writers and research institutions who have contributed significantly in recent years?

RQ6: What is the current literature on research collaboration?

RQ7: What is the conceptual framework of current literature?

RQ8: In the existing literature, which indicators impact co-occurrence networks?

RQ9: What changes have occurred in popular research topics over the years?

RQ10: What are the obstacles to comprehending the macroeconomic and stock market relationship?

RQ11: Which areas of the existing literature call for additional investigation?

This study is different from the existing literature. Firstly, our research is one of the first to use bibliometric analysis to evaluate and inspect the development and research inclination concerned with the "impact of macroeconomic variables on the stock market". Secondly, we suggest research direction for future research based on gaps in the existing literature.

3. Methodology

3.1. The procedure of bibliometric analysis

This bibliometric analysis is conducted by following five steps proposed by Zupic and Čaters is demonstrated in **Figure 1** [17].

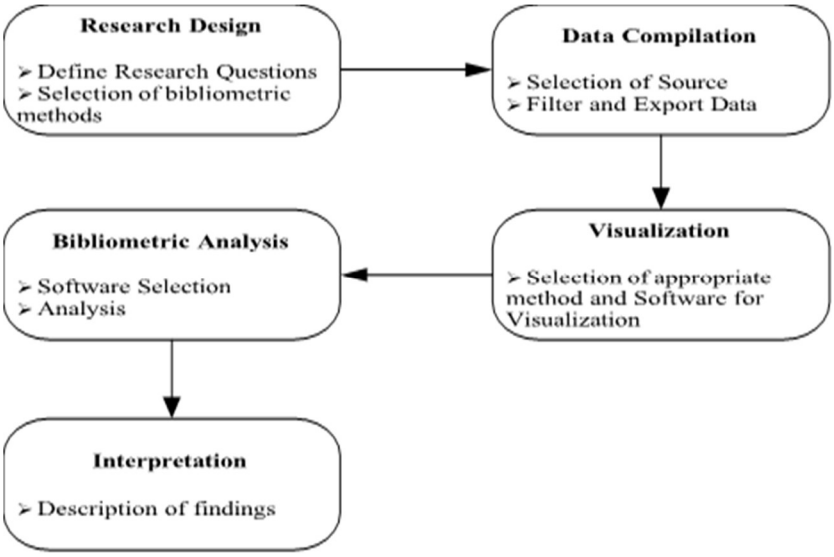

Figure 1. The five steps for conducting bibliometric analysis.

3.2. Research design

In this study we explore existing literature and suggest direction for future studies. Research questions are answered with the help of descriptive information and discovering influential research journals, core research publications, core words, core authors, research institutions, and countries. Core authors and influential research journals are identified based on annual publication, impact of the source, and total citations. Bradford's law is also used for identification in influential research journals. Further core research institutions and countries are identified based on publication frequency and total citations. To identify future research direction, we depend on co-occurrence network analysis and thematic map analysis. Co-citation analysis, content analysis, co-occurrence network, thematic map, and thematic evolution are used for this purpose. The "biblioshiny" tool from the R program is used in the study to detect research themes in current publications as part of bibliometric analysis.

3.3. Research objectives and analytical techniques

The current study aims to conduct a comprehensive systematic literature review on the impact of macroeconomic variables on the stock market and suggest ways to improve the existing literature. Using "bibliophile", our major purpose is to discover the key institutions, nations, authors, and research articles. Furthermore, we plan to reveal critical research topics using scientific mapping tools such as co-citation and co-occurrence analysis. Using these research methodologies allows us to conduct a full analytical evaluation, allowing us to discover the present limits in the body of literature.

3.4. Selection of dataset

Data for the current study was obtained from the Scopus database. The search query used for obtaining data was TITLE-ABS-KEY (relationship AND between AND ("stock market" OR "stock price") AND ("macroeconomic variables" OR "gold price" OR "crude oil price" OR "exchange rate")). There after data was refined by using various Scopus categories (LIMITTO (LANGUAGE, "English")) AND

(LIMIT-TO (DOCTYPE, "ar")) AND (LIMITTO (SUBJAREA, "ECON") OR LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "COMP") OR LIMIT TO (SUBJAREA, "ENVI") OR LIMIT-TO (SUBJAREA, "DECI")). Based on the above search criterion, we got 867 documents.

4. Bibliometric analysis and visualization

The comprehensive science mapping is accomplished by the use of a bibliometric technique in the study. It is a time-tested research technique used in library and information science to analyze scientific books statistically and mathematically to increase the efficiency and efficacy of libraries [18]. In this study, we use the Bibliometrics R package of R studio for data analysis and visualization. Bibliophagy, an application integrated in R studio is employed for conducting bibliometric analysis across various categories, including sources, authors, documents, conceptual structure, intellectual structure, and social structure. Compared to other bibliometric software, Bibliophagy offers the ability to receive multiple results through graphs and tables.

Table 1 indicates the main information about the data to understand before we proceed to further analysis. We have identified 867 articles authored by 1802 authors; 179 articles are single-authored documents which show a high degree of collaboration. The international co-authorship percentage is 23.07 which indicates a high degree of international collaboration. **Figure 2** shows annual production in this area. In the annual production, we can see that till 2007 the contribution is limited but from 2008 onwards there is a significant increment in annual production.

Table 1. Main information.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1979:2023
Sources (Journals, Books, etc.)	324
Documents	867
Annual Growth Rate %	2.53
Document Average Age	8.01
Average citations per doc	17.47
References	31,824
DOCUMENT CONTENTS	
Keywords Plus (ID)	926
Author's Keywords (DE)	1861
AUTHORS	
Authors	1802
Authors of single-authored docs	158

Table 1. (*Continued*).

Description	Results
AUTHORS COLLABORATION	
Single-authored docs	179
Co-Authors per Doc	2.42
International co-authorships %	23.07
DOCUMENT TYPES	
Article	867

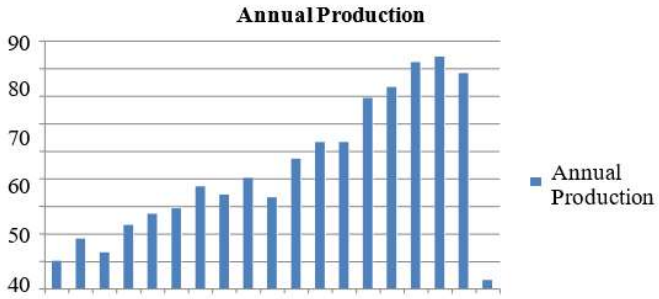

Figure 2. Annual production.

5. Analysis

5.1. Most prominent research journals

We apply Bradford's law and source impact to evaluate the effect of the most significant research publications. Based on the h-index, total contribution and starting year of the publication, the top ten journals are listed in **Table 2** shows the list of 20 top journals as per Bradford's law. Here the academic journals are classified into three categories: Zone 1, zone 2 and zone 3. Zone 1 includes core research journals for publication related to the relationship between the stock market and macroeconomic variables, gold price, crude oil price or exchange rate. It is the nuclear zone providing significant contributions. We found that out of 324 journals, 22 are in zone 1, 69 in zone 2 and 233 in zone 3.

Table 2. Top ten journals based on source impact.

Element	h_index	g_index	TC	NP	PY_start
Energy Economics	18	25	2249	25	2005
Applied Economics	10	19	417	19	1992
Research in International Business and Finance	10	12	450	12	2007
Energy	9	10	643	10	2009
International Journal of Energy Economics and Policy	9	11	171	19	2013
International Review of Economics and Finance	9	11	583	11	1994
Applied Financial Economics	8	14	373	14	2004
International Research Journal of Finance and Economics	8	15	239	15	2009
Journal of International Financial Markets, Institutions and Money	8	9	387	9	2003
Resources Policy	8	14	366	14	2016

Energy Economics is the most influential research journal which focuses on stock market return and oil price volatility in developing as well as developed economies. The most influential study in the journal was "Oil prices, exchange rates and emerging stock markets" [19] which investigated the dynamic relationship between the three variables and found that oil prices are negatively related to US dollar exchange rates and emerging market stock prices in the short run. Apart from this, it also concluded that an increase in oil production has a reducing effect on the oil prices, whereas a positive surge in real economic activity tends to drive up oil prices. An article titled "Evidence on the nature and extent of the relationship between oil prices and equity values in the UK". El-Sharif et al. [20] explore the correlation between crude oil prices and equity values in the oil and gas sector, focusing on data from the United Kingdom, the largest oil producer in the European Union. The findings consistently reveal a positive and frequently highly significant relationship, demonstrating that fluctuations in crude oil prices directly influence share values in this sector. Another study is "Oil shocks and stock markets revisited: Measuring connectedness from a global perspective". Zhang [21] analyzed the effect of oil shocks on the stock market and concluded that oil shocks could have a substantial impact on individual markets but may not exert a notable or statistically significant influence on global financial markets as a whole.

Applied Economics is the second most influential research journal which focuses on the relationship between the stock market and macroeconomic indicators in developing countries. "Stock prices and the effective exchange rate of the dollar". Bahmani and Sohrabian [22] studied the relationship between stock price and the effective exchange rate of a dollar, and concluded that a bidirectional relationship exists between the variables studied. Zhu et al. [23] investigated the impact of real oil price changes on industry stock returns based on the monthly data and found that the volatility of the Chinese real stock market to changes in crude oil prices varies over time and across different industries. Some industries display positive sensitivity, others negative, some are unaffected, and a few even change their sensitivity over time. Another study "Impact of Macroeconomic Factors and Country Risk Ratings on GCC Stock Markets: Evidence from a Dynamic Panel Threshold Model with Regime Switching" by Mensi et al. [24] reveals that the Financial Risk (FR) rating has a noteworthy positive impact on the performance of Gulf Cooperation Council (GCC) stock markets. Among the macroeconomic indicators, enhancements in global stock markets, the Islamic equity index, and crude oil prices contribute to the improved performance of GCC stock markets, indicating their integration with global markets and susceptibility to global economic shocks. Conversely, increases in the 3-month U.S. Treasury bill rate, gold prices, and the 10-year U.S. Treasury bond rate have a detrimental effect on the performance of GCC stock markets.

Research in International Business and Finance is the next most influential research journal with a focus on spillover effects between exchange rates and stock prices in BRICS. "Dynamic relationship between exchange rate and stock price: Evidence from China". Xu [25] found no long-term relationship between the selected variables. Furthermore, it was determined that there is a bidirectional relationship between the two markets, implying that previous innovations in the stock market have a significant impact on future fluctuations in the foreign currency market, and vice

versa. Sui and Sun [26] examined the dynamic relationships among local stock returns, foreign exchange rates, interest differentials, and U.S. S&P 500 returns and found that in the short run, exchange rates have a significant spillover effect on stock returns. Furthermore, stock markets in China, Brazil, and South Africa are influenced significantly by U.S. S&P 500. Nandha and Hammoudeh [27] investigated how beta risk, oil price sensitivity, and exchange rate fluctuations relate to realized stock index returns across 15 countries in the Asia-Pacific region and the stock market of all fifteen countries is significantly sensitive to domestic risk. Furthermore, regarding oil sensitivity, only the Philippines and South Korea display short-term sensitivity to changes in oil prices when expressed in their local currencies.

Source dynamics is presented in **Table 3** which indicates source growth based on publication in top ten journals to understand research publication over time. Energy economics is the highest contributor in studies related to the connection between macroeconomic variables and the stock market. Applied Economics has contributed most between 2015 to 2019, while Applied Economics Letters, Investment Management and Financial Innovations, and Research in International Business and Finance have contributed steadily after 2005. Policymakers and academic scholars should take into consideration these emerging scientific trends, as these scholarly publications offer valuable insights for assessing the influence of the relationship between oil prices and the stock market (**Figure 3**).

Table 3. Ranking of journals as per Bradford's law.

Sources	Rank	Freq	cumFreq	Zone
Energy economics	1	25	25	Zone 1
International journal of energy economics and policy	2	23	48	Zone 1
Applied economics	3	20	68	Zone 1
Resources policy	4	18	86	Zone 1
Cogent economics and finance	5	17	103	Zone 1
International journal of finance and economics	6	16	119	Zone 1
International research journal of finance and economics	7	16	135	Zone 1
Investment management and financial innovations	8	16	151	Zone 1
Applied financial economics	9	15	166	Zone 1
Research in international business and finance	10	12	178	Zone 1
International review of economics and finance	11	11	189	Zone 1
Economics bulletin	12	10	199	Zone 1
Energy	13	10	209	Zone 1
Applied economics letters	14	9	218	Zone 1
Empirical economics	15	9	227	Zone 1
Journal of Asian finance, economics, and business	16	9	236	Zone 1
Journal of international financial markets, institutions, and money	17	9	245	Zone 1
Quarterly review of economics and finance	18	9	254	Zone 1
Studies in economics and finance	19	9	263	Zone 1
Economic modelling	20	8	271	Zone 1

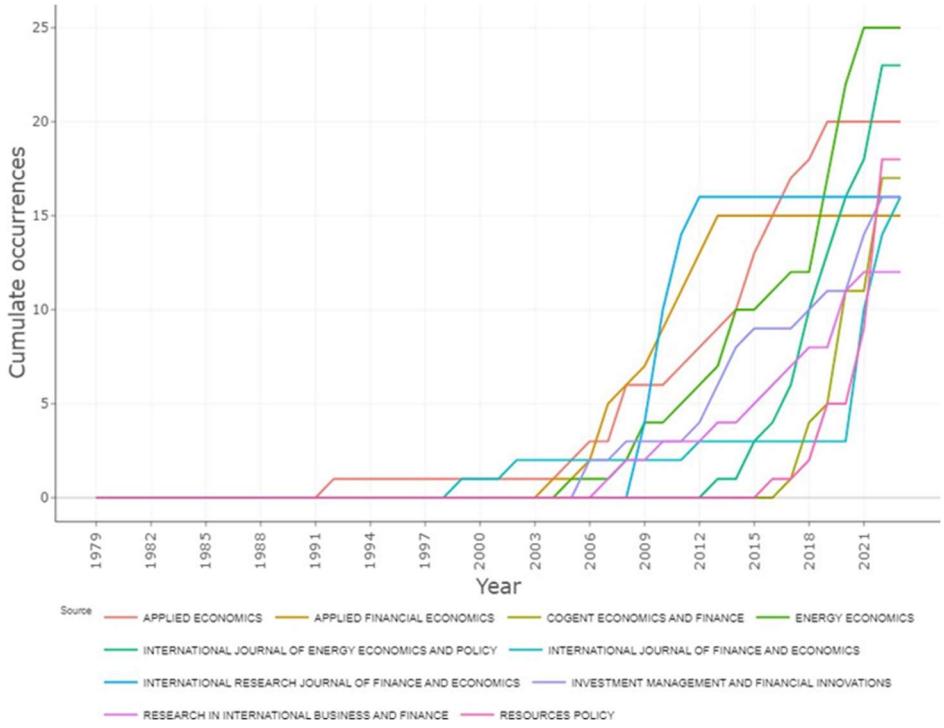

Figure 3. Source dynamics.

5.2. Core research publications

Table 4 lists the top 20 globally and locally cited articles in the macroeconomic variables and stock market domain. Overall citation analysis is indicated by global citations and citation analysis in the selected literature is indicated by local citations". Stock prices and the effective exchange rate of the dollar" by Bahmani-Oskooee and Sohrabian [28] is the research article with the highest citation, where the author studied the relationship between stock price and the effective exchange rate of the dollar by using the Granger causality as well as the co-integration technique and found bidirectional causality between the two variables, at least in the short run, whereas there is no relationship in the long run as revealed by the cointegration analysis. "Dynamic relationship between stock prices and exchange rates for G-7 countries" by Nieh and Lee [29] is the second most cited article here. Authors explore the dynamic relationships between the stock prices and the exchange rates for each G-7 country. Findings of time-series estimation indicate no significant relationship between the two financial variables in each G-7 country in the long run. In certain G-7 countries (Germany, Canada, the UK, Japan and Italy), only one day's short-run significant relationship has been found. "Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model" by Kim [30] is the third most cited article where authors used Johansen's cointegration analysis and discovered that US inflation, interest rate, and real exchange rate have negative correlations with the S&P 500 stock price while industrial production has a positive correlation. "Dynamic relationship between exchange rate and stock price: Evidence from China" by Zhao [31] is the fourth most cited article where authors studied the relationship between exchange and stock price; results of the study show that the long-term equilibrium relationship between RMB real effective exchange rate and stock price is not stable. The MGARCH model indicates the existence of bidirectional volatility spillover

effects between stock markets and foreign exchange". Oil prices, exchange rates, and emerging stock markets" by Basher et al. [32] is the fifth most cited article where authors have studied the dynamic relationship between the three variables and found that in the short run, positive shocks to oil prices negatively affect US dollar exchange rates and emerging market stock prices.

Table 4. Most cited articles globally and locally.

Title	Authors	Year	Local Citations	Global Citations
Stock prices and the effective exchange rate of the dollar	Bahmani-Oskooee M, Sohrabian A.	1992	80	202
Dynamic relationship between stock prices and exchange rates for G-7 countries	Nieh CC, Lee CF.	2001	77	217
Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model	Kim KH.	2003	53	118
Dynamic relationship between exchange rate and stock price: Evidence from China	Zhao H.	2010	52	147
Oil prices, exchange rates and emerging stock markets	Basher SA, Haug AA, Sadorsky P.	2012	44	431
The relationship between stock price index and exchange rate in Asian markets: A quantile regression approach	Tsai IC.	2012	43	139
Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries	Wongbangpo P, Sharma SC.	2002	43	177
A vector error correction model of the Singapore stock market	Maysami RC, Koh TS.	2000	42	158
Evidence on the nature and extent of the relationship between oil prices and equity values in the UK	El-Sharif I, Brown D, Burton B, Nixon B, Russell A.	2005	39	308
Bivariate causality between exchange rates and stock prices in South Asia	Smyth R, Nandha M.	2003	34	77
Dynamic analysis between the US stock returns and the macroeconomic variables	Ratanapakorn O, Sharma SC.	2007	28	101
Dynamic linkage between real exchange rates and stock prices: Evidence from developed and emerging Asian markets	Moore T, Wang P.	2014	27	86
International evidence on the stock market and aggregate economic activity	Cheung YW, Ng LK.	1998	27	150
Stock market volatility and exchange rates in emerging countries: A Markov-state switching approach	Walid C, Chaker A, Masood O, Fry J.	2011	26	132
Can macroeconomic variables explain long-term stock market movements? A comparison of the US and Japan	Humpe A, Macmillan P.	2009	26	118
The relationship between stock prices and exchange rates evidence from turkey	Aydemir O, Demirhan E.	2009	25	69
Stock Market and Foreign Exchange Market in India: Are they Related?	Mishra AK.	2004	25	48

6. Core words

In this section, we examine the keywords frequently appearing in the selected literature. A statistical summary of keywords plus abstract keywords, title keywords, and author keywords is presented in **Table 5**. Exchange rate, macroeconomic

variables, and stock market are common keywords in all four categories. These keywords are appearing in studies on the relationship between macroeconomic variables and the stock market. Keyword plus cover literature related to macroeconomic variables and stock market cointegration analysis. In the title and abstract, the most common keywords are stock, markets, and exchange. These terms are too general and do not have potential for contribution towards main research themes. Examination of keyword frequency in the articles reveals that "stock market" appeared 180 times and "exchange rate", "price dynamics", "commerce", "crude oil", "investments", "united states", "financial markets", "macroeconomic variables", and "China" followed. In **Figure 4**, we present the word cloud—a graphical representation where the size of each word corresponds to its frequency in the article, offering a visual insight into the word distribution. The size of the word represents its significance in the literature. Apart from these, gold, interest rate, crude oil price, inflation, oil supply, stock price, and stock return were seen to be dominant. The word cloud shows that the studies have explored how various macroeconomic factors affect the stock market.

Table 5. Most frequent keywords.

KEYWORDS PLUS	**OCCURRENCES**	**TITLE**	**OCCURRENCES**
STOCK MARKET	180	STOCK	626
EXCHANGE RATE	98	MARKET	335
PRICE DYNAMICS	64	EXCHANGE	287
COMMERCE	57	EVIDENCE	211
CRUDE OIL	54	PRICES	200
COSTS	42	OIL	173
INVESTMENTS	40	MACROECONOMIC	158
UNITED STATES	39	PRICE	156
FINANCIAL MARKETS	38	RATE	156
MACROECONOMICS	37	MARKETS	142
CHINA	34	RELATIONSHIP	131
FINANCIAL MARKET	32	RETURNS	116
COINTEGRATION ANALYSIS	30	RATES	103
GOLD	30	VARIABLES	95
INTEREST RATE	27	ANALYSIS	93
AUTHORS KEYWORDS	OCCURRENCES	ABSTRACTS	OCCURRENCES
STOCK MARKET	125	STOCK	3109
EXCHANGE RATE	108	MARKET	1954
MACROECONOMIC VARIABLES	67	EXCHANGE	1674

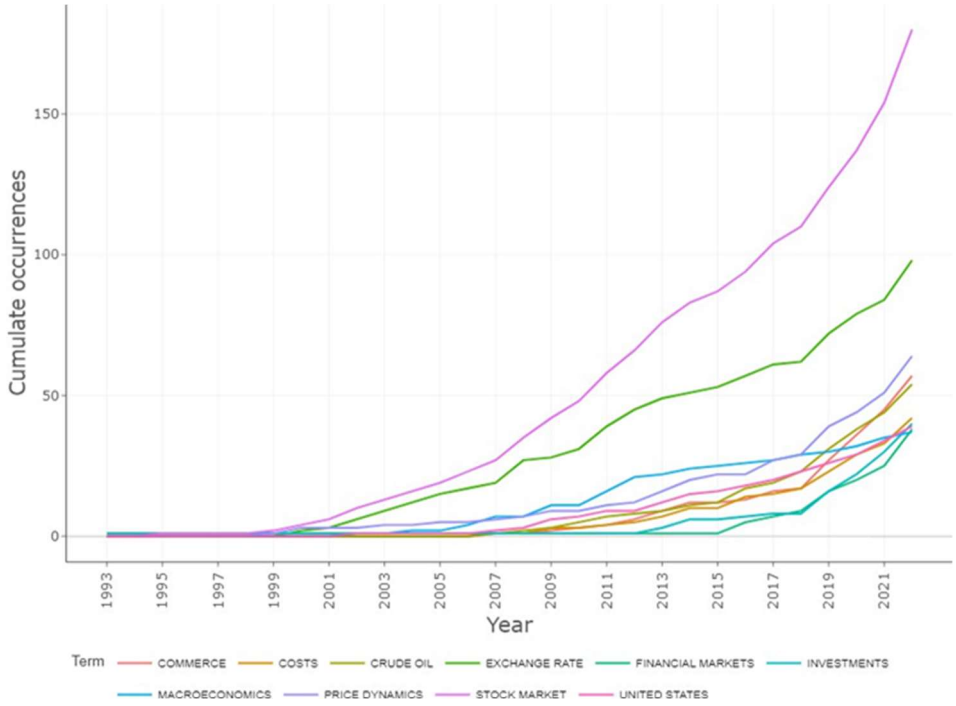

Figure 4. Word cloud.

Further, we analyze keywords by studying the trend in the top ten keywords in the selected literature. **Table 5** indicates that there is significant growth in macroeconomics, financial markets, crude oil, and exchange rates after 2018, as the focus is more on analyzing the effect of macroeconomic variables on the financial market.

7. Main researchers, research institutions, and countries

In this part of the manuscript, statistical data is provided regarding researchers, their academic affiliations, research institutions, and the countries that have notably contributed to the research. Top ten authors on the basis of total publication and h index are presented in **Table 6**. Hammoudeh is the most prominent in the domain and focuses on the relationship between the stock market and macroeconomic variables in emerging economies. "Systematic risk, and oil price and exchange rate sensitivities in Asia-Pacific stock markets" is the most cited article by Hammoudeh, which examined the relationship between beta risk and realized stock index return in the presence of oil and exchange rate sensitivities for 15 countries in the Asia-Pacific region using the international factor model and found that there are varying degrees of sensitivity in these Asia-Pacific stock markets to different factors, with oil prices and domestic economic conditions playing a more substantial role in influencing stock market performance compared to general market risk (beta). However, these relationships are not uniform across all countries and depend on various factors such as currency exchange rates and the measurement of oil prices in local currency or US dollars. McMillan is the second prominent in the domain with a focus on the predictability of stock market return based on the relation between the stock market and macroeconomic variables. McMillan's most cited article is "Nonlinear predictability of stock market returns: Evidence from nonparametric and threshold models" which

investigates whether there is a non-linear connection between stock market returns and influencing variables (financial and macroeconomic) and suggests that by considering non-linear relationships and incorporating threshold behavior into the forecasting model, it's possible to enhance the accuracy of stock market return predictions, especially when compared to traditional linear models. Yoon is the third prominent in the domain and focuses on the nexus between oil price, oil production, and the stock market. "Dynamic co-movement between oil and stock markets in oil-importing and oil-exporting countries" is the most cited article published by Yoon, which investigated the interconnected movements between oil prices and the stock markets of six countries: China, India, Japan, Saudi Arabia, Russia, and Canada and found that there are complex and dynamic relationships between oil prices and the stock markets of the studied countries. These relationships vary in strength and direction depending on whether a country is an oil exporter or importer, with oil-exporting countries being more heavily influenced by oil price movements. Chang is the fourth-ranked author with a focus on the linkage between macroeconomic variables and the stock market in developing countries. Article titled "Do the changes in macroeconomic variables have a symmetric or asymmetric effect on stock prices? Evidence from Pakistan" is the most cited article by Chang, which investigated the potential symmetric or asymmetric impact of macroeconomic variables on the stock prices (SP) of the Karachi Stock Exchange 100 index within the context of Pakistan. The findings indicated an asymmetric relationship between macroeconomic variables and SP in the short run, while this effect exhibited symmetry in the long run. Ghosh, Sis, fifth in the list, focused on the impact of crude oil prices on the stock prices of clean energy companies. "International crude oil prices and the stock prices of clean energy and technology companies: Evidence from non-linear co-integration tests with unknown structural breaks" is the most cited article published by Ghosh, which examines the long-term relationship between stock prices of companies in the alternative energy sector and the prices of crude oil within a multivariate framework, and results indicated that in the short term, stock prices of alternative energy companies are influenced by technology stock prices, oil prices, and interest rates. However, in the long term, there is no causal relationship running from these factors back to the stock prices of alternative energy companies (**Figure 5**).

Table 6. Top ten authors.

Authors	h_index	TC	NP	PY_start
Hammoudeh S	5	152	5	2007
McMillan DG	5	87	5	2001
Yoon SM	5	179	5	2017
Chang BH	4	77	4	2018
Ghosh S	4	315	4	2016
Jeon Bn	4	42	4	2011
Narayan PK	4	189	4	2009
Tiwari AK	4	98	6	2014
Wang Y	4	88	5	2001
Abbas G	3	52	3	2014

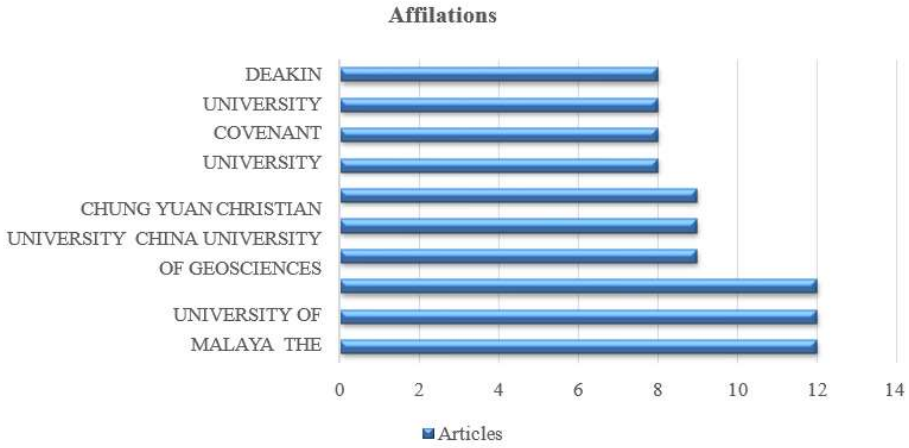

Figure 5. Main research institution.

Country-wise research contribution according to production and citation is presented in **Table 7**. The left section of the table ranks countries according to most publications, and the right section ranks as per total citations. The most consistent and influential countries in this domain are China, India, the USA, Malaysia, Pakistan, Turkey, the UK, and Australia, as they are present in both lists. Nigeria and South Africa ranked 8th and 9th are present only in the publication list; Qatar and Tunisia ranked 7th and 8th are present only in the total citations list.

Table 7. Countries with the most production and citation.

Country	Production	Country	Total Citations
China	230	USA	2117
India	221	China	2014
USA	156	United Kingdom	1405
Malaysia	152	India	950
Pakistan	107	Australia	558
Turkey	98	Malaysia	478
UK	89	Qatar	431
Nigeria	86	Tunisia	419
Australia	75	Turkey	392
South Africa	62	Pakistan	353

In this section, we examine the most relevant institutions in the domain. Top-ranked in this domain are Hunan University, Universiti Kebangsaan Malaysia, and the University of Pretoria with 12 publications each, followed by Drexel University, The University of Lahore, and the University of Malaya. On further examination, it is identified that the top ten institutions have focused on the impact of macroeconomic variables on stock market return. Macroeconomic variables like crude oil price, exchange rate, gold price, FDI and GDP are studied in most of the research articles.

Statistical information on the top ten countries is presented in **Table 8** which is divided into multi-authored publications (MCP) and single-authored publications (SCP). China tops the list with 72 publications, out of which 56 are single-authored

and 16 are multi-authored research articles. Followed by the USA, India, Malaysia, and the UK with 69, 61, 41 and 38 research articles. Country-wise research collaboration is presented in **Table 9**. China and the USA have contributed 12 joint academic research articles in the domain, which is the highest number, followed by China and Pakistan with 9 publications. China, the USA, Pakistan, and Malaysia have contributed most in terms of academic collaboration in the selected literature.

Table 8. Most relevant countries by corresponding authors.

Country	Articles	SCP	MCP	Freq	MCP_Ratio
China	72	56	16	0.083	0.222
USA	69	51	18	0.08	0.261
India	61	53	8	0.07	0.131
Malaysia	41	32	9	0.047	0.22
United Kingdom	38	27	11	0.044	0.289
Turkey	34	28	6	0.039	0.176
Pakistan	30	17	13	0.035	0.433
Australia	25	18	7	0.029	0.28
South Africa	25	20	5	0.029	0.2
Nigeria	22	16	6	0.025	0.273

Table 9. World collaboration.

From	To	Frequency
China	USA	12
China	Pakistan	9
Malaysia	Pakistan	7
USA	Pakistan	6
China	United Kingdom	5
India	USA	5
USA	Australia	5
India	South Africa	4
Malaysia	Australia	4
Malaysia	Nigeria	4

8. Conceptual framework

In this segment, different research directions are analyzed in the chosen literature. To achieve this, we establish a framework encompassing thematic map analysis along with co-occurrence network analysis. In the conceptual framework, we first perform co-citation analysis, according to Small [33], this indicates "the frequency of two articles being cited together". According to Rossetto et al. [34], co-citation analysis facilitates the examination of the intellectual framework in a systematic evaluation of the literature to point out advancements and research structures of existing literature [35]. If two articles are cited jointly in a publication, they are considered to belong to the same subject matter. For examining research publications, clustering has been used as an analytical tool and pattern identification in previous studies [36].

Content analysis

Cluster 1 (Red) exchange rate, oil price and stock market. Cluster 1 analyzes the relationship between crude oil prices and stock markets in developing economies and expands the research by exploring how oil price shocks impact the stock market [37] and stock prices [38]. In Cluster 1 there is another group of authors who focus on cointegration analysis between the stock market and oil price [39].

Cluster 2 (Blue) macroeconomic variables, exchange rate and stock price. Cluster 2 mainly focuses on analyses of the association between macroeconomic variables and the stock market in emerging economies. The main focus is on volatility and return linkage between macroeconomic variables and the stock market [40], modeling the relationship [41], and the impact of macroeconomic variables on industrial shares [42].

Cluster 3 (Green) exchange rate, causality and cointegration. Cluster 3 focuses on the association between foreign exchange rates and the stock market [43]; the causality relationship [44]; the non-linear causal nexus [45]; how this relationship is affected by the financial crisis [46] and the impact of exchange rates on the performance of IT firms [47].

9. Co-occurrence network

The co-occurrence network can be divided into two different research themes. Red cluster studies the impact of macroeconomic variables on the stock market and the causal relationship between them in developed as well as developing countries. As shown in **Figure 6**, the blue cluster focuses on the linkage between crude oil, oil production, price exchange rate, gold price, and stock return. It also includes a study of the spillover effect of crude oil on the stock market. Co-occurrence network analysis showing keywords in each cluster is presented in **Table 10**.

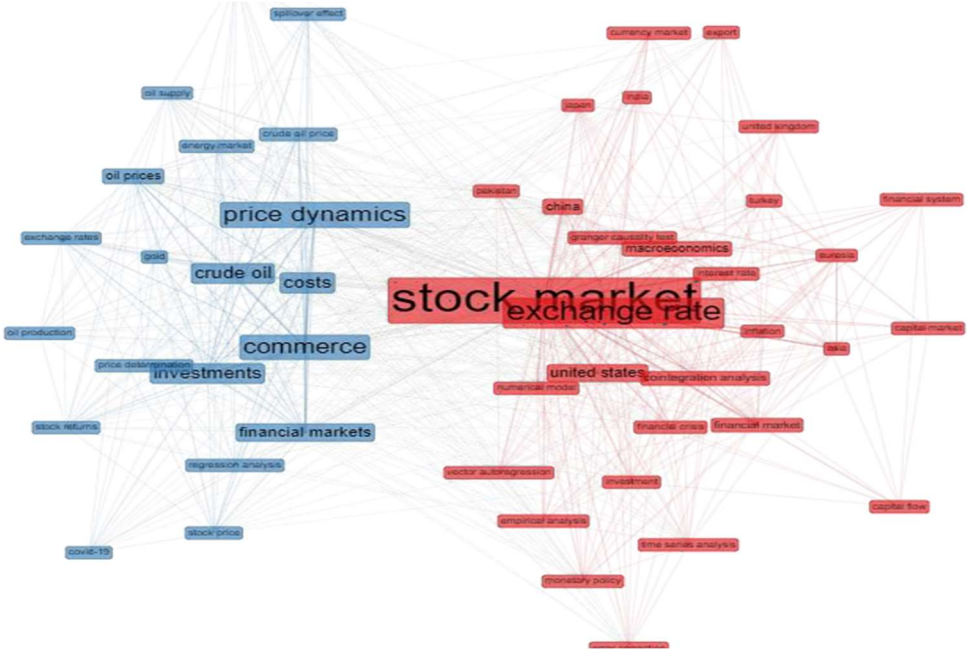

Figure 6. Co-occurrence network.

Table 10. Keywords in the cluster.

Keywords		
stock market, exchange rate, united states, macroeconomics, china, financial market, co integration analysis, interest rate, Asia, financial crisis, numerical model, granger causality test, Eurasia, inflation, time series analysis, investment, empirical analysis, financial system, India, Pakistan, vector auto regression, Japan, capital market, currency market, error correction, turkey, capital flow, monetary policy, United Kingdom, export.	Red	1
price dynamics, commerce, crude oil, costs, investments, financial markets, gold, crude oil price, oil prices, exchange rates, regression analysis, price determination, energy market, oil supply, stock price, stock returns, spillover effect, oil production, wavelet analysis, covid-19.	Blue	2

10. Thematic map

A two-dimensional graphic known as a "thematic map" shows the typological themes [48]. Keyword clusters are identified by employing co-word analysis, which then creates themes in the research domain. These themes can be divided into four quadrants based on their centrality and density on the two-dimensional graph, where centrality and density are the two dimensions. Every theme is depicted by a bubble on the map. The thematic map is shown in **Figure 7**. The major themes with high density and centrality are "price dynamics", "stock market", "profitability", "coal industry". These themes are most widely discussed. The crude petroleum theme appearing in the lower right portion is the basic theme, indicating something important but still developing. Theme risk factor is visible in the upper left portion, which represents a niche theme, which is of marginal importance as its internal links are well developed but external links are week. Foreign exchange rate, marketing, and statistics themes are present in the lower left portion, which indicates an emerging or declining theme; these show weak development and are of less importance [49].

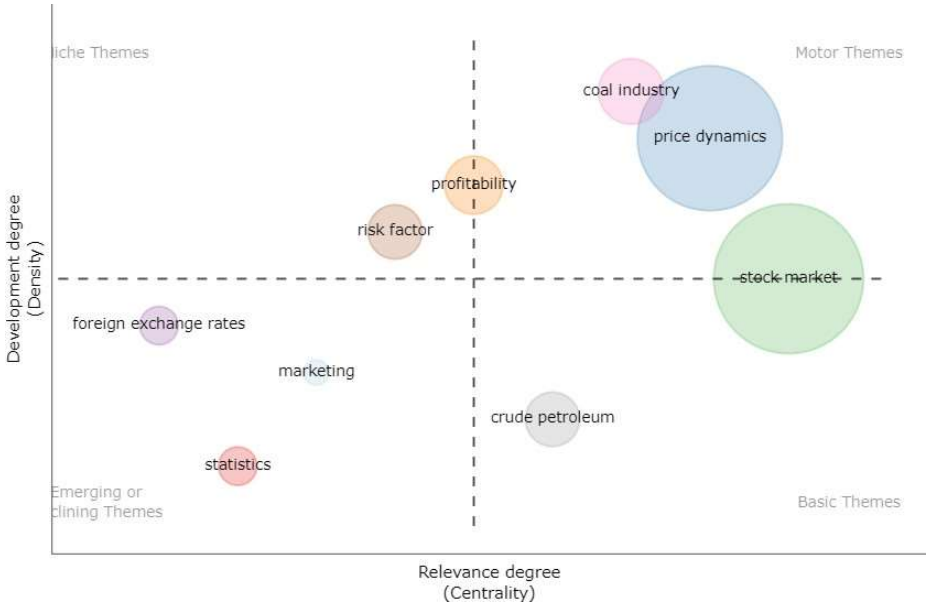

Figure 7. Thematic map.

Keywords appearing in various themes are presented in **Table 11**. Crude petroleum is a basic theme here. The researchers have studied crude petroleum, its production, and the stock market in the Middle East. Statistics, foreign exchange rates, and marketing are emerging or declining themes here. Researchers have focused on

foreign exchange and stock prices. Price dynamics is the first theme in the motor theme block. Here the focus is on the impact of oil price, oil production, gold price, and exchange rate on the stock market, stock price, or stock return. The second theme in this category is the stock market; here, the main focus is on co-integration and the causal relation between the exchange rate, interest rate, inflation, macroeconomic variables, and the stock market in the US, China, India, and Pakistan. Profitability is the third theme in the motor theme; here the focus is on profitability, competition, data mining, financial sectors, and sales. The fourth theme in the motor theme is the coal industry; here the focus is on the coal industry, energy prices, natural gas, oil, and the use of vector autoregressive models. Risk Factor is a niche theme here the focus is on risk factors, the European Union, and gas emissions.

Table 11. Thematic map: Theme and keyword.

Cluster	Theme	Keywords Frequency
crude petroleum	Basic Theme	crude petroleum (3), manufacturing (3), middle east (3)
statistics	Emerging or Declining theme	statistics (4)
foreign exchange rates	Emerging or Declining theme	foreign exchange rates (2), stock prices (2)
marketing	Emerging or Declining theme	marketing (2)
price dynamics	Motor Theme	price dynamics (63), commerce (57), crude oil (42), costs (42), investments (40), financial markets (38), gold (19), crude oil price (25), oil prices (25), exchange rates (21), regression analysis (19), price determination (17), energy market (15), oil supply (15), stock price (15), stock returns (15), spillover effect (13), oil production (11), wavelet analysis (10, covid-19 (8).
stock market	Motor Theme	stock market (171), exchange rate (98), united states (38), macroeconomics (37), china (32), financial market (32), cointegration analysis (30), interest rate (27), Asia (25), financial crisis (24), numerical model (24), granger causality test (22), Eurasia (21), inflation (17), time series analysis (16), investment (16), empirical analysis (15), financial system (13), India (13), Pakistan (12)
profitability	Motor Theme	Profitability (3), competition (2), data mining (2), financial sectors (2), sales (2)
coal industry	Motor Theme	coal industry (2), energy prices (2), methodology (2), model (2), natural gas (2), oil (2), technology companies (2), vector autoregressive model (2)
risk factor	Niche Theme	risk factor (3), European union (2), gas emissions (2)

11. Thematic evolution

Moreover, we enhance our analytical methodology by delving into the progression of various themes, as illustrated in **Figure 8**. To achieve this, we use the Bibliometrics R package alongside the "bibliophile" tool, allowing us to illuminate the transformation of economic literature's landscape and thematic trends across two distinct time periods. These divisions are established based on the authors' subjective assessments, providing insights into the thematic shifts that have occurred throughout the timeline of economic literature publication. 1979–2020 and 2021–2023 are the main research segment ranges. The study reveals that research themes have changed over time.

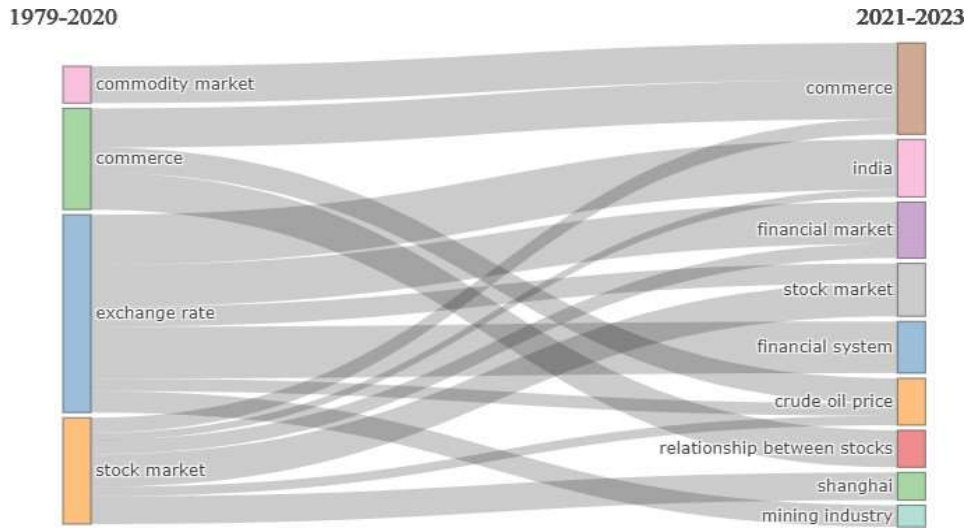

Figure 8. Thematic evolution.

The first major research interest, "commerce" has evolved into "crude oil price" and "relationship between stocks". The next major research interest", exchange rate" has evolved into the stock market, crude oil prices and the mining industry as the researchers are focusing on the impact of crude oil prices on the stock market. Next, the "stock market" has developed into the "financial market", "crude oil price", "India" and "Shanghai" where the focus is on the relationship between crude oil price and the financial market. This is of great importance as crude oil prices play an important role in the economy and also have a significant impact on the stock market as well as stock returns.

12. Key findings of the study

In this section, we discuss the key findings of the study and suggest future directions in the domain to fill the gap in existing literature. The publication trend on the stock market and macroeconomic variables is presented in descriptive information RQ1. Energy Economics is the most influential research journal which focuses on stock market return and oil price volatility in developing as well as developed economies RQ2. "Stock prices and the effective exchange rate of the dollar" by Bahmani-Oskooee and Sohrabian 1992 is the most cited research article in the literature, followed by "Dynamic relationship between stock prices and exchange rates for G-7 countries" [50] and "Dollar exchange rate and stock price: Evidence from multivariate cointegration and error correction model" [51] RQ3. Keyword analysis reveals relevant words in the literature RQ4, where stock market, exchange rate, and macroeconomic variables are common keywords appearing in the literature. Additionally, Hammoudeh has contributed the highest number of articles, and Hunan University is the highest contributing institution to this domain. RQ5. In terms of research collaboration, China and the USA top the list, followed by China and Pakistan RQ6 [52].

To understand existing literature's intellectual structure, we use co-citation and co-occurrence networks. Content analysis RQ7 discovers three clusters. Cluster 1 analyzes the relationship between crude oil price and stock markets in developing economies and expands the research by exploring how the stock market and stock

price are influenced by oil price shock. Cluster 2 mainly focuses on analyses of the relationship between the stock market and macroeconomic variables in emerging economies. Cluster 3 focuses on the relationship between foreign exchange rates and the stock market. Co-citation analysis indicates that in cluster 1, Ghosh S is the most influential author, followed by Chiou J and Huang S. In cluster 2, Tang X and cluster 3, Tian G.G. is the most influential author. Further co-occurrence network discovers two different research themes. Theme 1 studies the impact of macroeconomic variables on the stock market and the causal relationship between them in developed as well as developing countries. Theme 2 focuses on the linkage between crude oil, oil production, price exchange rate, gold price, and stock return RQ8 [53,54].

Further Thematic maps and thematic evolution are used to study current research themes and their evolution into new themes RQ9. The thematic map presents themes divided into four quadrants based on their centrality and density on the two-dimensional graph, where centrality and density are the two dimensions. Thematic evolution indicates the evolution of research themes over the period of time RQ10. Research interest, “commerce” has evolved into “crude oil price” and “relationship between stocks”. Research interest in “exchange rates” has evolved into the stock market, crude oil price and mining industry as the researchers are focusing on the impact of crude oil prices on the stock market. Next, the “stock market” has developed into “financial market”, “crude oil price”, “India” and “Shanghai,” where the focus is on the relationship between crude oil price and the financial market. Finally, the existing body of research faces an array of issues, ranging from a lack of theoretical developments to data accessibility constraints. Furthermore, as research questions 10 and 11 reveal, a significant lack of academic collaboration and sector-wise investigations holds back the growth of the current literature. As a result, additional research efforts are required. These should seek to broaden the scholarly focus on the subject and overcome existing theoretical and empirical limits.

13. Conclusion

The purpose of this study was to examine the scholarly literature on the relationship between macroeconomic variables and the stock market from 1979 to 2023. The study aimed to identify prominent research publications and trends within the existing literature. Initially we performed an academic search on the Scopus database and identified 869 articles. Following the search, we conduct data analysis and visualization by using Biblioshiny, a web-based application included in R studio. Next, we examine and summarize the most esteemed and important research that has made a substantial contribution to the advancement of literature. The literature is categorized into clusters and themes using author keyword co-occurrence and bibliographic coupling analysis, which highlights the significant evolution of associated relationships. This in turn yields insightful information about research areas that should receive more attention in the future. The evolution of the existing literature into new research domains, i.e., crude petroleum (crude oil price and crude oil production), because of globalization and one of the important sources of energy for countries all over the world, is observed by examining the prevailing research clusters and themes. Furthermore, a research gap is identified that emphasizes the importance

of focusing on the association between macroeconomic factors and sector-specific indices.

Our study provides insight to researchers on the association between the stock market and macroeconomic indicators and provides future research direction. However, our study is constrained by some limitations. Firstly, we collected literature only from the Scopus database. It is anticipated that the incorporation of additional databases could enhance the robustness of findings in subsequent studies. Secondly, we have included only articles in this study. To broaden the scope, researchers should include other types of documents in future studies. Thirdly, considering the limitations of the existing literature, it is imperative that future research initiatives focus their efforts on developing a robust theoretical framework. Lastly, most researchers have focused on the relationship between macroeconomic variables and broad market indices; less attention has been paid to sectoral indices. As industries differ in terms of their nature, customer bases, demand situations, cost structures, and financing patterns, the influence of macroeconomic indicators on the stock prices will be different on companies from different industries or sectors. Hence, future research should focus on the relationship between macroeconomic variables and sectoral indices.

Limitations of the study

1) **Data Scope and Availability:** The study is limited to academic documents available in the Scopus database, which may exclude relevant research published in other databases or non-academic sources such as reports from financial institutions or government agencies.
2) **Timeframe Restriction:** The analysis covers literature from 1979 to 2023, which may not fully capture the most recent developments or emerging trends in the relationship between stock markets and macroeconomic variables.
3) **Focus on Bibliometric Analysis:** The study relies primarily on bibliometric tools for analysis, which might not fully capture the depth or nuances of individual studies. It may overlook qualitative aspects such as the context or methodology of the studies reviewed.
4) **Contextual Variability:** The findings may be influenced by the specific economic, political, and technological contexts of the countries and time periods included in the data. This may limit the generalizability of conclusions across different regions or future scenarios.
5) **Complex Interactions and Causality:** While the study identifies trends and frameworks, it does not delve into the complex causal relationships between macroeconomic variables and stock market performance, which are difficult to establish through bibliometric analysis alone.

Author contributions: Conceptualization, SSC and PS; methodology, FA; software, SSC; validation, SSC, PS and FA; formal analysis, SSC; investigation, PS; resources, FA; data curation, SSC; writing—original draft preparation, AJ; writing—review and editing, AJ; visualization, FA; supervision, PS; project administration, AJ; funding acquisition, SSC. All authors have read and agreed to the published version of the manuscript.

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