STOCK RETURNS AND INFLATION: A BIBLIOMETRIC ANALYSIS

Tay Bee Hoong[A], Tan Yan Ling[B], Suzana Hassan[C], Norhasniza Mohd Hasan Abdullah[D]

ABSTRACT

Purpose: The challenging economic climate and increasing inflationary pressures have made it necessary to re-evaluate inflation research and its impact on the stock market. The purpose of this study is to use bibliometric analysis to review scholarly writing on stock returns and inflation from 1975 to 2022.

Design/methodology/approach: This study analyses bibliometric markers such as the number of citations, authors, journals, and institutions using the Web of Science database to discover publishing patterns and illustrate commonalities.

Findings: The study indicates that the volatility domain has gained more attention, therefore there is a necessity for future research to model predictive accuracy to match the rising volatility and uncertainty environment. Due to the expanding energy theme from bibliographic coupling analysis and the oil-related macroeconomic factors cluster from author keyword co-occurrence analysis, the study revealed a research gap that underlines the need for a green and sustainable stock market.

Research, Practical & Social implications: The study suggests a need for future research to increase academic collaboration and to contribute toward the development of theoretical and empirical literature.

Originality/value: The results revealed that it is vital to revise the current theory to integrate theoretical implications in light of the volatile market conditions and rising inflation rate.

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RETORNOS DE ESTOQUE E INFLAÇÃO: UMA ANÁLISE BIBLIOMÉTRICA

ABSTRACT

Objetivo: O clima econômico desafiador e as crescentes pressões inflacionárias tornaram necessário reavaliar a pesquisa de inflação e seu impacto sobre o mercado acionário. O objetivo deste estudo é usar a análise bibliométrica para revisar a escrita acadêmica sobre retornos de ações e inflação de 1975 a 2022.

Desenho/método/abordagem: Este estudo analisa marcadores bibliométricos como o número de citações, autores, periódicos e instituições usando o banco de dados da Web of Science para descobrir padrões de publicação e ilustrar os pontos em comum.

Descobertas: O estudo indica que o domínio da volatilidade ganhou mais atenção, portanto há necessidade de pesquisas futuras para modelar a precisão preditiva de forma a corresponder ao ambiente de volatilidade e incerteza crescente. Devido ao tema da energia em expansão a partir da análise do acoplamento bibliográfico e do agrupamento de fatores macroeconômicos relacionados ao petróleo a partir da análise de co-ocorrência de

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[A] *Master of Administration. Universiti Teknologi MARA Cawangan Johor Kampus Segamat. Malaysia.*
E-mail: taybe869@uitm.edu.my Orcid: https://orcid.org/0000-0001-7661-260X
[B] *PhD in Economics. Universiti Teknologi MARA Cawangan Johor Kampus Segamat. Malaysia.*
Email: tanya163@uitm.edu.my Orcid: https://orcid.org/0000-0003-1861-7423
[C] *Master of Administration. Universiti Teknologi MARA Cawangan Johor Kampus Segamat. Malaysia.*
E-mail: susan218@uitm.edu.my Orcid: https://orcid.org/0000-0002-7978-974X
[D] *Master of Science. Universiti Teknologi MARA Cawangan Johor Kampus Segamat. Malaysia.*
E-mail: horhasniza702@uitm.edu.my Orcid: https://orcid.org/0000-0003-2498-6153

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palavras-chave do autor, o estudo revelou uma lacuna de pesquisa que sublinha a necessidade de um mercado de ações verde e sustentável.

Pesquisa, implicações práticas e sociais: O estudo sugere uma necessidade de pesquisa futura para aumentar a colaboração acadêmica e contribuir para o desenvolvimento da literatura teórica e empírica.

Originalidade/valor: Os resultados revelaram que é vital revisar a teoria atual para integrar as implicações teóricas à luz das condições voláteis do mercado e do aumento da taxa de inflação.

Palavras-chave: Retorno de Estoque, Inflação, Análise Bibliométrica, Palavra-chave do Autor, Co-Ocorrência, Acoplamento Bibliográfico.

RENTABILIDAD DE LAS ACCIONES E INFLACIÓN: UN ANÁLISIS BIBLIOMÉTRICO

RESUMEN
Objetivo: La difícil coyuntura económica y las crecientes presiones inflacionistas han hecho necesario reevaluar la investigación sobre la inflación y su impacto en el mercado bursátil. El propósito de este estudio es utilizar el análisis bibliométrico para revisar los escritos académicos sobre los rendimientos de las acciones y la inflación desde 1975 hasta 2022.

Diseño/metodología/enfoque: Este estudio analiza marcadores bibliométricos como el número de citas, autores, revistas e instituciones utilizando la base de datos Web of Science para descubrir patrones de publicación e ilustrar puntos en común.

Resultados: El estudio indica que el ámbito de la volatilidad ha ganado más atención, por lo que existe una necesidad de investigación futura para modelar la precisión predictiva para que coincida con el creciente entorno de volatilidad e incertidumbre. Debido a la expansión del tema de la energía a partir del análisis de acoplamiento bibliográfico y al grupo de factores macroeconómicos relacionados con el petróleo a partir del análisis de co-ocurrencia de palabras clave de los autores, el estudio reveló una laguna en la investigación que subraya la necesidad de un mercado de valores ecológico y sostenible.

Investigación, implicaciones prácticas y sociales: El estudio sugiere la necesidad de futuras investigaciones para aumentar la colaboración académica y contribuir al desarrollo de la literatura teórica y empírica.

Originalidad/valor: Los resultados revelan que es vital revisar la teoría actual para integrar las implicaciones teóricas a la luz de las volátiles condiciones del mercado y la creciente tasa de inflación.

Palabras clave: Rendimientos Bursátiles, Inflación, Análisis Bibliométrico, Palabra Clave del Autor, Coocurrencia, Acoplamiento Bibliográfico.

INTRODUCTION

With the main objective of generating sustainable economic growth, inflation is an important economic element that a nation must monitor (Oikawa and Ueda, 2018). An increase in inflation lowers the real value of money, which results in less purchasing power, lower profitability, and a decline in the real returns on investments, including stocks. As a result, both the stock market and the economy as a whole are affected by inflation. Since the global financial crisis, inflation in developed and emerging economies has remained stable before the COVID-19 epidemic (United Nations, 2020). Lower and stable inflation offers a favourable environment for corporate expansion, notwithstanding the fact that inflation has some uneven effects on developing economies. Despite an expected recovery to 5.5 percent in 2021, rising inflation, the new COVID-19 variant, and a supply-chain bottleneck have increased the likelihood of lower economic growth to 4.1 percent in 2022 and 3.2 percent in 2023 (World Bank, 2022).

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Inflation has been a subject of both academic and policy study, with significant insights gained on the nature of inflationary behaviour from established economic theory (Tobin, 1965; Mishkin, 1990). Inflation has regained its attention because a sudden shift in inflation or changes in inflation expectations will not only affect economic policies but also impact stock markets. However, there has been little research into the explicit effects of inflation on the stock market in the academic literature (James and Chin, 2022), particularly since the outbreak of the COVID-19 pandemic. Therefore, there is a need for further understanding how the inflation rate will affect stock market returns in the future.

Examining the relationship between stock returns and inflation is crucial because it enables investors to hedge portfolio risk and policymakers to act amidst increasing inflationary pressure. In the past, it has been assumed that inflation affects stock returns because it provides information about future real activity that is used to calculate stock returns (Fama, 1981). Recent research by Pratama *et al*. (2022) found that inflation reduces the anomalous returns on stocks. As a result, if inflation is higher, the investor will earn a lower return. Although it increases marginal wealth, a spike in inflation is unfavourable for investors, hence it has a negative correlation with stock returns (H. Zhang, 2021). According to Suharyanto and Zaki (2021), inflation had a negative and considerable impact on the stock market performance of manufacturing companies from 2016 to 2020. Using the daily data from February 27, 2020, to April 30, 2020, Jelilov *et al*. (2020) discovered that the increased number of COVID-19 infection cases raises volatility and brings negative shocks to the correlation between inflation and stock market return.

However, McMillan (2021) revealed that the correlation between stock returns and inflation was predominantly negative but became increasingly positive following the dotcom crash and the financial crisis due to COVID-19. Thus, it shows the nexus between stock market returns and inflation is variable based on the economic situation. Umaryadi *et al*. (2021) documented a positive but insignificant relationship between inflation and stock returns. Bassar *et al*. (2021) failed to find any significant effects of inflation on Shariah stock returns, thus suggesting that Shariah stocks can be considered a viable hedging instrument in times of high inflation. Asiedu *et al*. (2021) indicate that inflation has a negative effect on the overall stock market performance in the long run. However, they found that the market is not affected by the sudden movement of inflation in the short run as it needs time to alter any form of fluctuations in the macroeconomic shock. Z. Zhang (2021) verifies a negative relationship between real stock returns and inflation at the quarterly horizon for global stock markets. He further supports that the central bank's reaction to inflation plays a vital role in determining the stock return-

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inflation relation via the decisions on monetary policy cyclicality and the instruments employed in combating inflation.

Bibliometric analysis has been used to examine a number of research topics in recent years. This study differs in the following ways from the earlier bibliometric studies conducted on oil price shocks, stock market returns and volatility (Bashir, 2022), cryptocurrencies (García-Corral *et al*., 2022), herd behaviour in the financial market (Choijil *et al*., 2022) and green finance (Zhang *et al*., 2019): Our study is among the first to assess and investigate the growth and research trend of the stock return-inflation nexus using bibliometric analysis. Second, it comprised data spanning the years 1975 to 2022, including research trends during the COVID-19 pandemic and the time of intense inflation brought on by the breakdown of the world supply system.

This paper aims to highlight research trends and focuses on the main research areas of stock returns and inflation, along with providing suggestions on research gaps for future research projects. The study addresses the following research questions: Q1: What are the most popular research categories in the current literature? Q2: What are the most authentic academic publishers and research areas in this field? Q3: What are the publication and citation trends in current literature? Q4: What are the most cited publications in the literature? Q5: What are the most productive and most cited journals? Q6: Who are the most productive and most cited authors? Q7: Which are the most productive and influential organisations? Q8: Which countries are the most productive and influential? Q9: What are the most frequent keywords? Q10: What are the clusters derived from the co-occurrence of author keywords? Q11: How have the author keywords evolved over time? Q12: What research themes are highlighted by the bibliographic coupling analysis?

The paper is organised as follows: We defined data and methodology in Section 2. In Section 3, we implement the bibliometric analysis with regard to the published records and citation analysis. Before concluding this section with a discussion of the main findings, we defined important clusters and themes based on the author's keyword co-occurrence analysis and bibliographic coupling analysis. Finally, Section 4 presents the conclusion and limitations of the study, as well as future directions of research.

DATA AND METHODS

Bibliometric research is a field of study where bibliometric resources are quantitatively examined (Broadus, 1987). To determine a set of information's publishing pattern, data is retrieved, and statistical techniques are used to conduct analytical analysis (McCain, 1996). In

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order to investigate publishing patterns and the most cited papers, this study used citation analysis with a variety of indicators, including the total number of articles, authors, institutions, and citations. The fundamental tenet is that the quantity of articles represents production, and the sum of citations reveals the significance of a group of articles (Cancino *et al*., 2018). Then, the subject field was viewed from a wide angle using co-occurrence analysis of author keywords and bibliographic coupling, which also aids in identifying potential future research directions on the relationship between the stock market and inflation. The graphic depiction of the bibliographic findings is produced using the visualisation programme known as VOS Viewer (Van Eck and Waltman, 2010).

We retrieved the data from the Web of Science Core Collection (WoSCC) database on March 16, 2022. The literature search involves searching all the literature irrespective of articles, proceedings papers, early access, book chapters, review articles, and other related documents available on the topic (TS). We focused on a set of search terms on "stock returns" and "inflation" in the title, abstract, author keywords and Keywords Plus. The exact search string is TS=(("stock market*" OR "stock market performance" OR "stock return*" OR "stock market return*" OR "stock market expected return*" OR "stock price*" OR "stock market price*" OR "share market*" OR "share market performance" OR "share return*" OR "share market return*" OR "share market expected return*" OR "share price*" OR "share market price*" OR "stock inde*" OR "stock market inde*" OR "share inde*" OR "share market inde*") AND ("inflation*" OR "consumer price inde*" OR "CPI")). The default timespan was selected instead of imposing a specific period. Subsequently, the search strategy identified a total of 2037 records between 1975 and 2022 in the WoSCC database. Finally, the 2037 records were used for conducting bibliometric analysis.

RESULTS AND DISCUSSIONS

This section presents the findings of bibliometric analysis conducted using 2037 published records retrieved from the WoSCC database between 1975 and 2022. Among the document categories, "articles" were published in most publication records, accounting for approximately 90% of the records. Proceedings papers, early access, and book chapters were the second, third, and fourth most popular document types, with 10.2%, 2.3%, and 1.3%, respectively. This is followed by other types of documents such as review articles, editorial materials, notes, books, discussions, book reviews, letters, and corrections, which each make up less than 1% of the records. On the other hand, English remains the language of choice for most international scholarly publications. For instance, about 97.7% of stock return-inflation

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papers were published in English. The use of other languages as a publication language includes Russian, Spanish, French, Portuguese, Turkish, Chinese, Czech, Polish, Croatian, Dutch, and German.

Table 1 provides information about the ten most popular categories and the most productive publishers based on the WoSCC categories, research areas, and publishers. Economics is the most popular WoSCC category with 1166 publications, followed by Business Finance with 755 documents. Both the Economics and Business Finance categories encompass more than half the total WoSCC categories reported in Table 1. The most popular research area in the literature is Business Economics, marked with 1755 documents, followed by Mathematics (107), Mathematical Methods in Social Sciences (87), and Computer Science (70). Environmental Studies and Environmental Science Ecology ranked 10th and 9th in terms of WoSCC categories and research area. Meanwhile, Elsevier is the most authentic publisher, with a record of 545 articles, followed by Wiley, Taylor and Francis, Springer Nature, and Emerald Group Publishing, with 203, 179, 121, and 113 articles, respectively. Most researchers have been content with the top five academic publishers because of the high-quality content they offer.

Table 1: The 10 most popular categories, research areas and productive publishers

Rank	Web of Science Categories	Documents	Rank	Research Areas	Documents	Rank	Publishers	Documents
1	Economics	1166	1	Business Economics	1755	1	Elsevier	545
2	Business Finance	755	2	Mathematics	107	2	Wiley	203
3	Business	182	3	Mathematical Methods in Social Sciences	87	3	Taylor and Francis	179
4	Management	154	4	Computer Science	70	4	Springer Nature	121
5	Social Sciences Mathematical Methods	87	5	Operations Research Management Science	43	5	Emerald Group Publishing	113
6	Mathematics Interdisciplinary Applications	65	6	Urban Studies	41	6	Oxford University Press	38
7	Operations Research Management Science	43	7	Engineering	36	7	MDPI	35
8	Statistics Probability	42	8	Social Sciences Other Topics	36	8	Cambridge University Press	26
9	Urban Studies	41	9	Environmental Sciences Ecology	35	9	IEEE	25
10	Environmental Studies	34	10	Science Technology Other Topics	35	10	Sage	24

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Citation analysis

Figure 1 shows the trends in annual research publications and citations from 1975 to 2022. There seems to be an upward tendency in research publishing patterns every year. There was a definite upward trend in the research from 102 to 255 articles from 2000 to 2005, starting in the aftermath of the dot-com bubble. From 2005 to 2009, there were 4578 reported citations; from 2010 to 2014, there were 9,435 citations. The primary cause of this uptrend was the financial crisis in 2008, when subprime mortgages were offered to borrowers. The financial institutions used this inexpensive debt to boost their return on investment, which led the stock market to downtrend drastically following the financial crisis and more researchers came up with studies covering these areas (Wallison, 2011). Thanks to the research that examined the effects of pre, during, and post-COVID-19 from various perspectives, the number of citations in this field reached a peak in 2015–2019 with 18,223 citations and is predicted to rise going forward.

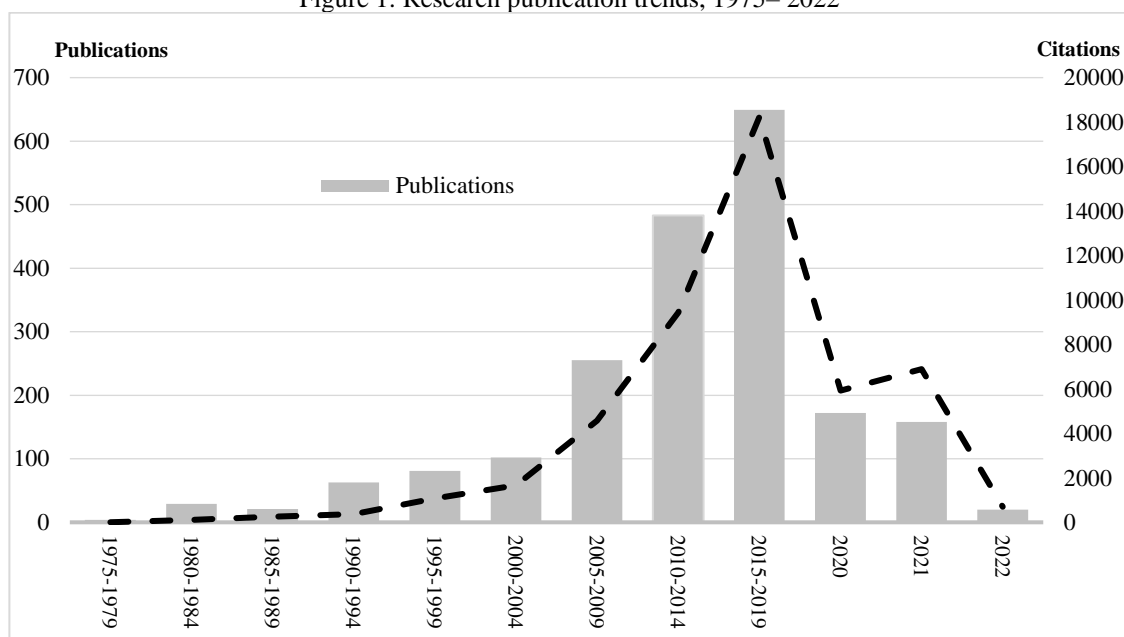Figure 1: Research publication trends, 1975– 2022

Table 2 reports the stock return-inflation articles with over 600 citations from 1975 to 2022. "ARCH modelling in finance: A review of the theory and empirical evidence" by Bollerslev *et al*. (1992) is the most cited research article with a total of 1727 citations to date. The study observed the formulation of ARCH models and a survey of the numerous empirical applications using financial data. "A comprehensive look at the empirical performance of equity premium prediction" by Welch and Goyal (2008) is the second most cited publication. The study re-examined 26 papers to predict the equity premium in-sample and out-of-sample. The

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article has been cited 1200 times and received much attention over the past ten years, suggesting that predicting stock market returns has a long tradition in finance. The third and fourth most highly cited studies are "Stock returns, real activity, inflation, and money" by Fama (1981) and "Oil price shocks and stock market activity" by Sadorsky (1999), with 918 and 865 citations, respectively. Both the researchers observed the anomalous stock return-inflation relations as well as the impact of oil price shocks on stock market performance.

Table 3 provides detailed information regarding the ten most productive and most cited journals. The most productive journal is Applied Economics, which produced 46 documents. With 36 and 35 documents, respectively, the Journal of Finance and Economic Modelling came in second and third place. This is followed by the Journal of Financial Economics (31) and the Journal of International Money and Finance (30). Although ranked second in terms of productivity, the Journal of Finance has the highest number of citations, i.e., 5102. The Review of Financial Studies and Journal of Financial Economics are the second-and third-most referenced journals, receiving 4013 and 3725 citations, respectively. The Journal of Econometrics (3133) and Energy Economics (3074) are next in line.

Table 2: Articles with over 600 citations from 1975 to 2022.

Title	Authors	Total Citations
ARCH modeling in finance - A review of the theory and empirical evidence (1992, Journal of Econometrics)	Bollerslev, T; Chou, Ry; Kroner, Kf	1727
A comprehensive look at the empirical performance of equity premium prediction (2008, Review of Financial Studies)	Welch, Ivo; Goyal, Amit	1200
Stock returns, real activity, inflation, and money (1981, American Economic Review)	Fama, Ef	918
Oil price shocks and stock market activity (1999, Energy Economics)	Sadorsky, P	865
No news is good-news - An asymmetric model of changing volatility in stock returns(1992, Journal of Financial Economics)	Campbell, Jy; Hentschel, L	818
The impact of oil price shocks on the us stock market (2009, International Economic Review)	Kilian, Lutz; Park, Cheolbeom	787
Testing for linear and nonlinear granger causality in the stock price-volume relation (1994, Journal of Finance)	Hiemstra, C; Jones, Jd	784
Approximately normal tests for equal predictive accuracy in nested models (2007, Journal of Econometrics)	Clark, Todd E.; West, Kenneth D.	770
Stock markets, banks, and growth: Panel evidence (2004, Journal of Banking and Finance)	Beck, T; Levine, R	715
Oil price shocks and stock markets in the US and 13 European countries (2008, Energy Economics)	Park, Jungwook; Ratti, Ronald A.	620

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Table 3: The 10 most productive and most cited journals

Rank	Journal	Documents	Rank	Journal	Citations
1	Applied Economics	46	1	Journal of Finance	5102
2	Journal of Finance	36	2	Review of Financial Studies	4013
3	Economic Modelling	35	3	Journal of Financial Economics	3725
4	Journal of Financial Economics	31	4	Journal of Econometrics	3133
5	Journal of International Money and Finance	30	5	Energy Economics	3074
6	Applied Economics Letters	27	6	American Economic Review	2684
7	International Review of Economics and Finance	27	7	Journal of Banking and Finance	1453
8	Energy Economics	25	8	Journal of Monetary Economics	1266
9	Journal of Banking and Finance	23	9	Journal of Business	1046
10	International Journal of Finance and Economics	21	10	Economic Modelling	993

The top ten authors in terms of output and citations are shown in Table 4. Gupta, R is the most productive author with a total of 24 documents, followed by Hsing, Y with 17 documents. Jareno, F. (16 documents), Salisu, A. (12 documents), and McMillan, D. round out the list (10 documents). With 1762 citations, Campbell, J., had the most papers cited. Next in line were Kilian, L. (1324 citations), Ratti, R. (980 citations), Filis, G. (366 citations), and Bekaert, G. (332 citations).

Table 4: The 10 most productive and most cited authors

Rank	Author (Most Productive)	Documents	Rank	Author (Most Cited)	Citations
1	Gupta, R	24	1	Campbell, J	1762
2	Hsing, Y	17	2	Kilian, L	1324
3	Jareno, F	16	3	Ratti, R. A	980
4	Salisu, A. A.	12	4	Filis, G	366
5	Mcmillan, D. G.	10	5	Bekaert, G	332
6	Dinh T. N. H	9	6	Arouri, M. E.H	327
7	Balcilar, M	8	7	Lee, B.	323
8	Shahbaz, M	8	8	Kang, W	305
9	Zivkov, De	8	9	Boudoukh, J	265
10	Hammoudeh, S	7	10	Richardson, M	265

The top organisations are listed in Table 5 based on productivity and influence. Due to the development of the working paper series, which is best known for business cycle records data in the US and global economy (CFI Team, 2020), the National Bureau of Economic Research ranked first for most productive organisation (46 documents) and most influential organisation (5033 citations). Under the most productive categories, the list continues with the

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University of Pretoria with 30 documents, Monash University, New York University, and Universidad De Castilla La Mancha with 17 documents each. With 1817 and 1559 citations respectively, Emory University and Harvard University came in second and third place among the most significant institutions.

Information about the most important and productive nations is provided in Table 6. The countries that appeared on both lists and had the most effects on academic studies about the relationship between stock returns and inflation were the USA, China, England, Australia, India, France, Germany, Taiwan, and Canada. Among these countries, the USA ranked first for both categories, which implies that public participation has sharply increased in the USA due to the unprecedented boom and ease of investing in the stock market. Between 1989 and 1995, the US Department of State reported that the proportion of stock market investors rose from 31% to 41% (Federal Reserve Bank of San Francisco, 2012). Pakistan and South Korea, meanwhile, came in at positions 10 and 3, respectively, for most productive and most influential nations.

Table 5: The10 most productive and most influential organisations

Rank	Most Productive Organisation	Documents	Citations	Rank	Most Influential Organisation	Citations	Documents
1	National Bureau of Economic Research	46	5033	1	National Bureau of Economic Research	5033	46
2	University of Pretoria	30	355	2	Emory University	1817	7
3	Monash University	17	214	3	Harvard University	1559	16
4	New York University	17	1286	4	New York University	1286	17
5	Universidad De Castilla La Mancha	17	172	5	World Bank	1239	7
6	Harvard University	16	1559	6	Princeton University	1184	8
7	University of Ibadan	16	198	7	Korea University	1123	5
8	Columbia University	15	899	8	University of Pennsylvania	1054	13
9	University of Stirling	14	72	9	University of North Carolina Chapel Hill	1014	12
10	University of Pennsylvania	13	1054	10	London Business School	1013	12

Table 6: The 10 most productive and most influential countries

Rank	Most Productive Country	Documents	Citations	Rank	Most Influential Country	Citations	Documents
1	USA	551	27620	1	USA	27620	551
2	China	209	2142	2	England	3539	164
3	England	164	3539	3	South Korea	2315	46
4	Australia	105	1489	4	Canada	2165	69
5	India	92	1113	5	China	2142	209
6	France	83	1405	6	Australia	1489	105

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7	Germany	75	1094	7	France	1405	83
8	Taiwan	72	1075	8	India	1113	92
9	Canada	69	2165	9	Germany	1094	75
10	Pakistan	69	362	10	Taiwan	1075	72

Author keywords co-occurrence analysis

Co-occurrence is defined as the joint occurrence of terms in a given text (Choijil *et al*., 2022). The co-occurrence of author keywords is represented by nodes (Araújo and Carneiro Junior, 2020). The content analysis on co-occurrence is based on the join-occurrence of the author keywords to identify the associations between the concepts contained by a theme. The more the joint occurrence of an author keywords, the greater the conceptual association will be found within a topic. Therefore, co-occurrence analysis of author keywords is useful to ascertain the essential ideas developed by the authors and the associations that exist between them (Caputo *et al*., 2019).

The VOS viewer provides the number and grouping of keywords based on the minimum number of defined occurrences. A minimum of ten occurrences per keyword was defined in this study. The outcome showed that 75 keywords meet the threshold of ten occurrences. Table 7 provides an overview of the 20 most frequently used author keywords, with their respective occurrences and total link strength. Inflation, monetary policy, and the stock market are the three most common keywords, which have an occurrence of 178, 102, and 101 times. These keywords are related to the stock returns-inflation theme, and it highlights the importance of monetary policy in explaining the movement of the stock market and inflation. Stock returns, macroeconomic variables, and stock prices are the 4th, 5th, and 6th most highly applied keywords, with 83, 69, and 68 occurrences, respectively, which highlights the importance of macroeconomic variables in explaining stock's performance. The importance of economic activity on stock market performance is supported by the following three highly used author keywords: economic growth, exchange rate, and oil price. Other research themes that contribute to the author keywords are methodology, as shown by the words i.e., granger causality, forecasting, cointegration, volatility, and GARCH, as well as the theme on stock performance in emerging markets.

Table 7: The 20 most frequently used author keywords

Rank	Author keyword	Occurrences	Total Link Strength
1	Inflation	178	222
2	Monetary policy	102	110
3	Stock market	101	116
4	Stock returns	83	113
5	Macroeconomic variables	69	73
6	Stock prices	68	88
7	Economic growth	46	56
8	Exchange rate	39	75
9	Oil price	36	37
10	Oil prices	34	43
11	Granger causality	33	51
12	Stock markets	33	34
13	Asset pricing	31	17
14	Forecasting	31	31
15	Emerging markets	30	44
16	Cointegration	29	48
17	Volatility	29	34
18	Financial development	25	24
19	Interest rates	25	52
20	GARCH	23	24

Figure 2 illustrates the author keyword occurrence according to the clusters. Previous studies have used clustering as an analytical measure to explore trends in research publications and analyse the research patterns (García-Corral *et al*., 2022; Xu *et al*., 2018). Each colour corresponds to a cluster of keywords categorised according to the number of articles containing the keywords. Each node represents the author keywords; the size of the node represents the frequency of occurrence; and the line thickness represents the link strength. Therefore, the greater the size of the node, the higher the number of articles containing that keyword, while the thicker the line, the greater the total link strength between two keywords. Eight clusters are derived from the author keyword co-occurrence analysis, i.e., inflation, methodology, stock markets in emerging countries, monetary policy, stock return behaviour, macroeconomic variables and stock markets, causality analysis, economic activity and stock prices.

As shown in Figure 2, the first cluster is indicated by the red colour and includes 14 keywords such as inflation, oil price, forecasting, financial markets, and gold. This cluster mainly focuses on inflation and the impact of commodities such as oil and gold on inflation. In addition, the research in this cluster provides evidence of the relationship between inflation and the financial market. The era of pandemic has seen a debate about the likelihood of persistent high inflation, with some countries around the world facing extremely high inflation (Hilmola, 2021). Oil prices, as an important element of production and transportation costs, play a crucial role in inflation. Chen *et al*. (2020) revealed the time-varying effect of the pass-through of oil price shocks on China's inflation. However, oil prices and oil price volatility had limited impact

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on inflation in the early months but increased over the following months due to the fact that oil is a commodity product that is bought at a set price level and stocked in the country (Köse and Ünal, 2021).

The second cluster is illustrated by the green colour nodes and includes 13 keywords. Examples of the keywords are asset pricing, interest rates, GARCH, quantile regression, stochastic volatility, and vector autoregression. The studies in this cluster are oriented towards understanding the methodology used in asset pricing. Methodology plays an important role in improving the accuracy of forecasts in asset pricing. In this context, vector autoregression, GARCH, quantile regression, and ARDL are important methodologies in examining market efficiency, stochastic volatility, and return predictability. Demirer *et al*. (2021) forecasted the output growth, inflation, and monetary policy interest rate for stock market volatility in China and India by employing the Generalised Autoregressive Conditional Heteroskedasticity-Mixed Data Sampling (GARCH-MIDAS) model. By utilising the vector autoregressive connectedness approach, Chatziantoniou *et al*. (2021) revealed that stock market sectoral connectedness in India differs across time, with the greatest connectedness during periods of uncertainty such as double-digit inflation and the demonetization of 2016. By using a different methodology, i.e., quantile regression, Jareño *et al*. (2016) proved that the sensitivity of the US stock market to changes in interest rates and inflation was different across sectors during the 2003 - 2013 period, with a more pronounced effect during extreme market conditions. Applying the same approach, Alagidede and Panagiotidis (2012) proposed that stocks act as a hedge against inflation for the G7 countries over the period of 1970 to 2008. By employing the Autoregressive Distributed Lag (ARDL) and Nonlinear Autoregressive Distributed Lag (NARDL) approaches, Yii *et al*. (2021) revealed the existence of an asymmetric effect between hot money and the stock market in China during the period of 2000 to 2017.

The third cluster is shown by the blue colour and has 10 items. Among the keywords are stock prices, stock markets, emerging markets, and volatility. It investigates the existence of research related to the stock market in emerging countries. Stock markets in emerging countries have different characteristics and are relatively riskier than the equity markets of developed countries (Bekaert and Harvey, 1997; Tay and Gan, 2016). It has been observed that one of the key components of firms responsible for developing policies is risk management (Shakatreh et al., 2023). Many emerging countries undertook important reforms, such as financial liberalisation, beginning in the late 1980s and early 1990s. Financial liberalisation encouraged increased foreign capital inflows, which resulted in positive outcomes for the emerging market's economic development (Bekaert and Harvey, 2000). Kim and Yang (2009)

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noted that capital inflows may lead to asset price bubbles, as evidenced by the Mexican financial crisis in 1994 and the Asian financial crisis in 1997. Hence, though emerging stock markets offer higher average returns, they are relatively more volatile as the high returns in emerging stock markets may imply the presence of bubbles.

The fourth cluster has ten keywords and is indicated by the yellow colour. The keywords include monetary policy, economic growth, financial development, and asset prices. This cluster explains the research domain of monetary policy and financial development. Changes in monetary policy have significant effects on the financial markets. Galí (2014) revealed a framework that establishes that monetary policy shocks have a positive impact on asset price bubbles. The monetary policy transmission via the stock market is supported by Ioannidis and Kontonikas (2008) in research related to 13 OECD countries during the 1972–2002 period. Monetary policies are statistically associated with stock price determination. The dynamic relationship between monetary policy and the stock market is inconsistent in different monetary regimes (Laopodis, 2013). Structural shocks in monetary policy have a negative impact on the stock price index (Salehi *et al*., 2021). Caraiani and Călin (2020) found the heterogeneous responses of monetary policy shocks to stock market bubbles during the post-2000 period. The level of financial development, consumer confidence, and liquidity have explanatory power on the impact of shocks on bubbles. However, monetary policy that focuses on price stability in the long term can also contribute to stock market stability (Cassola and Morana, 2004).

The fifth cluster is illustrated by 9 items and is exhibited by nodes in purple. This cluster provides research for a better understanding of stock return behaviour. The sixth, seventh, and eight clusters are marked by skyblue, orange, and rose brown colour nodes, as well as having eight, six, and five keywords, respectively. These clusters highlight the clusters on macroeconomic variables and stock markets, causality analysis, as well as economic activity and stock prices.

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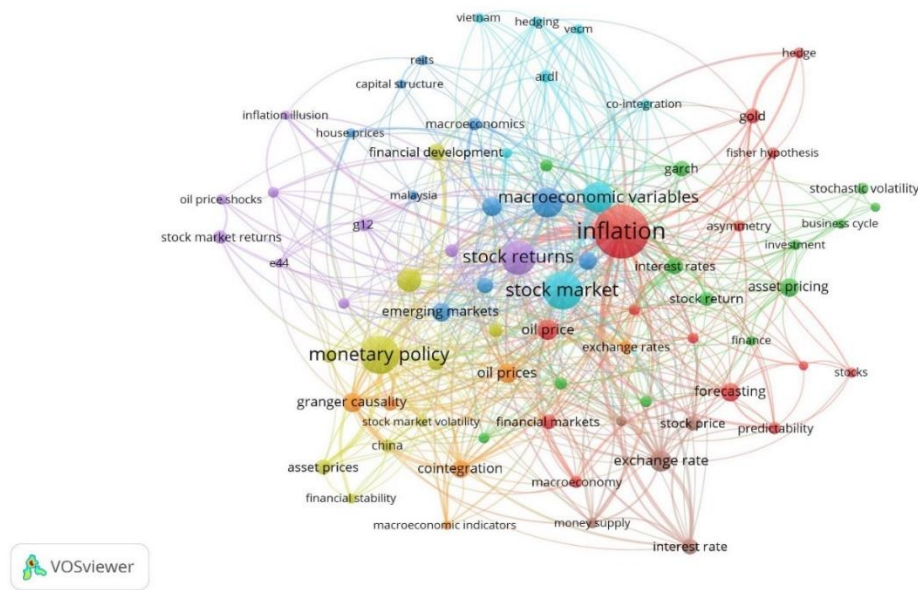Figure 2: Visualisation maps for author keywords co-occurrence

Figure 3 is the overlay visualisation map that shows the evolution of the author keywords over time. Nodes with lighter colours indicate the more recent keywords in the related research field. The results indicate that inflation, monetary policy, and stock returns are the most important author keywords in the period around 2012, as a result of the aftermath of the global financial crisis in 2009 that affected global economic stability. The apparent evolution took place between 2014 and 2016, which saw the development of studies related to the impacts of macroeconomic variables on the stock market, particularly in emerging stock markets. This is supported by the author keywords of interest rates, oil prices, and exchange rates. In the more recent period of 2018, the researchers focused on the keyword of ARDL, i.e., autoregressive distributed lag, which indicates the evolution of the use of non-stationary time series data and the estimation that disentangles long-run relationships from short-run dynamics. Not to forget the keywords gold and hedge, which represent the investors' search for hedging assets to offset the volatility in the stock market.

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Figure 3: Overlay visualisation map for author keywords co-occurrence
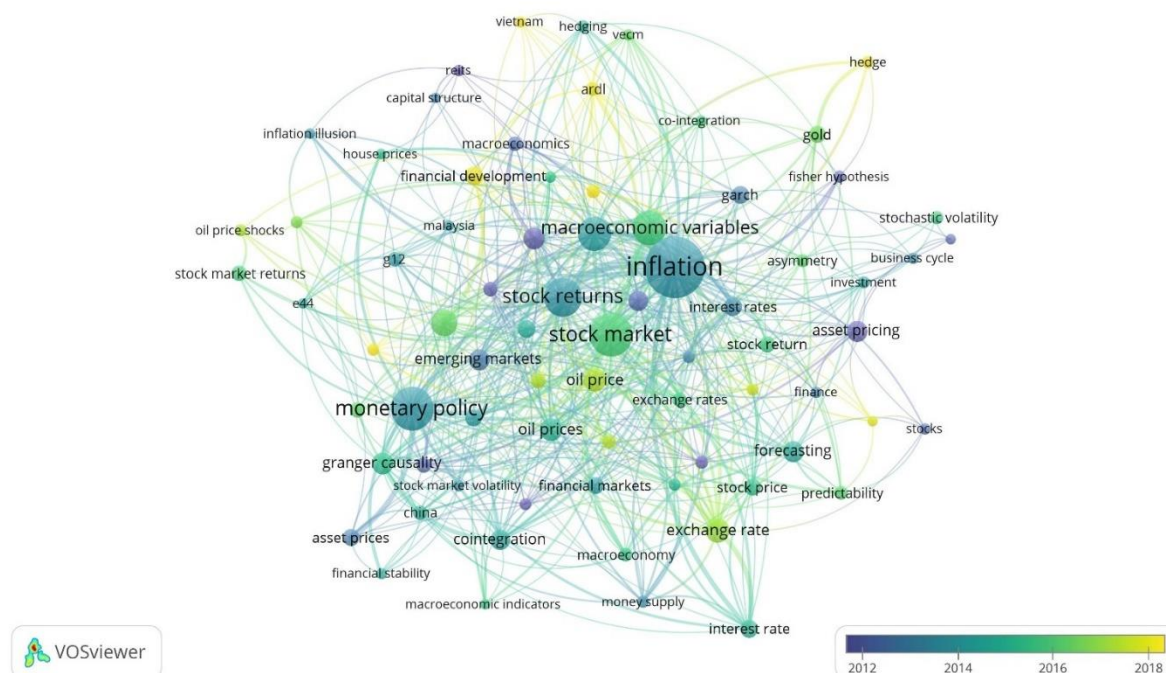

Bibliographic coupling analysis of documents

Bibliographic coupling analysis is a technique that establishes the networks between articles based on the shared common references. This science mapping technique was introduced by Kessler (1963), where it is assumed that the articles with common references that are drawn from the overlapped bibliographies are similar in their content (Zupic and Čater, 2015). This technique is applied to identify themes from research papers of different domains (Modak *et al.*, 2020). Figure 4 shows a bibliographic coupling network of articles published in the stock return – inflation nexus between 1975 and 2022. The coupling analysis, formed by a threshold of 50 citations, resulted in a total of 189 documents and revealed 8 main clusters of articles with relatively homogenous themes. The remaining discussion for this section focused on the six main themes resulting from this analysis.

Cluster 1 is mainly concerned about the predictability of stock returns. Economic variables such as stock market risk premium (Ferson and Harvey, 1991), lag production growth rate, default premium, and term premium (Chen, 1991), U.S. Treasury bill rate, dividend-price ratio, and interest rate variables (Campbell and Hamao, 1992) are associated with predictability. Mark (1995) examined the predictable component of long-horizon changes in log nominal exchange rates based on the bootstrap distributions. Campbell and Ammer (1993), as well as Bekaert and Hodrick (1992), decompose excess asset return by using a vector autoregressive model. Cluster 2 suggests the energy theme. It mainly pointed out the oil price shock (Huang

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and Masulis, 1996; Park and Ratti, 2008; Cong *et al*., 2008) and the impact of demand and supply shocks on the energy markets (Kilian, 2008; Kilian and Park, 2009). Oil prices are a risk factor for stock returns (Sadorsky, 2001; Kumar *et al*., 2012), and their volatility has asymmetric effects on the economy (Sadorsky, 1999). Cluster 3 focuses on the response of stock returns to monetary policy shocks (Thorbecke, 1997; Geske and Roll, 1983) as well as the anomalous stock return and inflation relationship (Fama, 1981). The portfolio problem in the context of time variation (Brennan *et al*., 1997) and the importance of the business cycle in stock market performance (McQueen and Roley, 1993) are highlighted.

Cluster 4 examines the impacts of inflation and banking sector development (Boyd *et al*., 2001; Beck and Levine, 2004). Articles in this cluster discuss inflation hedging (Cooper and Kaplanis, 1994), inflation during stock market openings (Kim and Singal, 2000), and investor sentiment (Brown and Cliff, 2005). Cluster 5 is related to the volatility theme. Equity market volatility is measured using Autoregressive Conditional Heteroskedasticity (ARCH) (Bollerslev *et al*., 1992), GARCH modelling (Nelson and Cao, 1992; Engle and Rangel, 2008), and an asymmetric model (Campbell and Hentschel, 1992). This cluster shows that incorporating the macroeconomic fundamentals into volatility models, i.e., inflation and industrial production growth (Engle *et al*., 2013), inflation and money growth (Flannery and Protopapadakis, 2002), pays off in terms of long-horizon forecasting. Cluster 6 is regarding the forecast accuracy. This cluster examined the predictive power of future economic activity on asset prices (Stock and Watson, 2003) and credit spread indices (Gilchrist and Zakrajšek, 2012). The predictive accuracy of the regression model may be impaired by model uncertainty and instability (Rapach *et al*., 2010). The model seems unstable (Welch and Goyal, 2008), and there is a need to account for noise arising from the forecasts (Clark and West, 2007).

Figure 4: Network visualisation map for bibliometric coupling of documents
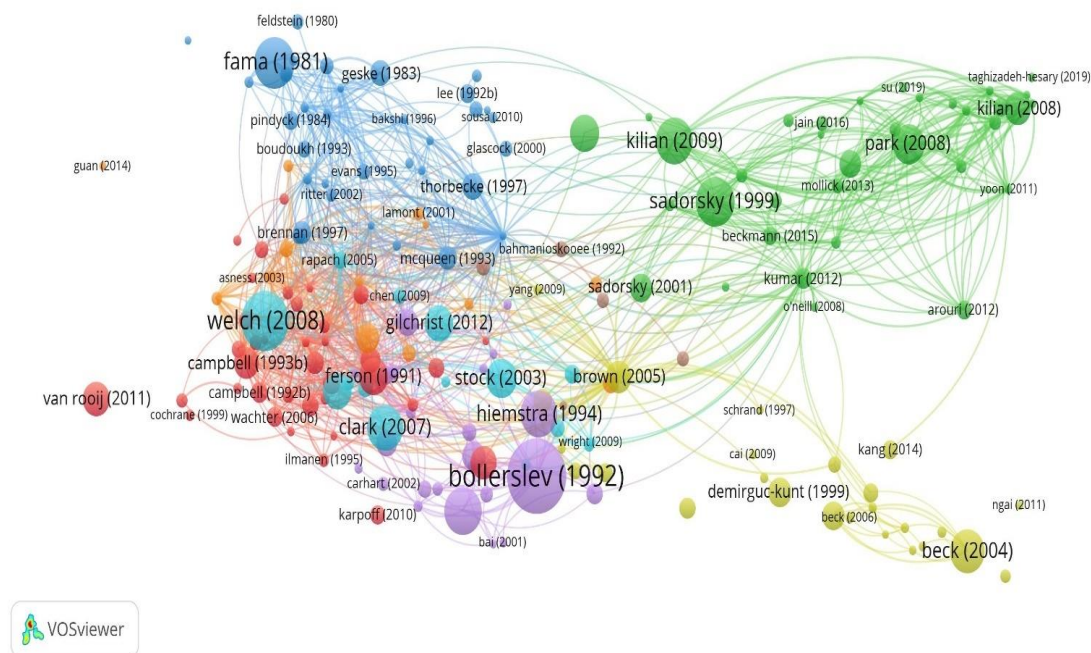
Discussions on main findings

This section highlights the main findings of the current study and suggests areas of existing literature that require further research. Based on the results of analysis, Economics and Business Finance are the two most popular research categories during the 1975–2022 period (Q1). Meanwhile, Business Economics was the most researched area and Elsevier is the most productive publisher in the field of stock return-inflation (Q2). The publication trends in this field were trending upward during the period of observation with an obvious souring of citations starting from the aftermath of the dot-com bubble, and the trend is predicted to continue going forward owing to the uncertain market conditions. (Q3). The most cited publication in the literature was "ARCH modelling in finance: A review of the theory and empirical evidence" by Bollerslev *et al*. (1992), published in the Journal of Econometrics, with a total of 1727 citations (Q4). This study has greatly contributed to the development of knowledge related to the volatility domain in this field of study. Applied Economics and the Journal of Finance are the most productive and most cited journals, respectively (Q5). Gupta, R is the most productive author, while Campbell, J is the most cited author (Q6). The National Bureau of Economic Research is the most productive and influential organisation that has contributed to innovation and development in this field of study (Q7). The USA, China, and England are among the most productive and influential countries that promote growth in terms of publication output (Q8).

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Analysis of author keywords facilitates our understanding of the evolution of author keywords. The three most frequent keywords in this research are inflation, monetary policy, and the stock market (Q9). We identified eight clusters from the author keywords co-occurrence analysis, namely inflation, methodology, stock market in emerging countries, monetary policy, stock return behaviour, macroeconomic variables and stock market, causality analysis, as well as economic activity and stock prices (Q10). Following this, we learned the author keywords evolved over time with the shift of attention from understanding the role of monetary policy on stock returns-inflation nexus to the role of macroeconomic variables. More recently, the study evolved into a methodology in this research field that engaged in asymmetric association, stochastic volatility, and structural vector autoregression. The increasing number of studies on hedging and the adoption of gold as a hedge asset implies the markets are volatile and suggests the need to revisit the research on stock market volatility to reflect the current market environment (Q11). The bibliographic coupling analysis helps us to identify research papers coupled within a theme, i.e., predictability of stock returns, energy theme, response of stock returns to monetary policy, impacts of inflation on the stock market, volatility and forecast accuracy themes (Q12). The analysis of bibliographic coupling discovered growing attention on modelling predictive accuracy, thus suggesting a future research direction that will help to present scientific evidence for decision making and policy. In addition, we noticed the volatility theme that supports the author keyword evolution, thus revealing the importance of the volatility domain in future stock market studies.

CONCLUSION

The purpose of this study was to examine the bibliometric literature on the trends of stock return-inflation over forty-seven years, i.e., from 1975 to 2022. The analysis was conducted to identify dominant academic publications and research trends in the existing literature. We started with an academic search from the WoSCC database that revealed a total of 2037 articles relevant to our research field. Following the search, we conduct the mapping procedure by using the VOS viewer. Then, we analyse and summarise the most prestigious and influential studies, which have made a significant contribution to the development of literature. The author keywords co-occurrence and bibliographic coupling analysis classify literature into clusters and themes that highlight the important evolution of the related relationship, thus offering insight in terms of research areas needed to focus on in the future. By examining the prevailing research clusters and themes, we discovered the transformation of the current literature into new research initiatives, namely the volatility domain, as a result of the

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uncertainty in the global environment. In addition, we found a research gap that highlights the need for a green and sustainable stock market, owing to the emerging energy theme from the bibliographic coupling analysis and the oil-related macroeconomic variables cluster from the author keyword co-occurrence analysis. Nonetheless, in the challenging market conditions with potentially higher levels of inflation, there is a need to revise the existing theory to reflect theoretical implications.

Our study provides insight to investors, fund managers, and authorities in understanding the stock return-inflation relationship and assists them in making informed decisions. However, our study is subject to several limitations. First, we examined the publications available on the WoSCC database only. Therefore, we suggest exploring this topic from other search platforms to cover a larger scope of study and offer additional perspectives for the discussion of this topic. Second, bibliometric analysis only provides information on the quantity and trend of publications; therefore, judgement from the experts in this field is required to provide detailed intellectual discussion. Third, the number of citations of an article may depend on the date of publication, i.e., the earlier the article is published, the more likely it will have more citations. A more recent article with significant impacts may not have a high number of citations and subsequently be excluded from the main results. Thus, the citation analysis must be combined with other analysis such as bibliographic coupling analysis to offer a comprehensive examination of the topic under review. Fourth, a lack of theoretical development on this topic impedes current literature in terms of theoretical implication. Therefore, further research is needed to increase academic collaboration as well as to contribute toward the development of theoretical and empirical literature.

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