Understanding Commodity Investments:
Factor Analysis and Bibliometric Findings

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Abstract

In recent years, commodity investment research has made significant progress. The crisis arising from the Covid-19 pandemic and the war in Ukraine highlighted the importance of understanding commodity markets and rationalizing distribution chains. The main research topics relating to commodities are in constant flux. The present study conducts a bibliographic analysis based on 920 research papers indexed in Scopus during 1980-May 2023. The focus was set on the economic perspectives of commodities and a knowledge map of the most frequently used research themes revealed remarkable research advancements. This analysis was deepened by factor-based research methods, which allowed us to explore the relationships between the most used keywords and implicitly identify the themes of increasing interest in commodity investments. The results show that commodity markets research is closely linked to cost-economic research, environmental impact research, and human involvement in the management of distribution chains.

Key words: commodity investment, bibliometric analysis, factor analysis, knowledge mapping.
J.E.L. classification: D80, G00, Q02

1. Introduction

Despite technological progress and economic difficulties, our planet suffers from pollution and depletion of resources. Although the deterioration of the environment is indisputable and leads to global warming and increasingly poor access to resources, human consumption, and expenditure behavior progress.

Several studies warn against the risks of the consumption of underground resources or the generation of energy that severely impact the global environment (Huijbregts et al., 2010). The greenhouse effect and its analysis of evolution have become increasingly important and highly analyzed topics. Efficiency or rationalization of water consumption, desertification and the environmental impact of primary resource consumption are just some of the recent problems that have stimulated the scientific world.

The context of the crisis arising from the Covid-19 pandemic, the long-term war in Ukraine, and the global imbalances resulting from lack of access to resources are all questions of research. Concerns are raised about the destructive environmental impacts of mismanagement of resources or abuse of commodities. On the other hand, commodities create an opportunistic context for the investment environment (Poncela et al., 2014). The listing of commodity traders has become an increasingly exciting topic for economic research.

The present study provides a retrospective of published economic studies focusing on the topic of commodities. The bibliometric analysis on keywords supplemented by factor analysis showed commodity market investigations are closely linked to economic cost research, environmental analysis, and human involvement in commodity management.

2. Theoretical background

The field of commodities and commodity markets is of intense research interest especially in recent years. Although there are many analyses on the impact of commodity consumption on the environment (Batrancea et al., 2021), the research hotspots still change, because the commodity market itself is constantly evolving.

Understanding commodities implies a dual perspective. On the one hand, commodities offer investment opportunities and have become important portfolio investment assets. On the other hand, commodity management is a challenge for controlling negative effects and has a direct impact on the environment of our planet, leaving deep traces in terms of resource consumption or reckless exploitation.

Commodity investments relate to energy, metals, cereals, soft foods, and meats. Among the investments in metals, literature focuses mainly on the analysis of gold, silver, and platinum investments. In terms of energy investment, research has focused on Brent oil prices, carbon emissions, crude oil, and natural gas. In cereals, several scholars explored the evolution of investment indicators for wheat, corn, rice, or oats. The soft market includes stocks markets indicators for cocoa, coffee, sugar and orange juice, while meat markets provide information on livestock.

Commodity investment research has multiple implications for daily life. Commodities are the main resources of human life or economic activity. Consumption has various triggers, as the research provides insights into technological advances or social media that can influence consumer behavior (Micu et al., 2016). Other studies explore energy consumption and show that it is one of the driving forces of business and also an important resource. Commodity prices influence consumption and business cycles (Alquist et al., 2014), but they also directly affect exchange rates, according to empirical evidence (Sankararaman et al., 2018).

By reviewing the literature, we have observed that there are shortcomings in the bibliometric analysis in the field of commodity investments. From an economic perspective, diversification of investment portfolios is an important concern for financial market players.

The methodology of the study contributes to the research and is anchored in the subjectivity of the researcher's argumentation (Pathac et al., 2023). Traditional classification and data analysis face serious difficulties when it comes to the need to investigate large amounts of information or long time series. Statistical analysis is an objective alternative to such contexts and is preferred by researchers to explore information in depth and in a comprehensive way (Tolmasky et al., 2002; Micu et al., 2013). Bibliometric analysis is a valuable method for investigating research trends. Relations between authors, keywords, journals, co-citations, source journals and other such information can be thoroughly explored and can actively contribute to the mapping of knowledge on various hot topics. Factor analysis allows the database to reduce its dimensions, and visually explains and represents the correlations between the increase in variables in an n-dimensional space (Mirea et al., 2016a; Munteanu et al., 2017). Reducing the large number of keywords used in various research directions to a limited number of factors allows for better and more comprehensive information management.

3. Research methodology

To identify relevant data for our analysis we used the Scopus database, following a process of systematically evaluating the commodities literature through several steps (Bem, 1995). The observation period was extensive, starting from 1980 to May 2023. The first stages of the research focused on building an analysis base and filtering the relevant information for the study. The selection criteria of relevance and validity were set up to include keywords such as "accounting" and "commodity". A total of 920 publications which met the criteria were obtained.

The numerical evolution of the publications included in the analysis sample is shown in Figure 1. It is interesting to note that the subject of commodities has started to raise more and more interest among economics researchers since 2006 and is now a hot topic in research. The diachronic evolution of research trends on the topic of commodities allows us to calculate the prediction of research interest over the next three years. The forecast of the research trends for the following period is marked with a dotted line in Figure 1, and it vividly shows that its upward trend suggests the expectation of an intensification of research in the field of commodities.

Figure no. 1 Numerical evolution of research publications on accounting and commodities topics
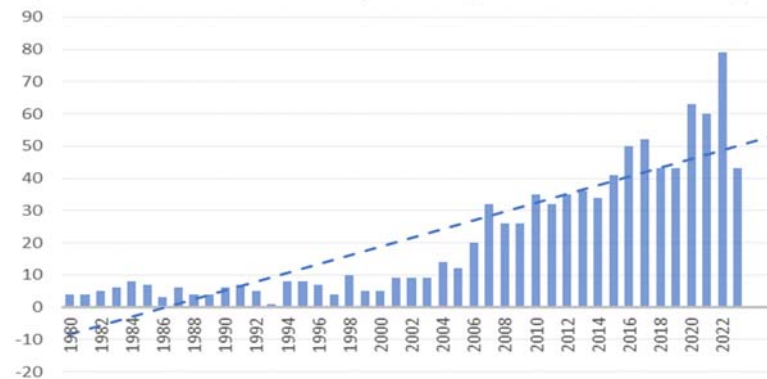
Source: own research

The next steps of the analysis aimed at reducing the dimensionality of the identified keywords and exploring the relationships between them to identify hot topics related to commodity investments. Towards this goal, factor analysis allowed the construction of a knowledge map of linked keywords and the analysis of the relevance of the links between the items analyzed.

4. Findings

The bibliometric analysis followed the relevance of each selected study and the validity of the keywords used. To increase the relevance of the analysis, the next step consisted of additional filtering of the database, setting the condition that the minimum number of occurrences of each identified keyword was 12. Of the 7055 keywords identified, 100 met the selection criteria, total link strength was 5318, and the keywords were grouped into 6 clusters according to the research topic and the association of their use in research papers.

The validity of the keywords used was confirmed in the next stage of data processing, when the data filtering focused on keywords that were similar, such as keywords in plural and singular form that had the same meaning. After applying this last filter, 6966 keywords were identified, of which the selection targeted those words with a minimum number of occurrences of 8. 84 keywords out of the 920 selected papers met the threshold.

The visual presentation of the results and the creation of a knowledge mapping were made possible by using the VosViewer software, density visualization being considered the most suggestive for observing item density, according to Figure 2. A medium value of the Kernel width parameter was chosen.

Figure no. 2 Density visualization of research keywords
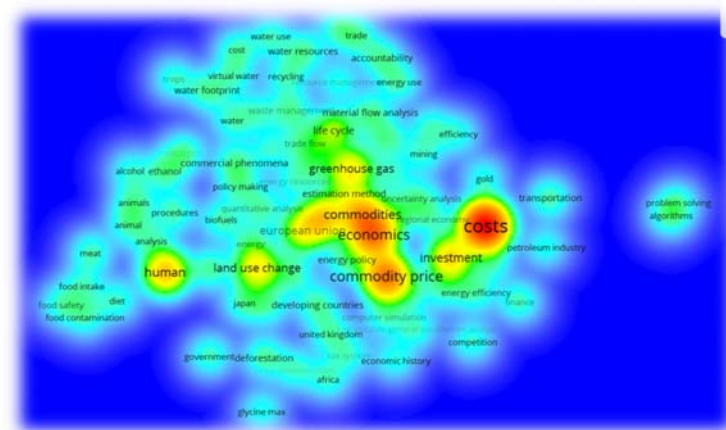
Source: own research

From Figure 2 a rough conclusion can be drawn regarding most of the used keywords in the field of commodity accounting research. The density visualization suggests that commodity prices, costs, economic implications, and human interventions are key issues concerning commodity analysis.

Keywords represent the quintessence of analyzed contextual ideas, and their repeated use across multiple studies allows the identification of hot topics in research (Gurtu et al., 2015). VosViewer shows a link between two keywords whenever there is a co-occurrence relationship between these two keywords in a publication (Guo et al., 2019, pp. 7). Total link strength shows the number of papers in which the two keywords appear together. Of the 84 keywords identified, keywords that recorded or frequented a co-occurrence greater than 10 were selected for inclusion in the next steps of the analysis, as shown in Table 1.

Table no. 1 Data description of keywords co-occurrence

No.	Keyword	Occurrences	Links	Total link strength
1	costs	140	50	229
2	commodity price	74	49	130
3	economics	73	64	172
4	commodities	52	51	100
5	human	46	46	124
6	carbon	42	57	130
7	investment	40	38	80
8	greenhouse gas	33	46	103
9	land use change	33	43	93
10	European Union	29	51	99
11	life cycle	22	42	88
12	accountability	11	11	14
13	commercial phenomena	11	49	63
14	conservation of natural resources	11	28	44
15	deforestation	11	14	28
16	developing countries	11	21	30
17	energy policy	11	21	34
18	environmental management	11	23	28
19	estimation method	11	28	38
20	ethanol	11	29	51
21	income	11	31	43
22	material flow analysis	11	30	46
23	nitrogen	11	29	40
24	transportation	11	15	22
25	waste management	11	25	33
26	water footprint	11	27	41
27	water resources	11	22	32

Source: own research

The factorial analysis was performed by using Kaiser criteria, principal component matrix (PCA) as the extraction method (Mirea et al., 2016b) and the oblique rotation as the interpretation method. In accordance with the interpretation of Field, the oblique rotation was preferred to avoid oversimplifying the data (Field, 2013). The factor analysis performed on the sample data led to the extraction of two factors which explain 91,51% of the variance. The two factors were labeled according to Table 2 and the component plot is presented in Figure 2.

Table no. 2 Factor labels and the corresponding number of keywords

Factor	Factor Label	Number of keywords
Factor 1	Commodity investment	11
Factor 2	Commodity management	16

Source: own research

The label attributed to each factor was influenced by the keywords contained by the corresponding factor and the theme that could be considered as common. In order to better observe each factor, we used the red color for the representation of the keywords in factor 1, and the blue color for the representation of the keywords in factor 2, according to Figure 3.

Figure no. 3 Representation of component plot in rotated space
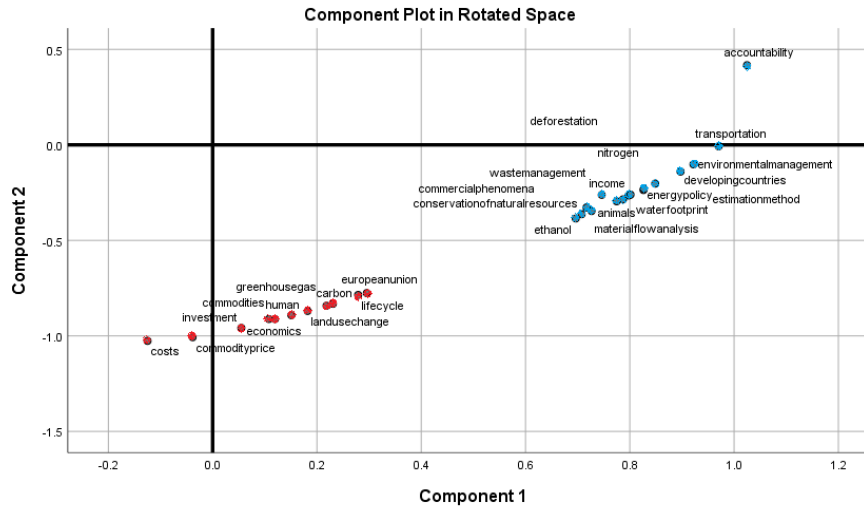
Source: own research

Factor 1 contained 11 keywords and explained most of the variance, 87, 54%. The label, Commodity investment, was inspired by the economic and commodity market oriented contained in the factor sampling. The most popular keywords are "cost", "commodity price", "investment" and "economics". The analysis suggests that the papers investigating commodities as portfolio investments or for cost reasons, also show close interest in the human involvement in supply chain management. Suggestive keywords supporting such conclusion are "greenhouse gas", "human", "land use change", "lifecycle" and "carbon".

Factor 2 contained 16 keywords, amongst which the most representative ones are "waste management", "deforestation", "environmental change", "developing countries", "water footprint" and "conservation of natural resources". The papers attributable to this factor have the common theme commodity management and support the research of commodities by acknowledging the managerial implications and the environmental effects of such management decisions.

It is interesting to note from the representation of Figure 3 that the keyword "accountability", which is contained in Factor 2, is represented at a fair distance compared to the cloud of related keywords. Such an observation suggests that understanding commodity management and its implications to the environment or resource use does not necessarily have strong links with accountability incentives.

5. Conclusions

This paper explores trends in research published on accounting and commodity topics on the Scopus platform from 1980 to May 2023. The subject of commodities is complex, manifesting several implications for daily life in general, and representing extensive investment opportunities in particular. Since 2066, the topic has attracted significant research interest and is currently a hot topic of research, particularly in terms of exploring trends in the commodity market.

The exploration of co-occurrence of keywords using bibliometric analysis and factor analysis allowed the identification of the main directions of commodity economic research. Although the research hotspots have tended to change over time along with the development of research perspectives, two main directions of analysis can be observed, namely commodity investment and commodity management.

When analyzing the limitations of the study, they are characterized mainly by the limited nature of the research sample. The data platform used for data collection, Scopus, is a comprehensive and relevant research literature database from which data can be extracted from renowned journals and publishers. The expansion of research trends analysis by supplementing the analysis sample with other relevant international databases in the field of research is a proposed future direction of analysis. In addition, this document analyzed the full record of selected papers, but bibliometric analysis did not allow other important aspects of the analysis to be included, such as the distinction between theoretical and empirical articles. On the basis of these limitations, it may be suggested to deepen the analysis of the contents of publications in the field of commodity investments in general and commodity investments in particular.

6. References

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