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Bibliometric analysis of business performance dynamics in the infrastructure sector

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Abstract: The infrastructure sector is one of the factors for a country's development and will also impact economic growth. This study aims to analyze and describe research trends from the dynamics of business performance in the infrastructure sector reviewed from company fundamentals, macroeconomics, IHSG, and ESG. The research method uses a quantitative approach through bibliometric analysis and systematic literature review with data obtained from the Scopus database using the keywords "market fundamentals"," "macroeconomic," "IHSG," and "ESG." The data that has been obtained is then analyzed through VosViewer and described. The results of the study show that the trend of research publications from corporate fundamentals, macroeconomics, IHSG, and ESG has experienced research developments every year and many countries have contributed to their publications so that this can show that all factors that shape the dynamics of business performance in the infrastructure sector are related to each other so that they can shape the business performance of companies and need to be further researched for researchers in the future.
Keywords: *Bibliometric, Business performance, Infrastructure, Systematic literature review.*

1. Introduction

The infrastructure sector is one of the main pillars of economic development, with a contribution to economic growth [1], [2]. Infrastructure development not only supports community mobility but also strengthens connectivity between regions [1], [3]. However, complex dynamics and policy changes, require companies in this sector to be more adaptive and responsive to changes in the business environment [4]. Infrastructure includes a range of services and facilities needed to support daily life and economic growth, but the relationship between infrastructure and economic growth is not always simple, and with the right approach, countries can bridge the infrastructure gap and build a better future for all [5].

In this context, the company's fundamentals are a crucial aspect that needs to be considered [6]. A company's fundamentals reflect the company's financial and operational health, consisting of various indicators such as net profit, debt ratio, and cash flow [7]–[9]. Research shows that a company's fundamentals are closely correlated with stock performance [10], especially in the infrastructure sector requires large investments and long-term financing [11], [12]. Macroeconomic conditions also play an important role in determining the performance of infrastructure companies [13], [14]. Fluctuations in exchange rates, gold prices, and oil prices, policy changes are some of the factors that can affect a company's financial performance [15], [16]. The infrastructure sector, which relies on large investments, is particularly vulnerable to macroeconomic changes [17]–[19]. Therefore, it is important to understand how these macroeconomic factors interact with the company's fundamentals and also how they affect the company's share price in the Indonesia Composite Stock Price Index [20], [21].

ESG is now one of the increasingly relevant topics in the business world, including in the infrastructure sector [22]. The importance of applying ESG principles for infrastructure companies cannot be ignored because companies that implement good ESG practices tend to have a better

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reputation in the eyes of the public and stakeholders. This good reputation can increase investor and customer confidence, which in turn can have a positive impact on the company's financial performance. In this context, previous research has shown that ESG implementation can improve a company's reputation and attract investors [23]. In addition, investors and financial institutions are now also considering ESG criteria in their investment decisions. Infrastructure companies that have good ESG performance may have an easier time obtaining financing or investment, which is crucial for supporting large projects [24]. ESG adoption not only reflects corporate social responsibility but also has a significant impact on the company's long-term performance [25], [26]. However, in the Indonesian context, research on the impact of ESG on the infrastructure sector is still limited.

The potential novelty of this research lies in how the research trend of business performance dynamics is reviewed from the company's fundamental factors, macroeconomic conditions, and ESG implementation. This research is expected to make an important contribution to the literature on business performance in companies in the infrastructure sector, as well as provide practical guidance for company managers in formulating business strategies that are more sustainable and adaptive to changes in the business environment. Thus, this research offers novelty, both in academic and practical contexts. For companies, the results of this study can be used as a guide in adopting more effective ESG practices and increasing competitiveness in the global market. Meanwhile, for investors, this research can help in understanding the factors that affect the performance of stocks in the infrastructure sector and guide wiser investment decision-making. For future research, careful factors can be considered as research topics with in-depth and comprehensive analysis.

Financial ratio analysis is an important tool in evaluating a company's financial performance, providing a deeper understanding of financial conditions through various aspects such as leverage, liquidity, and total asset turnover. Leverage measures how much debt a company uses to finance its assets and operations. Meanwhile, liquidity indicates a company's ability to meet its short-term obligations, and total asset turnover describes how effectively assets are used to generate sales. This ratio analysis provides an important guide for managers and investors to make strategic decisions related to investment and business management [27]. On the other hand, macroeconomics also plays an important role in influencing a company's performance. Macroeconomic theory developed by John Maynard Keynes emphasized that major economic factors such as fiscal policy, exchange rates, oil prices, and gold prices can significantly affect business performance. Appropriate monetary and fiscal policies can help stabilize the economy and support business growth. Global macroeconomic changes, such as fluctuations in commodity prices, have a direct impact on the profits and strategies of companies in various sectors, especially those that rely heavily on resources or international trade [28], [29]. The Composite Stock Price Index (IHSG) is also an important indicator in the Indonesian context. IHSG reflects stock price movements on the Indonesia Stock Exchange and shows market sentiment towards the performance of listed companies. When the IHSG strengthens, this can indicate healthy economic conditions, which in turn encourages business optimism. In contrast, the decline in IHSG often reflects economic challenges, both from domestic and global factors, which can affect the company's ability to grow and attract investors [30].

In addition to financial and macroeconomic factors, ESG (Environmental, Social, and Governance) assessments are increasingly important in the modern business world. ESG assesses the extent to which a company pays attention to sustainability in its operations, including concern for the environment, social welfare, and good governance. Environmental factors include efforts to reduce negative impacts on ecosystems, while social aspects focus on the company's impact on employees and the surrounding community. Good governance reflects transparency and ethics in the Company's decision-making [31]. The relationship between financial, macroeconomic, IHSG, and ESG ratio analysis can be seen in daily business dynamics. Macroeconomic changes, such as interest rate hikes or exchange rate fluctuations, can affect the company's liquidity and leverage, as well as suppress the IHSG's performance. On the other hand, companies that have healthy financial ratios and apply strong ESG principles are more likely to survive and even grow in dynamic market conditions. Commitment to ESG not only improves a company's reputation, but also helps attract investors who are increasingly concerned about sustainability. Overall, the company's success in navigating economic dynamics is highly dependent on

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its ability to maintain a balance between financial health, adaptation to macroeconomic conditions, and the implementation of sustainable business practices. By understanding these relationships, managers and investors can make more informed decisions to create long-term value for the company and its stakeholders.

2. Material and Method

This study uses a bibliometric analysis approach and Systematic Literature Review (SLR) which aims to analyze and describe research trends related to the dynamics of business performance in the infrastructure sector, which are reviewed from the company's fundamental aspects, macroeconomic variables, IHSG, and ESG. The bibliometric method is a quantitative approach used to evaluate scientific publications and interactions between documents in the academic literature to provide a deeper understanding of research trends [32]. In addition, the Systematic Literature Review (SLR) method, as defined by Dekkers et al., (2022), is a structured and systematic approach to reviewing literature. The stages in SLR include a literature search based on clear criteria, determining documents, and in-depth analysis of relevant literature. In this study, literature analysis was carried out using the PRISMA framework developed by Moher et al., (2009), which aims to ensure that the review flow is carried out systematically, starting from identification, screening, and eligibility to the inclusion of articles in the final analysis, but the researcher develops by adding explanatory points to explain the results of the research. For data collection, this research is sourced from the Scopus database using the keywords "market fundamentals" and "macroeconomic" and "IHSG" and "ESG", then for data processing is used assistance from VosViewer.

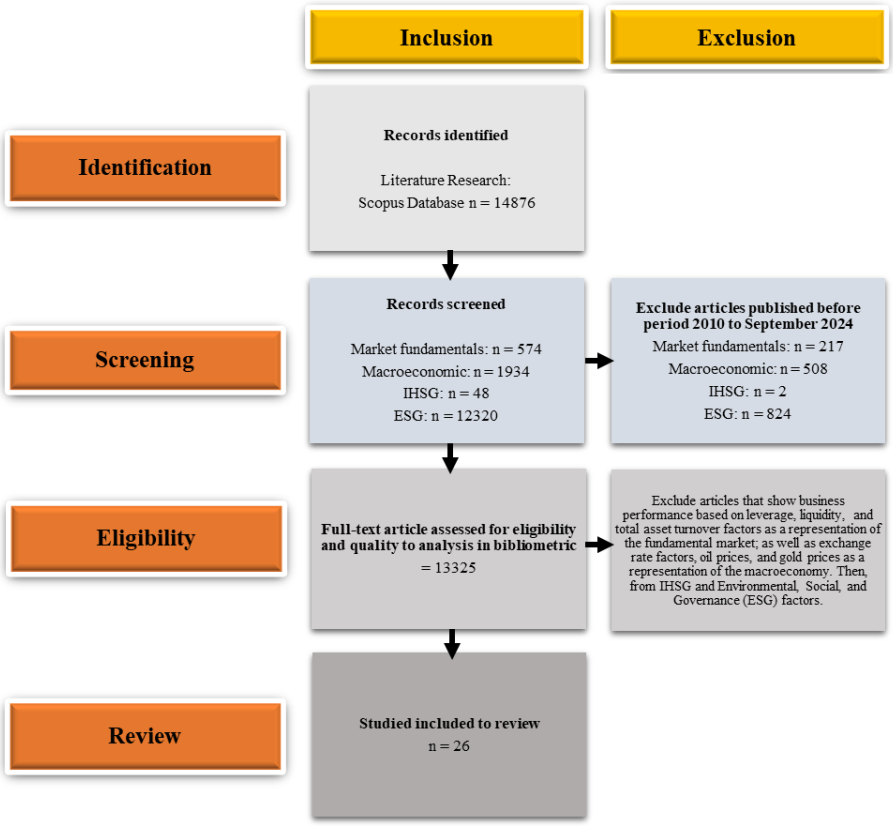

Figure 1.
Research flow.

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From the Scopus database that is included and exclusive, namely in the inclusion of the database from Scopus, then based on the keywords market fundamentals, macroeconomics, IHSG, and ESG. Then what is included is data that is not included in the period from 2010 to September 2024 because the data used for bibliometric analysis uses data from the period 2011 to September 2024. Furthermore, the data is again excluded from the criteria for publication of articles that show research related to business performance based on leverage, liquidity, and total asset turnover factors as fundamental market factors, as well as exchange rates, oil prices, and gold prices as macroeconomic factors, and also related to the Composite Stock Price Index (IHSG), as well as Environmental, Social, and Governance (ESG) factors. So the total data used in this study is 13325 for bibliometric analysis and 26 article data for review. The merger of bibliometric and SLR analysis is expected to identify research gaps and offer new insights related to the relationship between company fundamental factors, macroeconomic dynamics, and IHSG, as well as the impact of ESG on business performance in companies and in the infrastructure sector. This analysis is also to contribute to the understanding of how infrastructure companies can improve their performance by considering various factors in this study.

3. Data Analysis

The results of data collection through the Scopus database show that several factors that can affect business performance, namely fundamental markets, macroeconomics, IHSG, and ESG have different research trends as explained below:

3.1. Company Fundamentals

3.1.1. Number of Publications

In the company's fundamental research trend, it is known that research on this factor has been carried out from 1943 to 2024 September with a total of 574 scientific publications, but below is described how the trend of market fundamental publications over the past 15 years, as shown in Figure 2 below.

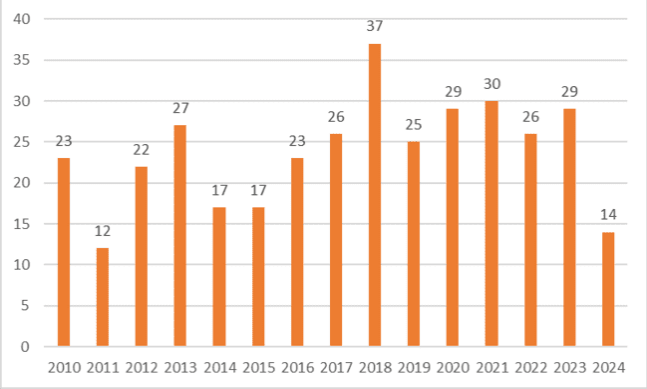

Figure 2.
Publication trends in research related to corporate fundamentals.

Based on Figure 2, in 2010 there were 23 publications, in 2011 there were 12 publications, in 2013 there were 22, then in 2014 and 2015 there were 17, in 2016 there were 23, in 2017 there were 26, in 2018 there were 37 publications, and in 2019 there were 25, in 2020 there were 29 publications, then in 2021 there were 30 publications, In 2022 there were 26 publications, in 2023 there were 29, then in 2024 until September there have been 14 publications. Thus, the trend of publications of the Company's fundamental research in 2011 was the year with the least number of publications during the last 15 years, and 2018 was the year with the highest number of publications with a total of 37.

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3.2. Countries Contributing to Publications

There are 64 countries that have contributed to scientific publications on corporate fundamentals; here is Figure 3, which shows the countries with the highest number of publications.

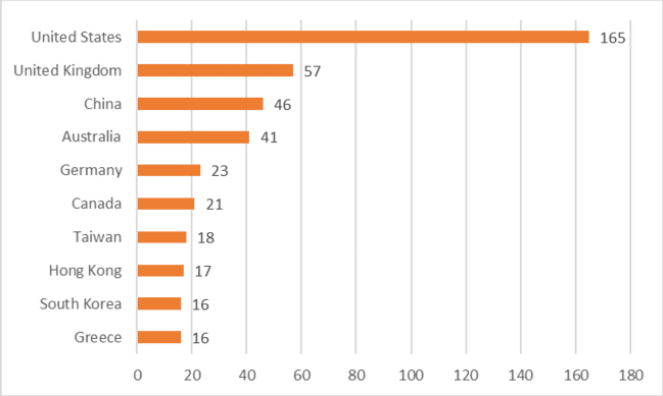

Figure 3.
Top 10 countries with the most publications.

The number of countries that have contributed the most to the Company's fundamental research shows that publications on this topic have become a concern for many countries. The country with the highest number of publications since the existence of publications related to company fundamentals is the United States, with 165 publications, then in the second to tenth positions there is the United Kingdom with 57 publications, China with 46 publications, Australia with 41 publications, Germany with 23 publications, Canada with 21 publications, Taiwan with 18 publications, Hong Kong with 17 publications, South Korea with 16 publications, and Greece with 16 publications.

3.3. Affiliations That Contribute To Publications

The number of affiliates that have contributed to fundamental research is as many as 160 affiliates, which then in figure 4 it is shown that there are 15 affiliates with the highest number of publications and The Hong Kong Polytechnic University with the highest number of publications which is 12 publications, then UNSW Sydney as many as 10, University of Technology Sydney with 9 publications, University of Piraeus as many as 8, National University of Singapore as many as 7, National Bureau of Economic Research as many as 7, Massachusetts Institute of Technology with 7 publications, University of Pennsylvania with a total of 6 publications, London Business School as many as 6 publications, Boston University with 6 publications, National Cheng Kung University with 5 publications, University of California, Berkeley with 5 publications, New Mexico Institute of Mining and Technology as many as 5 publications, Northwestern University as many as 4 publications, and Hankuk University of Foreign Studies as many as 4 publications.

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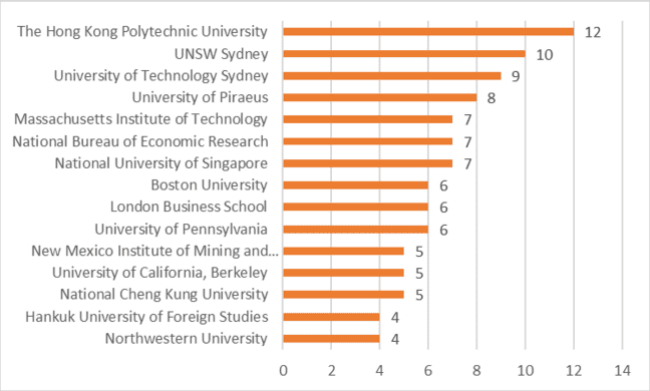

Figure 4.
15 affiliates with the most publications.

3.4. Network Visualization of Corporate Fundamentals

Figure 5 below is the result of data processing through Vosviewer about the network visualization of the Company's fundamentals, which is related to other factors or variables.

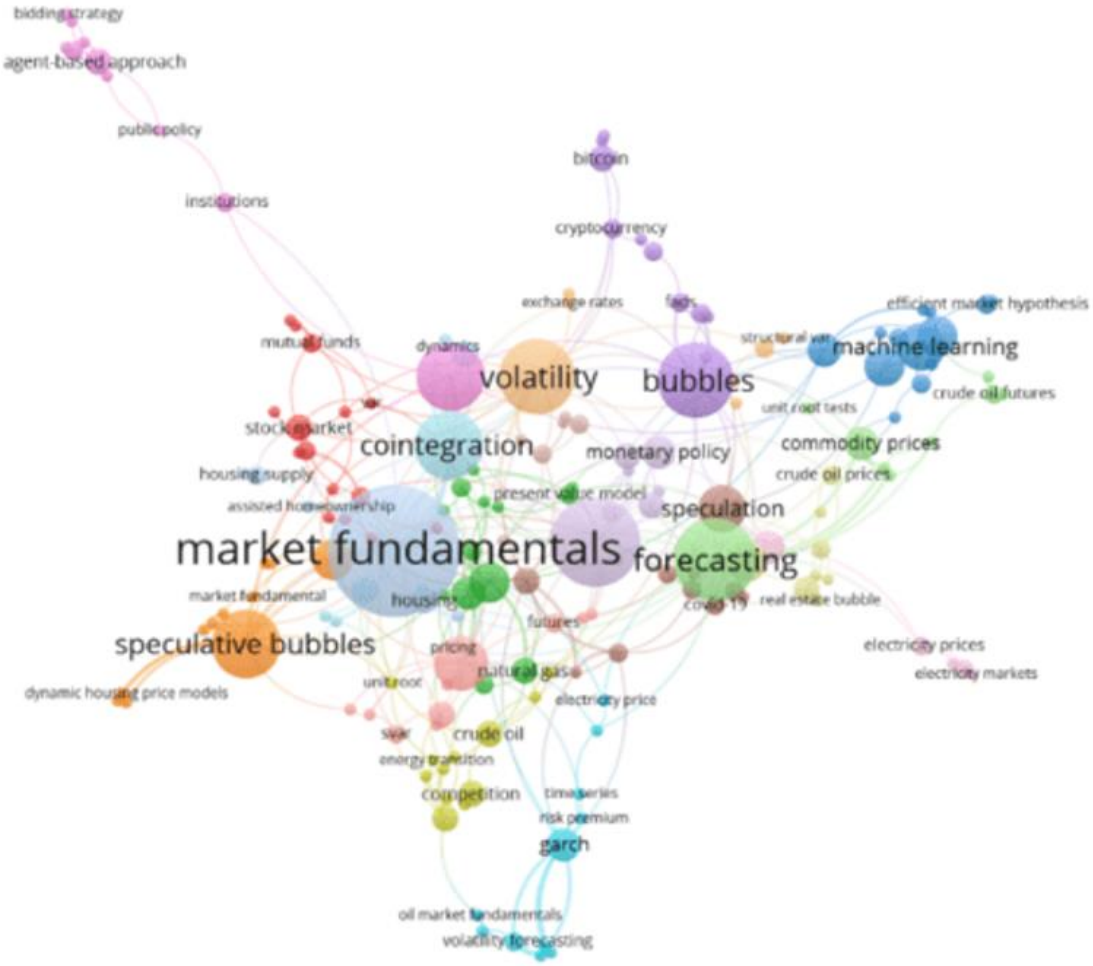

Figure 5.
Network visualization of corporate fundamental publications.

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Based on the results of the network visualization in Figure 5, it is known that the Company's fundamentals have many relationships with other factors or variables. There are 18 clusters in Figure 5, here is a brief explanation for each cluster based on different colors:

Red: Examining the stock market and related fund investments, as it is known that in this cluster there are keywords such as stock market and mutual funds.

Green: The basic factors that affect the market, as it is known that in this cluster there are keywords such as commodity prices.

Blue: Focus on market modeling; as is known in this cluster, there are keywords such as the efficient market hypothesis.

Light Purple: Studying the impact on monetary policy, as it is known that in this cluster there are keywords such as monetary policy.

Orange: Analysis related to the company's fundamental factors, as it is known that in this cluster there are keywords such as market fundamentals.

Pink: Analysis for public policy, as it is known that in this cluster there are keywords such as public policy and institutions.

Yellow: Discussing economic forecasting, as is known in this cluster there are keywords such as crude oil and energy transition.

Brown: Analyzing the energy market, especially natural gas, as it is known that in this cluster there are keywords such as natural gas.

Dark Green: Studying the dynamics of oil prices, as it is known that in this cluster there are keywords such as crude oil futures.

Cyan: Focus on volatility modeling, as it is known that in this cluster there are keywords such as volatility, oil market fundamentals, and risk premium.

Purple: An analysis of the cryptocurrency market and the role of bitcoin, as it is known that this cluster contains these keywords.

Bluish-Green: Examines market risk, as known in this cluster.

Cream: The impact of the pandemic on assets and the real estate market, as is known in this cluster there is this keyword.

Gray: Analysis of market dynamics using the structural VAR model, as it is known that in this cluster there is a VAR structural keyword.

Olive: Researching the oil market and forecasting volatility.

Bright Pink: The use of prices for market analysis, as is known in this cluster, there are keywords such as pricing and futures.

Light Brown: Analysis of the company's condition, as it is known that in this cluster there are keywords such as covid-19.

Dark Purple: Company analysis, as is known in this cluster there are keywords such as Finance Accounting Development (FAD).

3.5. Density Visualization of Company Fundamentals

Figure 6 below is the result of data processing through Vosviewer about the density visualization of the Company's fundamentals, which are related to the keywords that appear the most in the research.

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Figure 6.
Density visualization of corporate fundamental publications.

The bright yellow color in the image shows the keyword areas that appear most often in fundamental market research. Keywords such as "market fundamentals" dominate this area. In contrast, the dark colors in the images show keywords that rarely appear in the study. Keywords such as "efficient market hypothesis" are less common and are in darker areas. This visualization helps to understand the frequency distribution of keywords in fundamental market research and highlights topics that appear more often than others that are marked by the light or dark color of the yellow color.

3.6. Author with the Most Citations

Table 1 shows the 10 authors with the highest number of citations, the authors with the highest number of citations are Gyourko, Josep with 427 citations. Thus, Josep's large number of citations shows that his publications have good writing quality.

Table 1.
Top 10 most cited authors.

No.	Author	Citations
1	Gyourko, Joseph	427
2	Kaufmann, Roberk K.	353
3	Bunn, Derek W.	233
4	Paraschiv, Florentina	223
5	Hui, Eddie C. M.	220
6	Sola, Martin	192
7	Shi, Xunpeng	164
8	Su, Chi-Wei	144
9	Robe, Michel A.	113
10	Lobont, Oana-Ramona	108

3.7. Macroeconomic

3.7.1. Number of Publications

Publications on macroeconomics have been carried out from 1973 to 2024 as many as 1934 publications and the trend of this research over the last 15 years is illustrated in Figure 7 below.

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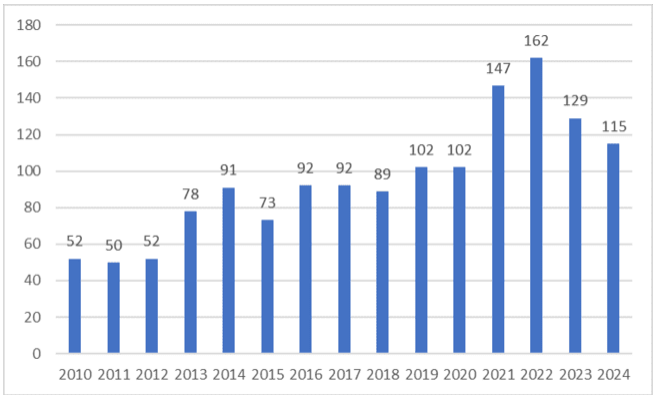

Figure 7.
Publication trends in macroeconomics-related research.

Over the past 15 years, the number of publications in 2010 is known to be 52, in 2011 there were 50 publications, in 2012 there were 52 publications, then in 2013 there were 78, in 2014 there were 91, in 2015 there were 73, in 2016 and 2017 there were 92 publications, in 2018 there were 89 publications, in 2019 and 2020 with the same number of 102 publications, in 2021 with 147 publications, In 2022 with 162, in 2023 with 129 publications, and in 2024 until September there have been 115 publications. Thus, 2011 is the year with the least number of publications on macroeconomics in the last 15 years, while 2022 has the highest number of publications, namely 162.

3.8. Countries Contributing to Publications

There are 96 countries that have contributed to publications on macroeconomics of which there are 10 countries with the most publications depicted in Figure 8 below.

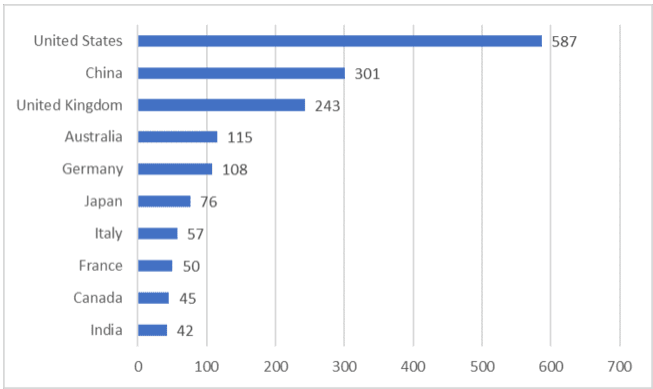

Figure 8.
Top 10 countries with the most publications.

From ten countries that contributed the most, the United States became the country with the highest number of publications with 587, then China became the second position with 301 publications, the United Kingdom with 243, Australia with 115, Germany with 108 publications, Japan with 76 publications, Italy with 57 publications, France with 50 publications, Canada with 35 publications, and India with 42 publications.

3.9. Affiliations That Contribute to Publications

Scientific publications that have been published on macroeconomics are based on the contribution results of 160 affiliates, with 15 affiliates contributing the most shown in Figure 9 below.

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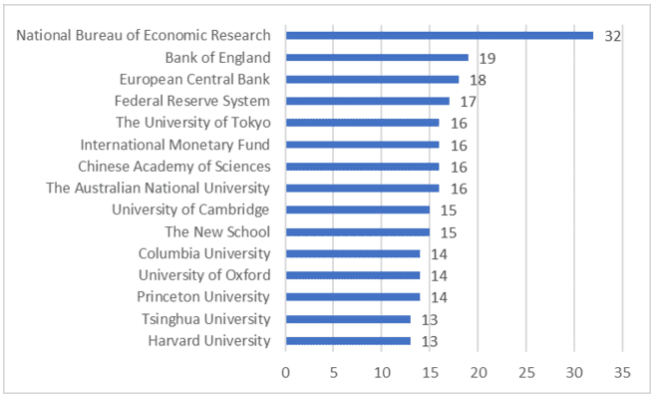

Figure 9.
15 affiliates with the most publications.

The affiliation with the highest number of publications comes from the National Bureau of Economic Research, with a total of 32 publications related to macroeconomics, then the Bank of England with 19 publications, the European Central Bank with 18, the Federal Reserve System with 17 publications, The Australian National University with 16 publications, the Chinese Academy of Sciences with 16 publications, the International Monetary Fund with 16 publications, The University of Tokyo with 16 publications, The New School with 15 publications, University of Cambridge with 15 publications, Princeton University with 14, University of Oxford with 14 publications, Columbia University with 14 publications, Harvard University with 13 publications, Tsinghua University with 13 publications.

3.10. Network Visualization of Macroeconomics

The analysis results through Vosviewer about network visualization from macroeconomics are related to other factors and variables, as shown in the following Figure 10.

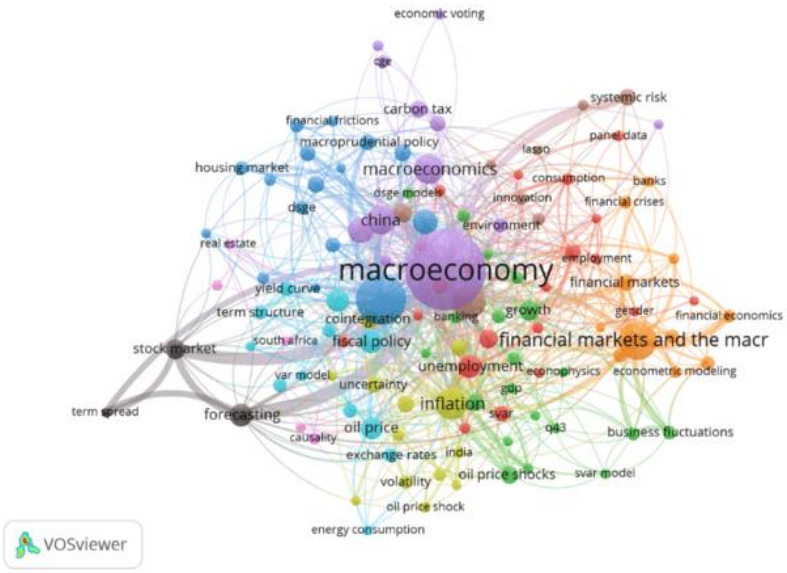

Figure 10.
Network visualization of macroeconomic publications.

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The results of the network visualization in Figure 10 show that macroeconomics has many relationships with other factors or variables. There are 10 clusters in Figure 10, here is a brief description of each cluster based on different colors:

Red: This cluster focuses on macroeconomic impact studies related to keywords consumption, employment, and unemployment.

Dark Green: This cluster focuses on the study of economic growth, international trade, and economic development, as there are keywords such as growth, GDP, and business fluctuations.

Blue: This cluster describes the research as in this cluster there are keywords such as yield curve, macroprudential policy, financial frictions, oil prices, exchange rates, and energy consumption.

Yellow: This cluster includes research on the impact of oil price changes on market volatility and inflation, as in this cluster, there are keywords such as uncertainty, inflation, and oil price shock.

Purple: This cluster examines topics related to macroeconomy, macroeconomics, carbon tax, and Computable General Equilibrium (CGE).

Light Green: This cluster connects topics related to the keyword environment.

Brown: This cluster is related to research on systemic risk keywords.

Orange: This cluster discusses financial markets and financial crises, as well as the use of econometric modeling to analyze this phenomenon; as in this cluster, there are keywords such as financial markets and macroeconomics, financial crises, and financial economics.

Gray: This cluster describes research on stock market predictions, interest rate spreads, and financial models.

Pink: This cluster focuses on monetary policy keywords.

3.11. Density Visualization of Macroeconomics

Figure 11 below is the result of data processing through Vosviewer about density visualization of macroeconomics related to the keywords that appear most often in the research.

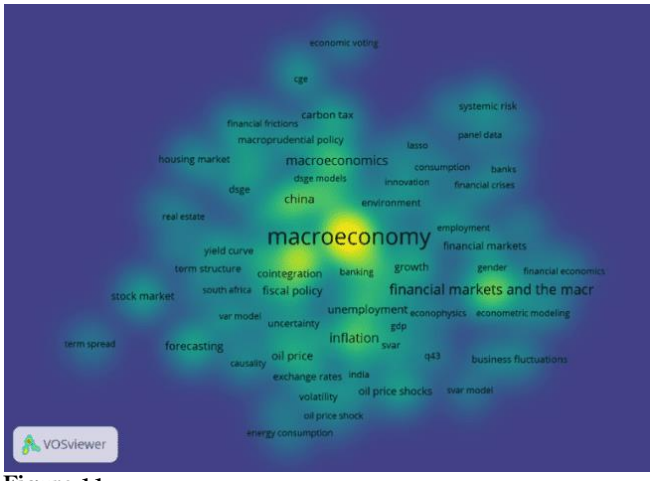

Figure 11.
Density visualization of macroeconomic publications.

The figure shows the density of keyword occurrence in macroeconomic research. Areas with bright yellow colors such as "macroeconomy" and "financial markets and the macroeconomy" indicate that these keywords appear very often in research, making them the center of attention in this area. In contrast, areas with dark colors such as "stock market" and "economic voting" indicate that these keywords appear infrequently and are less in the focus of research. This pattern depicts which topics are the main trends in macroeconomic studies. Thus, this visualization helps in identifying the most and least researched topics in the macroeconomic literature.

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3.12. Author with the Most Citations

Table 2 shows the 10 authors with the highest number of citations; the authors with the highest number of citations are Aguiar-Conraria, Luis and Soares, and Maria Joana with the same number of citations, namely 362.

Table 2.
10 authors with the most citations.

No.	Author	Citations
1	Aguiar-Conraria, Luis	362
2	Soares, Maria Joana	362
3	Ziliak, James P.	261
4	Chevallier, Julien	248
5	Gundersen, Craig	223
6	Zhou, Dequn	112
7	Fujimori, Shinichiro	104
8	Gupta, Rangan	89
9	Heijdra, Ben J.	82
10	Evgenidis, Anastasios	78

3.13. Indonesia Composite Stock Price Index (IHSG)

3.13.1. Number of Publications

Publications about IHSG have been carried out since 2004, with a total of 48 publications until 2024, and in 2021, publications related to IHSG have the highest number of publications. In the last 15 years, as it should have started in 2010 to 2024, but based on data, it is known that from 2011 to 2013, there were no publications, and in 2014, there were publications related to IHSG again, with a total of 1 publication until 2016. Continued in 2017 there were 3 publications, in 2018 there were 5 publications, in 2019 there were 6 publications, then in 2020 there were 7, in 2021 there were 11 publications, then in 2022 there were 5 publications, in 2023 there were 4, and in 2024 until September there were 2 publications, so in Figure 12 it can be seen that the trend of IHSG publications is still not widely carried out and published in the Scopus database.

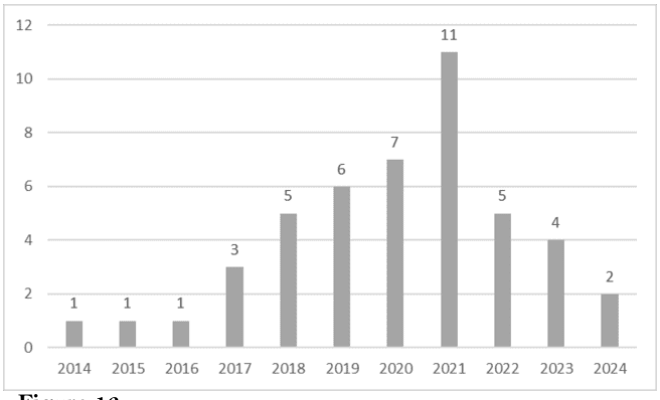

Figure 12.
Publication trends in research related to IHSG.

3.14. Countries Contributing to Publications

There are 13 countries that have contributed to the IHSG publication. Figure 13 shows the country with the highest number of publications with the first placement, namely the United States, with a total of 587 publications.

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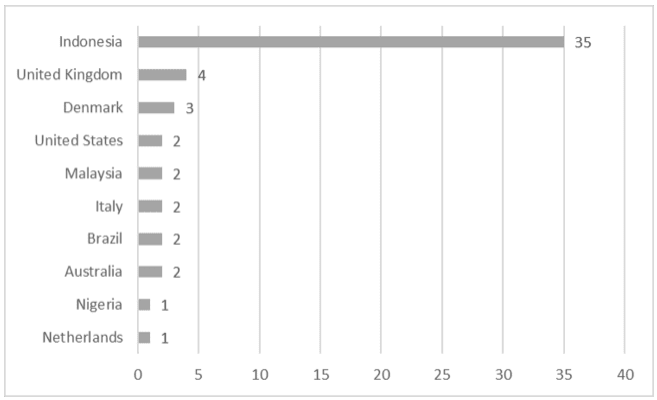

Figure 13.
Top 10 countries with the most publications.

From twelve countries, Indonesia is the country with the highest number of contributions to scientific publications that have been published with a total of 35 publications, then in second place there is the United Kingdom with a number of publications as many as 4, Denmark with 3 publications, the United States with 2 publications, Malaysia with 2 publications, Italy with 2 publications, Brazil with 2 publications, Australia with 2 publications, Nigeria with 1 publication, and in tenth position is the Netherlands with 1 publication.

3.15. Affiliations That Contribute to Publications

In publications related to IHSG, it is known that there are 103 affiliates that have contributed to its publications, but as shown in Figure 14, there are 15 affiliates that have contributed the most to publications related to IHSG.

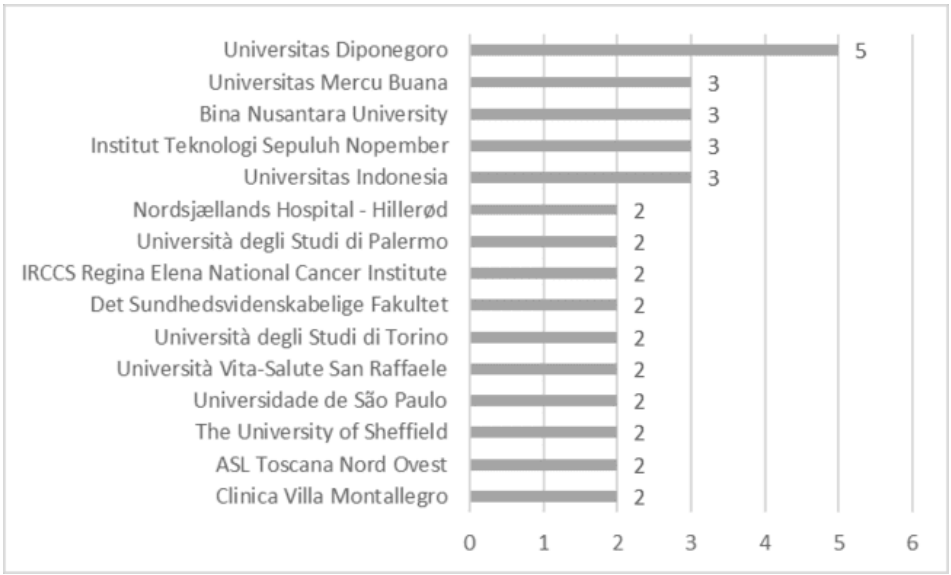

Figure 14.
15 Affiliates with the most publications.

From Figure 14, Diponegoro University from Indonesia has the highest number of publications related to IHSG, namely 5 publications, University of Indonesia has 3 publications, Sepuluh Nopember Institute of Technology has 3 publications, Bina Nusantara University has also contributed 3 publications, Mercu Buana University has 3 publications, Clinica Villa Montallegro has 2 publications,

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ASL Toscana Nord Ovest has 2 publications, The University of Sheffield has 2, Universidade de São Paulo also has 2, Università Vita-Salute San Raffaele has 2 publications, Università degli Studies in Turin has 2 publications, Det Sundhedsvidenskabelige Faculty has 2 publications, IRCCS Regina Elena National Cancer Institute has 2, Università degli Studies in Palermo also has 2 publications, and Nordsjællands Hospital – Hillerød with 2 publications

3.16. Network Visualization from IHSG

The results of the analysis through Vosviewer about network visualization from IHSG show that they are related to other factors or variables, such as the existence of good and bad news, the state of the Covid-19 pandemic, and others, as shown in Figure 15.

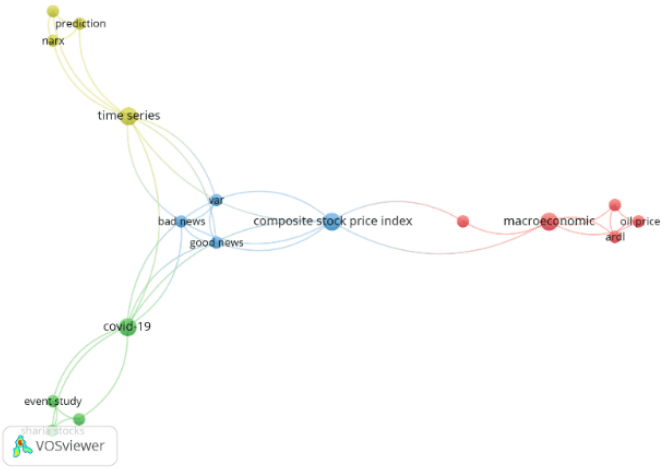

Figure 15.
Network visualization of IHSG publications.

The results of the network visualization in Figure 15 show that the IHSG is related to other factors or variables. There are 4 clusters in Figure 15, here is a brief description of each cluster based on different colors:

Red: This cluster focuses on macroeconomic keywords.

Green: This cluster researches the impact of the Covid-19 keyword on the stock market, including sharia stocks, by using an event study approach to analyze market changes.

Blue: This cluster discusses the combined stock price index keywords with good or bad news and analysis using the VAR model to understand market dynamics.

Yellow: This cluster focuses on keywords using a time series model to predict the economy.

3.17. Density Visualization from IHSG

Figure 16 below is the result of data processing through Vosviewer about density visualization from IHSG, which is related to the keywords that appear the most in the study.

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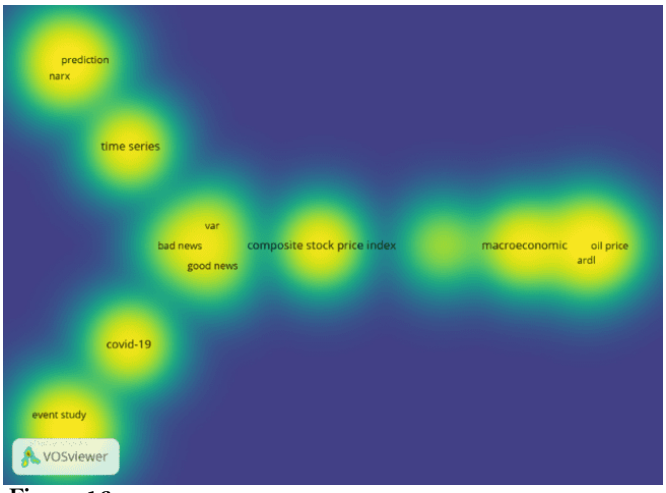

Figure 16.
Density visualization from IHSG publication.

The figure shows the distribution of keyword density in research related to the Indonesia Composite Stock Price Index (IHSG). Areas in bright yellow, such as "composite stock price index" and "time series", indicate that these keywords appear very often in IHSG research, indicating the main focus of researchers. In contrast, areas with dark colors, such as "event study" and "sharia stocks", indicate that these keywords are rarely discussed in the context of IHSG research. The more intense yellow color depicts the popularity of the topic among academics. This visualization helps identify topics of primary concern and those still underexplored in the IHSG study.

3.18. Author with the Most Citations

Table 3 shows the 10 authors with the highest number of citations, the author with the highest number of citations based on the table starting from sequence numbers one to seven with the same number of citations, which is 176.

Table 3.
10 authors with the most citations.

No.	Author	Citations
1	Abraham, Mary B.	176
2	Jones, Timothy W.	176
3	Karges, Beate	176
4	Maahs, David M.	176
5	Naranjo, Diana	176
6	Oduwole, Abiola	176
7	Tauschamann, Martin	176
8	Endri, Endri	30
9	Abidin, Zaenal	30
10	Nurhayati, Immas	30

3.19. Environmental, Social, and Governance (ESG)

3.19.1. Number of Studies

ESG-related publications have started since 1934 with a total of 12320 publications until September 2024. Figure 17 shows the publication trend over the last 15 years, starting from 2010 to 2024.

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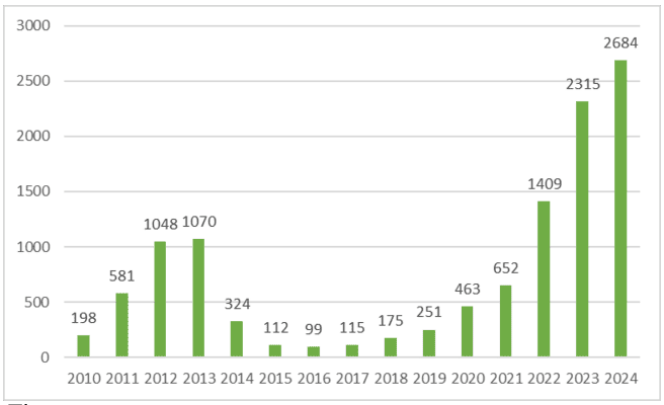

Figure 17.
Publication trends in ESG-related research.

The year 2024 until September is known to be the year with the highest number of publications, namely 2684 publications related to ESG, followed by 2023 as many as 2315, in 2022 there are 1409 publications, then in 2021 with the number of publications is 652, in 2020 there are 463, in 2019 there are 251, in 2018 there are 175, then in 2017 there are 115 publications, in 2016 with 99 publications, in 2015 with a total of 112 publications, in 2014 there were 324, in 2013 there were 1070 publications, in 2012 there were 1048 publications, in 2011 there were 581 publications, and in 2010 there were as many as 198 publications.

3.20. Countries Contributing to Publications

There are 135 countries that have contributed to ESG-related publications from 1934 to 2024. Figure 18 shows the 10 countries that have contributed the most to ESG-related publications.

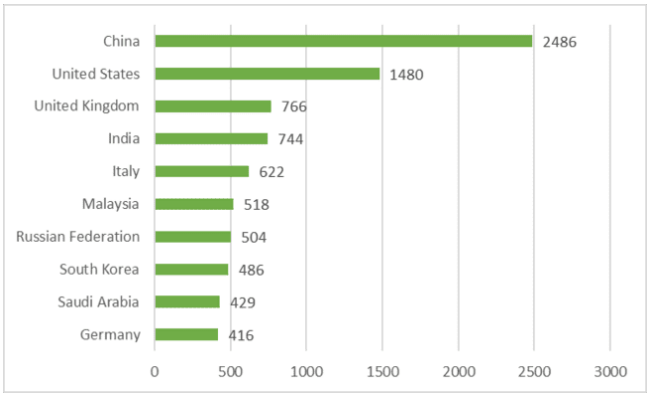

Figure 18.
Top 10 countries with the most publications.

Figure 18 shows that the country with the highest number of ESG-related publications is China, with a total of 2486 publications, in second place are the United States with 1480 publications, the United Kingdom with 766 publications, India with 744 publications, Italy with 622 publications, Malaysia with 518 publications, Russian Federation with 504 publications, South Korea with 486 publications, Saudi Arabia with 429 publications, and in tenth place is Germany with 416 publications.

3.21. Affiliations That Contribute to Publications

Since its first publication, 160 affiliates have contributed to ESG-related research, as shown in Figure 19.

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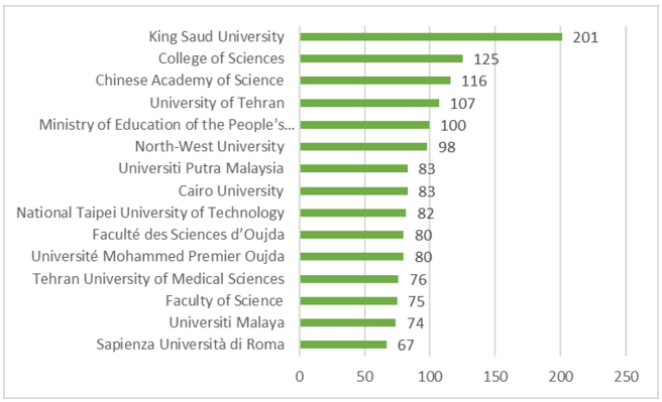

Figure 19.
15 affiliates with the most publications.

Figure 19 shows that King Saud University has the highest number of publications, with 201 endorsements. Followed by the College of Sciences with 125 publications, then the Chinese Academy of Science has 116 publications, the University of Tehran contributed 107 publications, the Ministry of Education of the People's Republic of China has 100 publications, North-West University has 98, Cairo University has 83, Universiti Putra Malaysia also has 83 publications, National Taipei University of Technology has 82, Université Mohammed Premier Oujda with 80 publications, Faculté des Sciences d'Oujda with 80, Tehran University of Medical Sciences with a total of 76, Faculty of Science with 75 publications, University of Malaya with 74, and Sapienza Università di Rome with 67 publications.

3.22. Network Visualization of ESG

The results of the analysis through Vosviewer about the network visualization of ESG in figure 20 show that it is related to other factors or variables such as social, environmental, governance, corporate, social responsibility, sustainable development, green innovation, green finance, sustainable investment, and others.

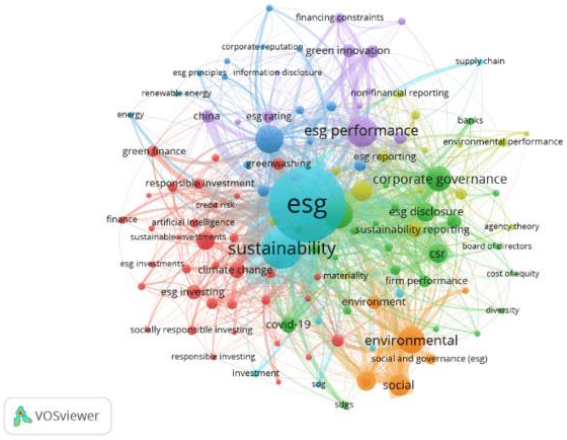

Figure 20.
Network visualization of ESG publications.

The results of the network visualization in Figure 20 show that ESG is related to other factors or variables. There are 7 clusters in Figure 20, here is a brief description of each cluster based on different colors:

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Red: This cluster covers topics related to responsible investment, green finance, and the use of technology in investment in this cluster, there are keywords such as responsible investing, sustainable investment, green finance, credit risk, climate change, ESG investing, and social.

Dark Green: This cluster focuses on corporate governance, ESG reporting, and corporate social responsibility, as in this cluster there are keywords, namely sustainability reporting, corporate governance, CSR, SDGs, firm performance, and ESG disclosure.

Blue: This cluster focuses on ESG keywords and their relationship with sustainability keywords, corporate reputation, SDGs, and ESG principles.

Purple: This cluster discusses the keywords green innovation, financing constraints, ESG rating, and ESG performance.

Yellow: This cluster focuses on keywords environmental performance and ESG reporting.

Orange: This cluster focuses on environmental keywords, then social keywords from ESG, and social and governance (ESG).

Young Green: This cluster highlights the impact of the COVID-19 pandemic on ESG practices, as there are keywords Covid-19, sustainability, and cost of equity.

3.23. Density Visualization of ESG

Figure 21 below is the result of data processing through Vosviewer about the density visualization of ESG, which is related to the keywords that appear most in the research.

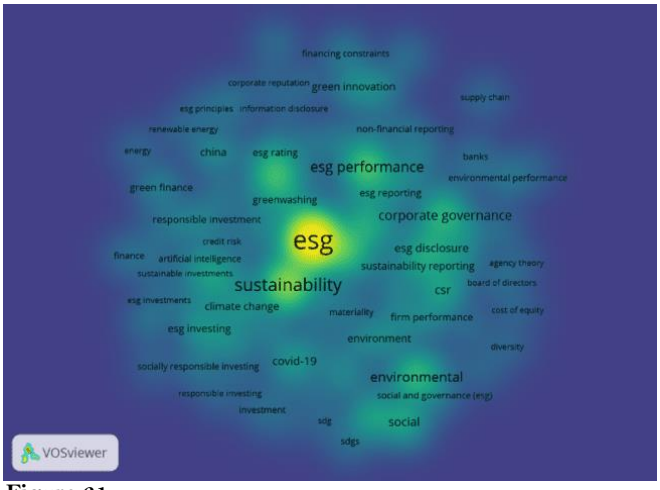

Figure 21.
Density visualization of ESG publications.

The figure shows the density of keywords in research related to Environmental, Social, and Governance (ESG). The bright yellow color around the keywords "ESG" and "sustainability" indicates that these keywords are most discussed in ESG-related research. This area reflects the topics that are the main focus of the researchers. In contrast, dark-colored areas such as "artificial intelligence" and "supply chain" indicate that these keywords rarely appear in ESG research. This helps identify topics that are very popular and that are still underexplored in ESG research.

3.24. Author with the Most Citations

Table 4 shows the 10 authors with the highest number of citations; the author with the highest number of citations is Hammouti, B. with the number of citations is 3980, then in the second position is Al-Devab. S.S with 3072 publications, and the third is Ebensi, Eno E. with 2328 publications.

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Table 4.
10 authors with the most citations.

No.	Author	Citations
1	Hammouti	3980
2	Al-Deyab, S.S	3072
3	Ebenso, Eno E.	2328
4	Chen, Shen-Ming	2171
5	Zarrouk, A.	2035
6	Ganjali, Mohammad Reza	1681
7	Zarrok, H.	1655
8	Salghi, R.	1606
9	Norouzi, Parviz	1582
10	Sherigara, B. S.	1420

Based on the data collection results, Table 5 shows the factors that affect the dynamics of business performance in the infrastructure sector, which are reviewed from market fundamentals, macroeconomics, IHSG, and ESG factors.

Table 5.
Factors affecting business performance dynamics in the infrastructure sector.

No	Variable	Influencing factors	Author and year	Result
1	Fundamental market	Total asset turnover	[35] [36]	Positive influence
		Liquidity	[37] [38] [39]	Positive influence
		Leverage	[40] [41]	Pengaruh negatif
			[42] [43] [44]	Negative influence
2	Macroeconomic	Exchange rate	[45] [46] [47]	Negative influence
		Oil Prices	[16] [48]	Positive influence
			[49]	Negative influence
		Gold Price	[50] [51]	Positive influence
3	IHSG	IHSG	[52]	Positive influence
4	ESG	Environmental, social, and environment	[53] [54] [55] [56] [57] [58] [59]	Positive influence

Business performance in the infrastructure sector is greatly influenced by various factors, both in terms of company fundamentals and macroeconomic conditions. In this context, the analysis of leverage,

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liquidity, and total asset turnover as the company's fundamental factors, as well as exchange rates, oil prices, gold prices, the Composite Stock Price Index (IHSG), and the application of Environmental, Social, and Governance (ESG) principles are very important. Here are the main points that summarize the dynamic, accompanied by references from relevant research.

3.25. Company Fundamental Factors

Leverage: Research by Renaldo et al., (2023) indicates that leverage has a negative influence on the company's value, which means that the higher the debt, the lower the company's value. But, Adam et al., (2023) Finding that leverage can increase profitability, especially in the context of diversification, suggests that good debt management can provide profits.

Liquidity: Liquidity plays an important role in financial performance. Paul et al., (2021) indicates that liquidity has a significant effect on a company's profitability. But El-Chaarani et al., (2023) noted that high liquidity can increase ROA but reduce ROE, indicating that there are trade-offs that need to be managed properly.

Total Asset Turnover: Maharani et al., (2024) found that Total Asset Turnover has a significant positive influence on business performance, indicating that efficiency in asset use can increase the Company's profitability.

Based on the above, it is known that high leverage can give companies access to greater capital, allowing them to make the necessary investments in infrastructure projects. However, if the debt is too high, this can reduce the company's liquidity, which is essential for meeting short-term obligations. The inability to manage debt and liquidity can lead to greater financial risk, which in turn can affect the business's overall performance. Efficiency in the use of assets (Total Asset Turnover) is directly related to profitability. A company that can manage its assets well can generate more revenue from each unit of assets owned. This is especially important in the infrastructure sector, where large initial investments are required. Good performance, in this case, can increase the company's attractiveness in the eyes of investors and stakeholders.

3.26. Macroeconomic Factors

Exchange Rate: Research by Edoko et al., (2018) shows that the exchange rate significantly influences business performance, with exchange rate fluctuations affecting the company's financial results. Nwakoby et al., (2019) added that exchange rates can have a negative impact on business performance.

Oil and Gold Prices: Research by Bakhsh and Khan, (2019) shows that fluctuations in oil prices can have an impact on exchange rates and macroeconomic performance. Meanwhile, Anyalechi et al., (2019) noted that changes in oil prices have a positive but not significant impact on business performance in the long term.

Based on the above, it is known that exchange rate fluctuations can affect the cost of imported raw materials and equipment, which are often important components in infrastructure projects. Research shows that unstable exchange rates can have a negative impact on business performance. In addition, oil and gold prices can also affect operational costs and profitability. For example, high oil prices can increase transportation and raw material costs, reducing a company's profit margin.

3.27. Indonesia Composite Stock Price Index (IHSG)

Research results by Jumintang and Utami (2022) noted that the IHSG does not directly show an influence on business performance, but the returns generated from the IHSG can provide an indication of how the companies listed in it are performing. This shows that the IHSG can be an important market indicator for investors. Based on this, IHSG functions as a market indicator that reflects the performance of listed companies. A good IHSG performance can increase investor confidence and make it easier for companies to get funding for infrastructure projects. Conversely, a poor IHSG can reduce investment interest, affecting a company's ability to finance new projects.

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3.28. Environmental, Social, and Governance (ESG)

Apart from financial factors, Environmental, Social, and Governance (ESG) is an important aspect in assessing the performance of infrastructure companies. Many investors and stakeholders now consider ESG implementation as a determining factor in business sustainability. Companies committed to ESG, such as maintaining environmental sustainability, supporting local communities, and having good governance, tend to have a better reputation and attract more investors. Research by Lee and Kim (2022) shows that the application of ESG principles can improve the company's non-financial performance, which is related to corporate social responsibility and ethics. The implementation of ESG in the infrastructure sector presents its own challenges. Infrastructure projects often have a major impact on the environment, such as the construction of toll roads requiring large land areas. Therefore, companies need to ensure that their operations are aligned with environmental sustainability principles, such as using eco-friendly materials or investing in renewable energy. Infrastructure companies implementing ESG have a higher probability of attracting institutional investors focused on sustainability. The study highlights how ESG is a key factor in investment attractiveness, especially amid growing global awareness of sustainability. Chernykh et al., (2024) added that ESG has a positive influence on business performance, with companies that implement good ESG practices tending to have a better reputation and attract investment. Thus, good management of ESG issues can reduce risks associated with environmental and social issues, which can have a positive impact on the company's financial performance. Thus, companies that integrate ESG principles in their strategies contribute to sustainability and improve their businesses' performance.

3.29. Research Gap

Research related to business performance dynamics which is reviewed from various factors analyzed from the research trend, has contributed each of each factor to research on business performance dynamics, but based on the article that has been reviewed in Table 5, it is known that research related to fundamental market factors, macroeconomics, IHSG, and ESG has been carried out but partially and no one has combined these factors on business performance in companies in the infrastructure sector. For example, research that has been conducted by Maharani et al., (2024) and Nurlaela et al., (2019) In his research on the factors of total asset turnover and liquidity as part of the fundamental market, it is stated that these two factors have a positive influence on business performance, but the research on the leverage factor in the fundamental market is based on [40] has a negative influence on business performance and research results by [44] In fact, it shows that leverage can have a positive influence on business performance. Therefore, research related to market fundamentals reviewed from the factors of total assessment turnover, liquidity, and leverage has a positive and negative influence, so it is necessary to review more deeply research related to market fundamental factors on business performance. Then in macroeconomics which is reviews from the exchange rate, oil prices, and gold prices according to research Edoko et al., (2018) the existence of the exchange rate has a negative influence on business performance, then changes in oil prices can have a positive effect, according to Anyalechi et al., (2019) and can also have a negative effect, according to Perifanis and Dagoumas (2021). In addition, the Indonesia Composite Stock Price Index has a positive influence on business performance, as well as ESG, which is reviewed from three factors, namely environmental, social, and governance, based on several research results such as Kharlamov (2023), Shushunova et al., (2022), dan Lee and Kim (2022) has a positive influence on the company's business performance, especially in increasing environmental awareness and company reputation.

Based on all previous studies related to market fundamentals, macroeconomics, IHSG, and ESG, each of these factors has its research limitations, namely related to how all factors are researched individually, not together, and there are also factors whose results have negative and positive influences so that future research can be researched more complexly, considering the complexity and interactions that occur in today's business world. In this context, understanding how factors such as leverage, liquidity, exchange rates, commodity prices, and the application of ESG principles interact with each other and affect the performance of this research can provide valuable insights for company management in strategic decision-making. By knowing the factors that affect performance, management

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can formulate more appropriate policies in debt management, investment, and risk management. This will ultimately contribute to increasing the company's profitability and sustainability. Not only beneficial for companies, this research also provides useful information for policymakers in formulating policies that support the growth of the infrastructure sector. With a better understanding of the factors that affect business performance, the government can create a more conducive environment for investment and infrastructure development. Then this research also presents an opportunity for researchers in the future to deepen studies or research related to business performance, especially in the infrastructure sector which is reviewed from corporate fundamentals, macroeconomics, IHSG, and ESG.

4. Conclusions

From the above analysis, business performance in the infrastructure sector is influenced by a combination of company fundamental factors and macroeconomic conditions. Leverage, liquidity, and total asset turnover are important factors that must be managed properly to improve financial performance. In addition, macroeconomic conditions such as exchange rates and commodity prices must also be considered. The application of ESG principles is increasingly an important factor in increasing the company's attractiveness in the eyes of investors and stakeholders. Therefore, companies in the infrastructure sector need to integrate all these factors into their strategies to achieve optimal performance. Then based on research trends from all factors of business performance dynamics, it is known that research related to the company's fundamentals has existed since 1943 with the United States as the country with the highest number of publications, namely 165, publications related to macroeconomics have started since 1973 with the United States as the country with the highest number of contributions, namely 587 publications, further related to IHSG publications have started since 2004, and Indonesia as the country with the highest number of publications is 35, and in ESG-related publications, it has existed since 1934 with China as the country with the most contributors which is 2486.

Research on the dynamics of business performance in the infrastructure sector shows developments in scientific publications from year to year. This research trend reflects the increasing attention of academics and practitioners to factors that affect business performance, especially in a dynamic and competitive context. Overall, this study emphasizes the importance of integration between company fundamental factors, macroeconomic conditions, IHSG, and the application of ESG principles in the business strategy of infrastructure companies. By understanding the interaction between these variables, companies can formulate more effective policies to improve the company's business performance. This research contributes to the development of academic literature in the fields of business management, finance, and economics. By increasing the understanding of the dynamics of business performance, this research can be a reference for future studies and help in the development of new theories. Thus, it is important for researchers, practitioners, and policymakers to continue to explore and understand these dynamics for the advancement of the business sector.

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